MANUAL Kit Z-Upgrade 2.0 with Oldham 2.3

Suivi des évolutions

Indice	Date	Description de l'évolution	Auteur
0.0	17/02/2023	Création	FBR

Rédacteur	Responsable X	Qualité
FBR	FBR	FBR

Pre-check

BEARINGS

It is a good idea to check bearings health before assembly, it can solve issue before spending time on a painfull full check.

-Choose a 2RS or a ZZ protection to remove the dust to be a future issue

-Check the bearing armor (ZZ) it should be flat, no pinch, no deformations

-Roll it by hand to check an eventual hard point, proof of an internal issue

-Check the presence of dark oil coming from a junction (used bearing), if present, change the bearing. (Bearing are generally cover by a clean film of clear oil/lubricant that is normal)

The M1-M2 design has been made with not need and possibilities to compress the bearing, meaning there will be no issues relative to that.

BELTS

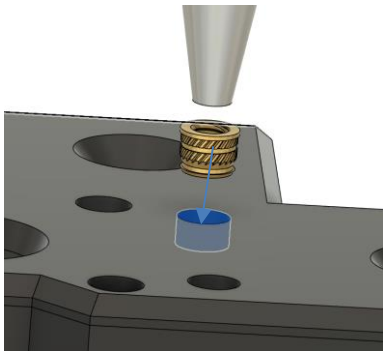
I always advised to use quality genuine Gates belts in order to have less issues in the future, be sure to have the good length (at least 15mm more on each side)

I personally experienced non straight belt with no-name ones, it leads to issue during printing by moving the belt path contact up and down the bearing leading to friction, loose of steps, and even rapid faillures. Choose quality first 😉

Part preparation

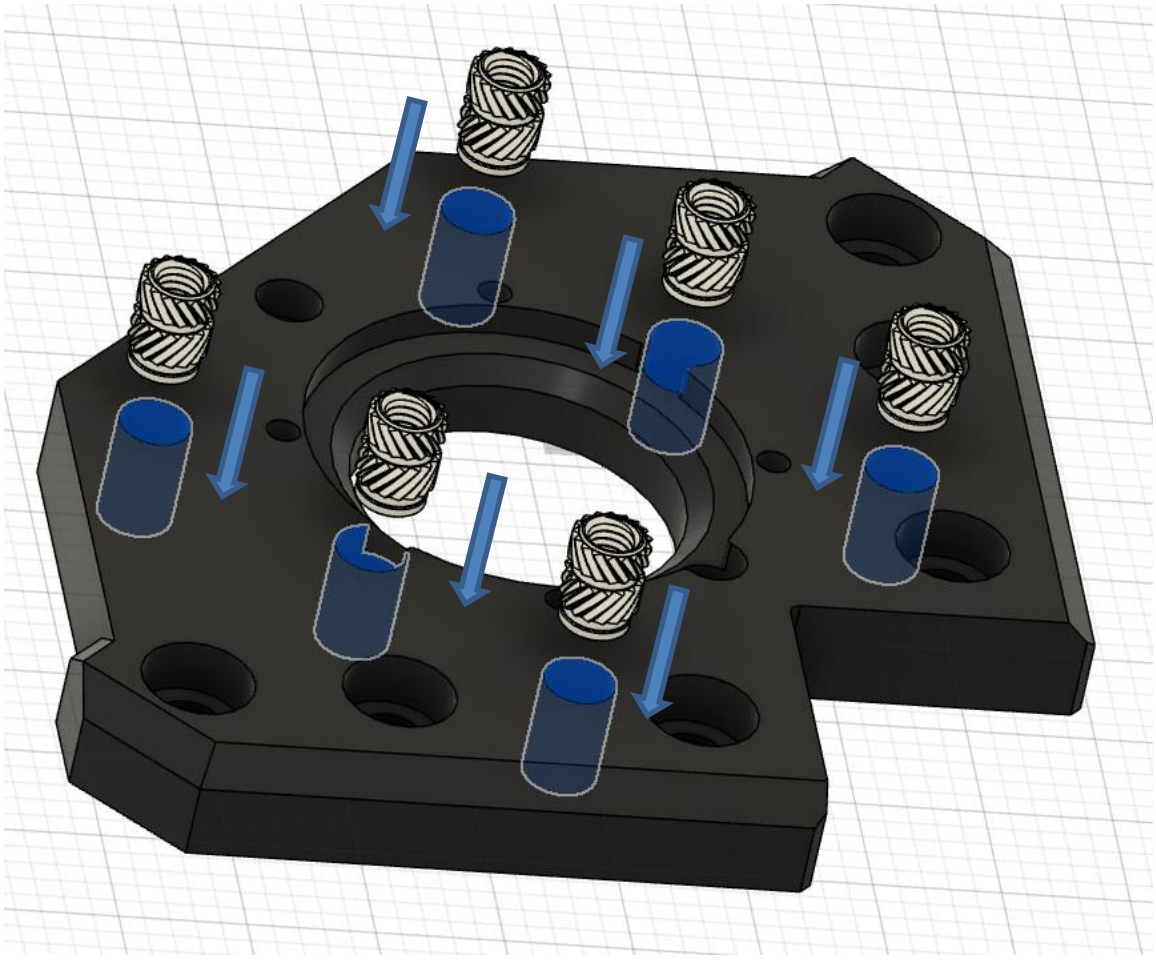
1/ HEAT INSERTS

Insert m4 Inserts in the required places with a soldering iron



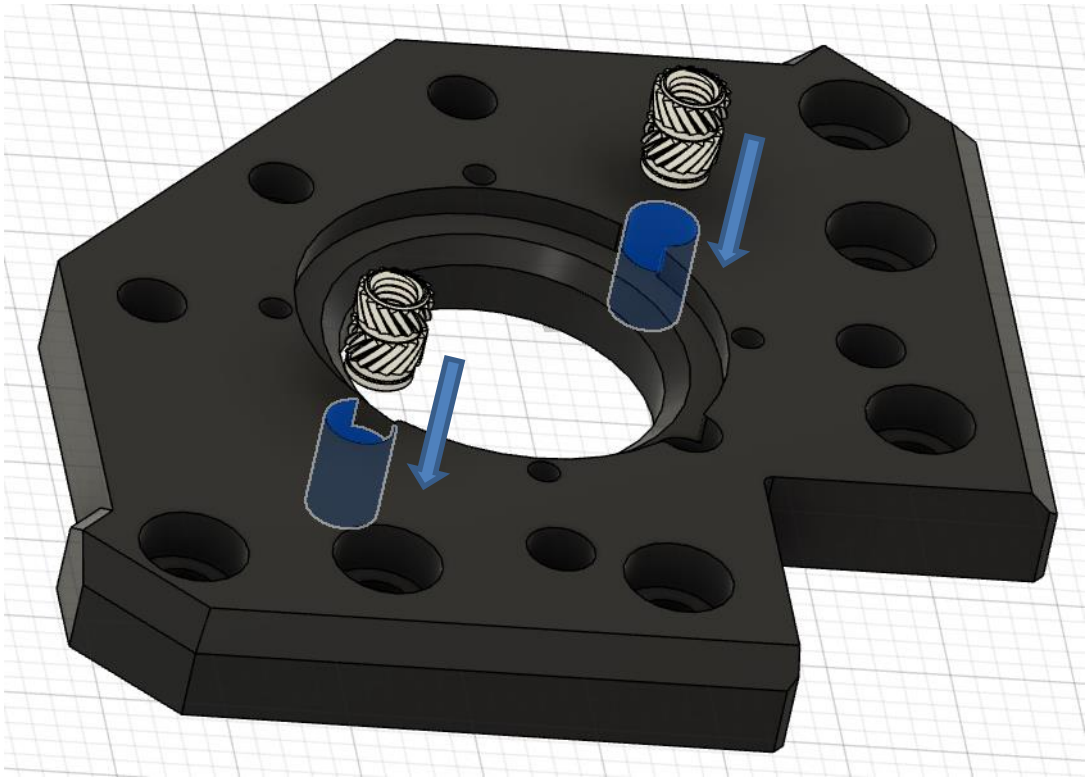
Exemple

A/ LOWER PLATES



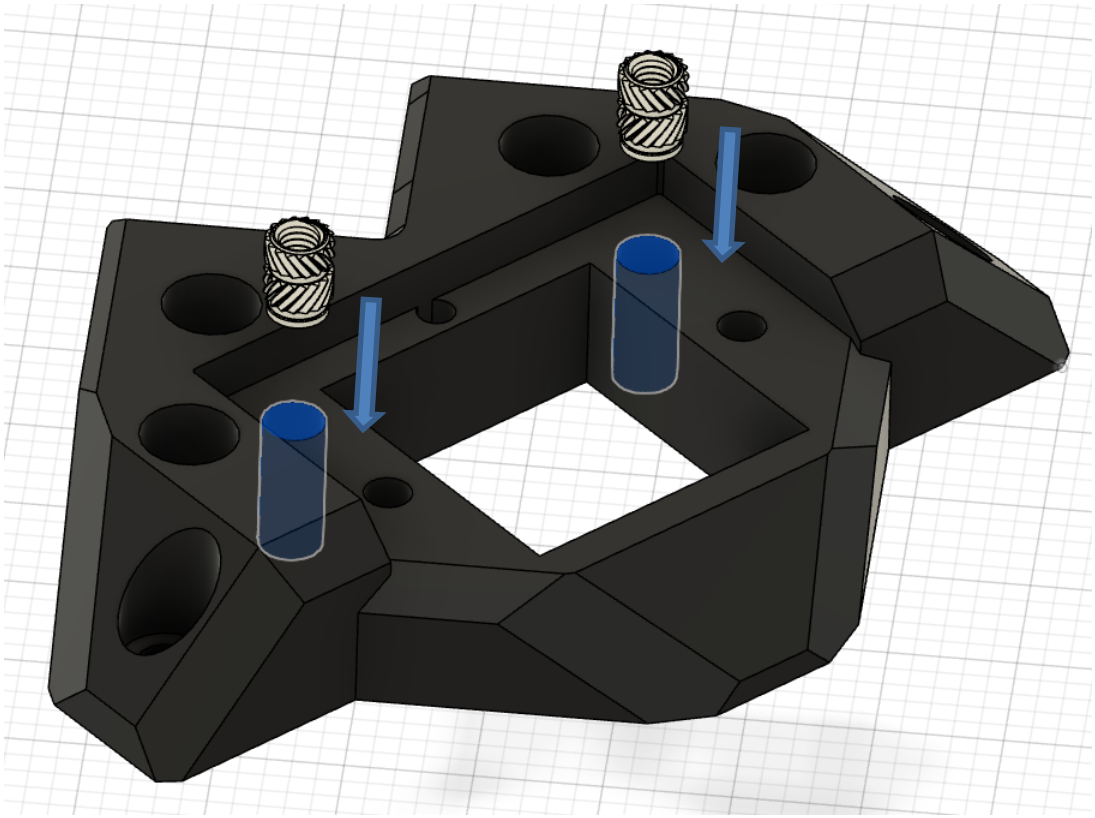
If you plan to use NEMA23, you will need to insert with M5 units the 6x holes like the next figure

If you plan to only using NEMA17, the only the 2 next holes need a m5 insert

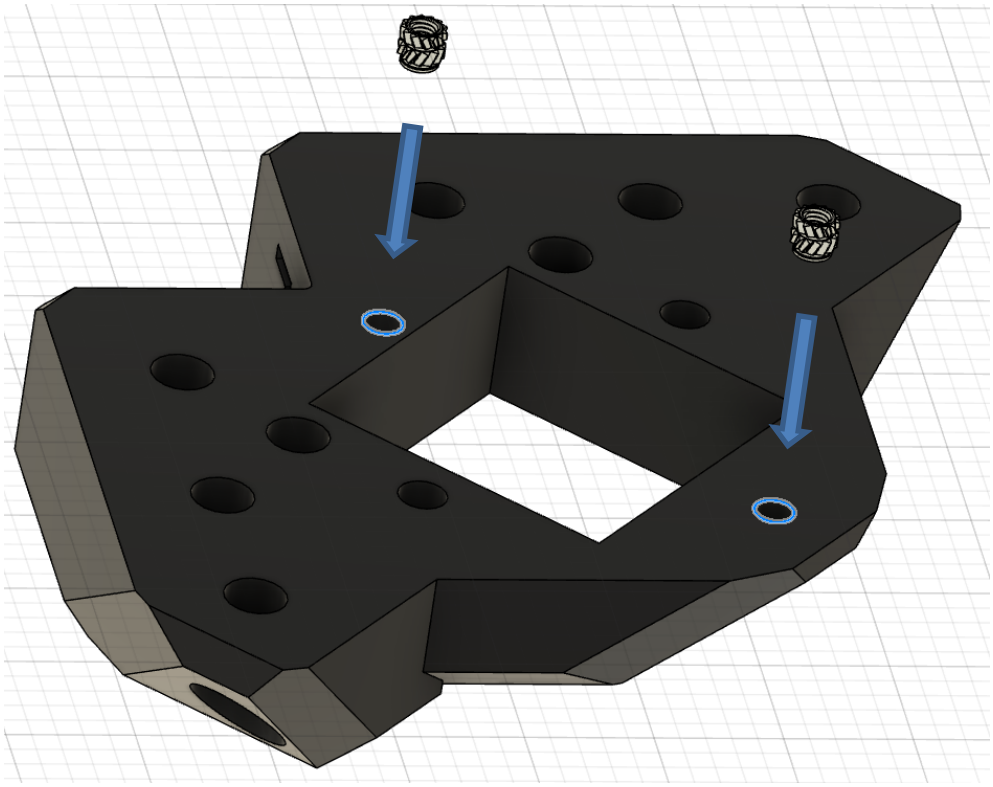


B/ UPPER PLATES

Insert 2x M5 insert here

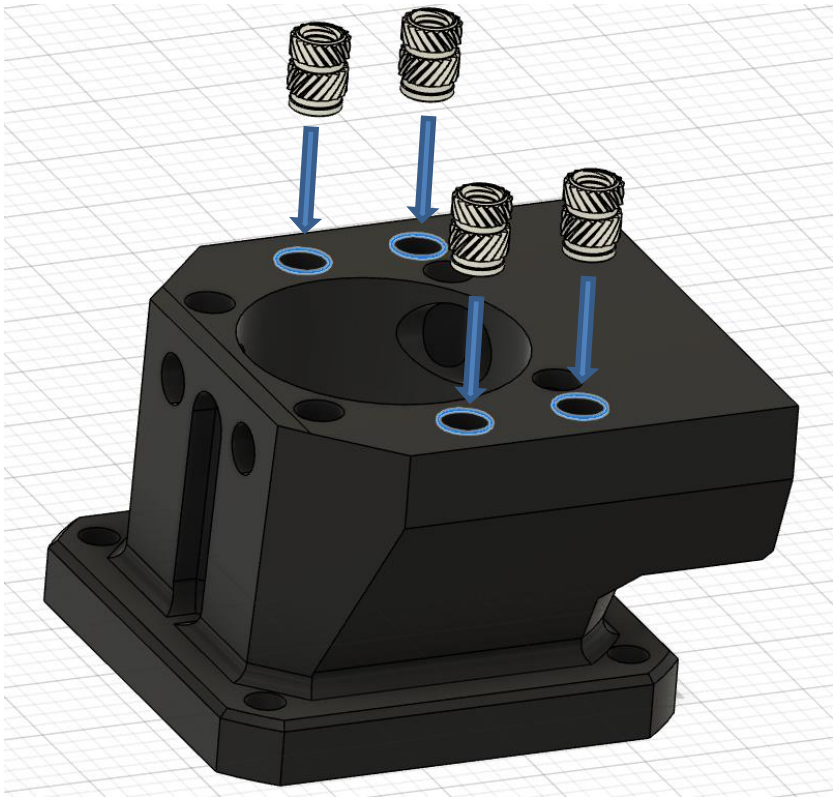


The x2 M3 insert here

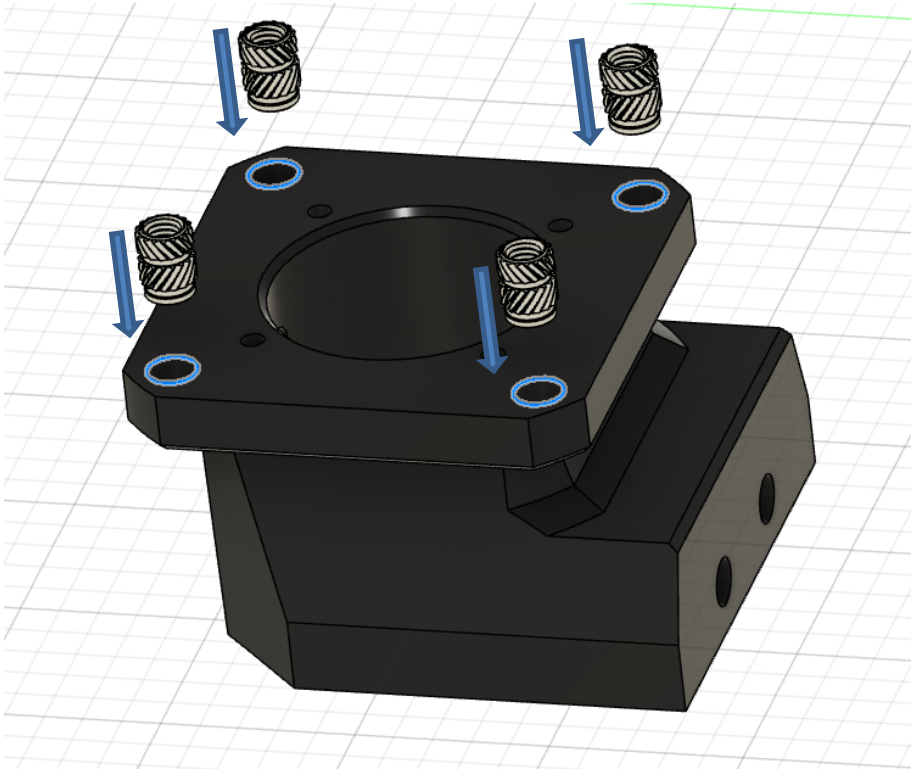


C/ REAR BLOCK

4x M5 Inserts here

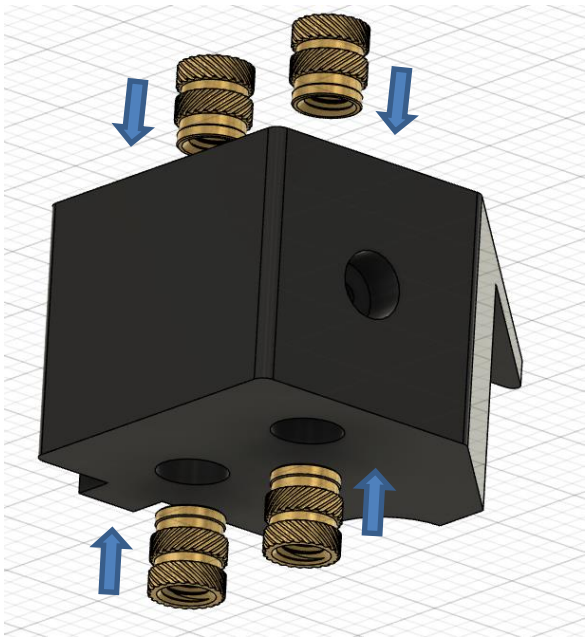


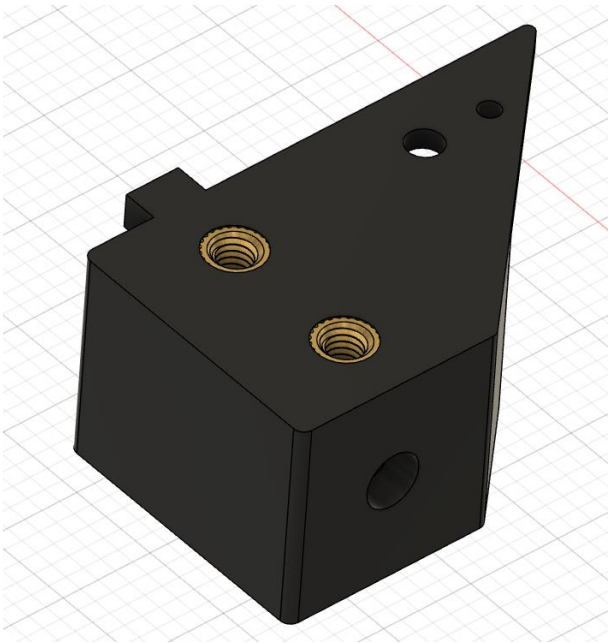
If plan is to use NEMA23, place 4 M5 inserts here



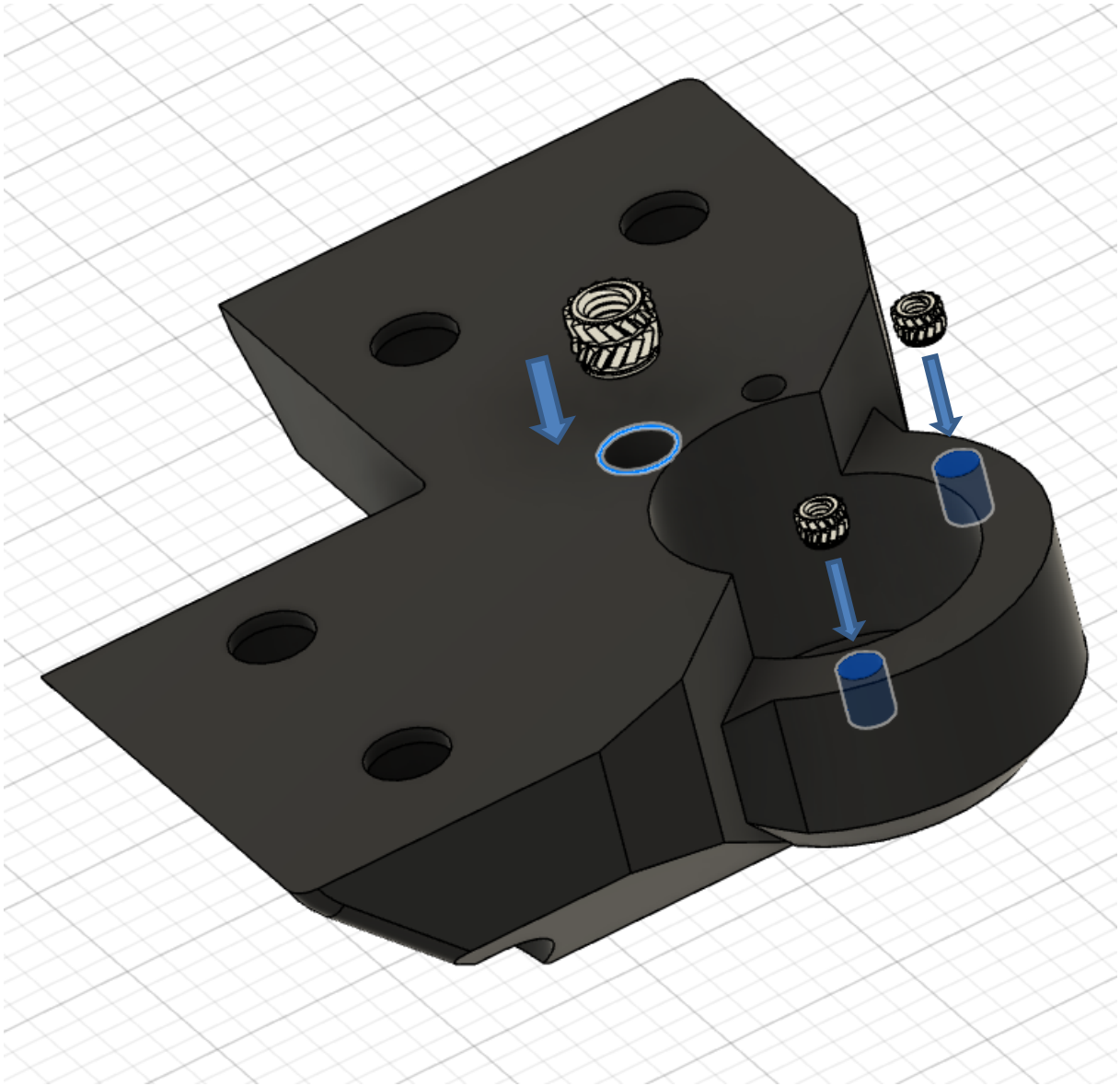
D/ OPEN FRONT IDLERS 2.0

Use 4 M6 insert here





The on the SFU relainers:



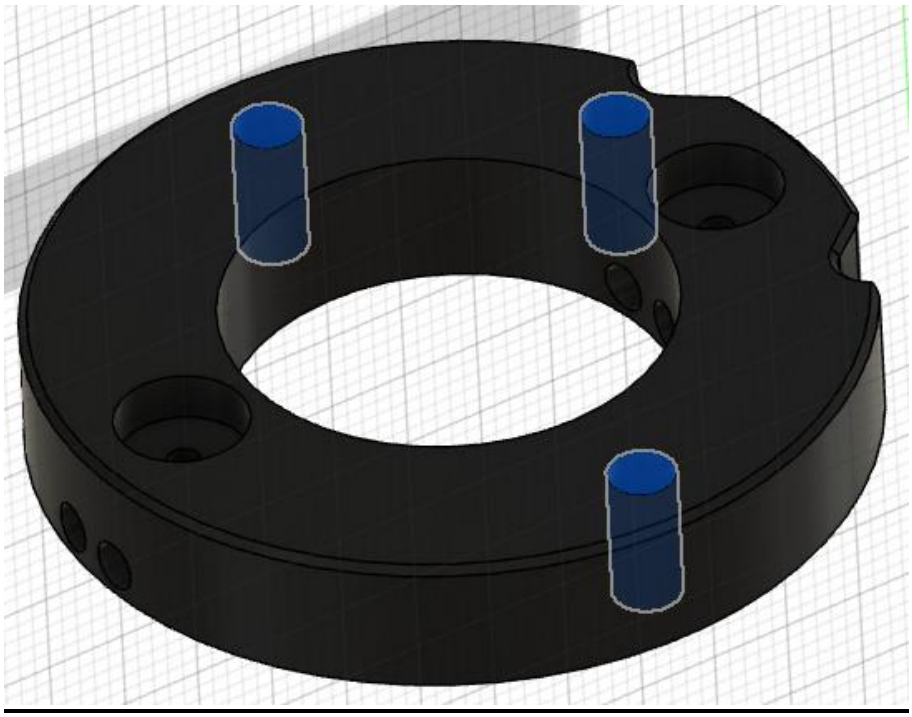
Insert 2x m2 and 1x m4 inserts here

!!! Do not insert 608ZZ Bearings now!!!

E/ OLDHAM-2.3

Install all inserts and all the dowel pins

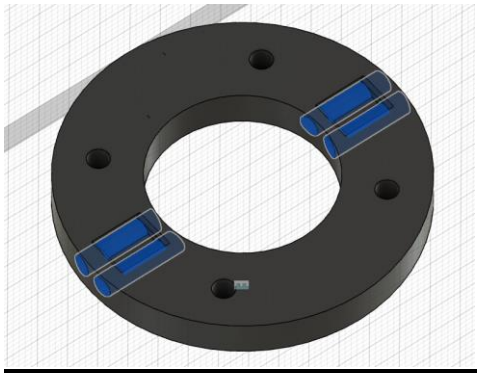
M4 inserts here on the lower ring



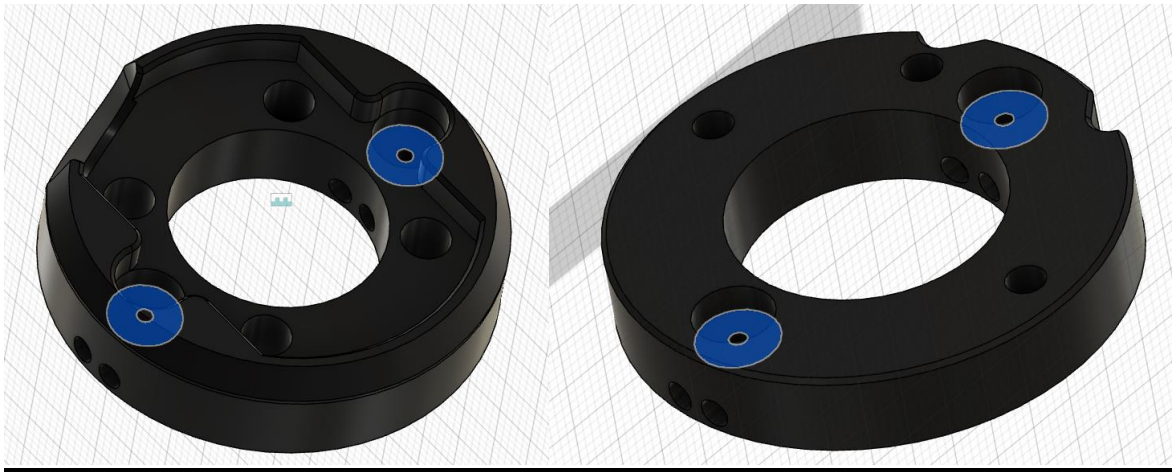
M3 inserts here

The R and the left parts contains 3 slots for inserts, mirored between R and L, the rear one is either a left or a right part, we only use the 2 laterals holes at 180° angle.

THE LAST REVISION IS REBUILD AROUND A UNIFIED CENTRAL DISK? ONLY INSERT THE DOWEL PINS ACCORDINGLY WITHOUT THE M2 INSERTS AND M2x8 SCREWS



Dowel pin on every 3mm holes



8x3mm magnets here on the lower and upper parts.

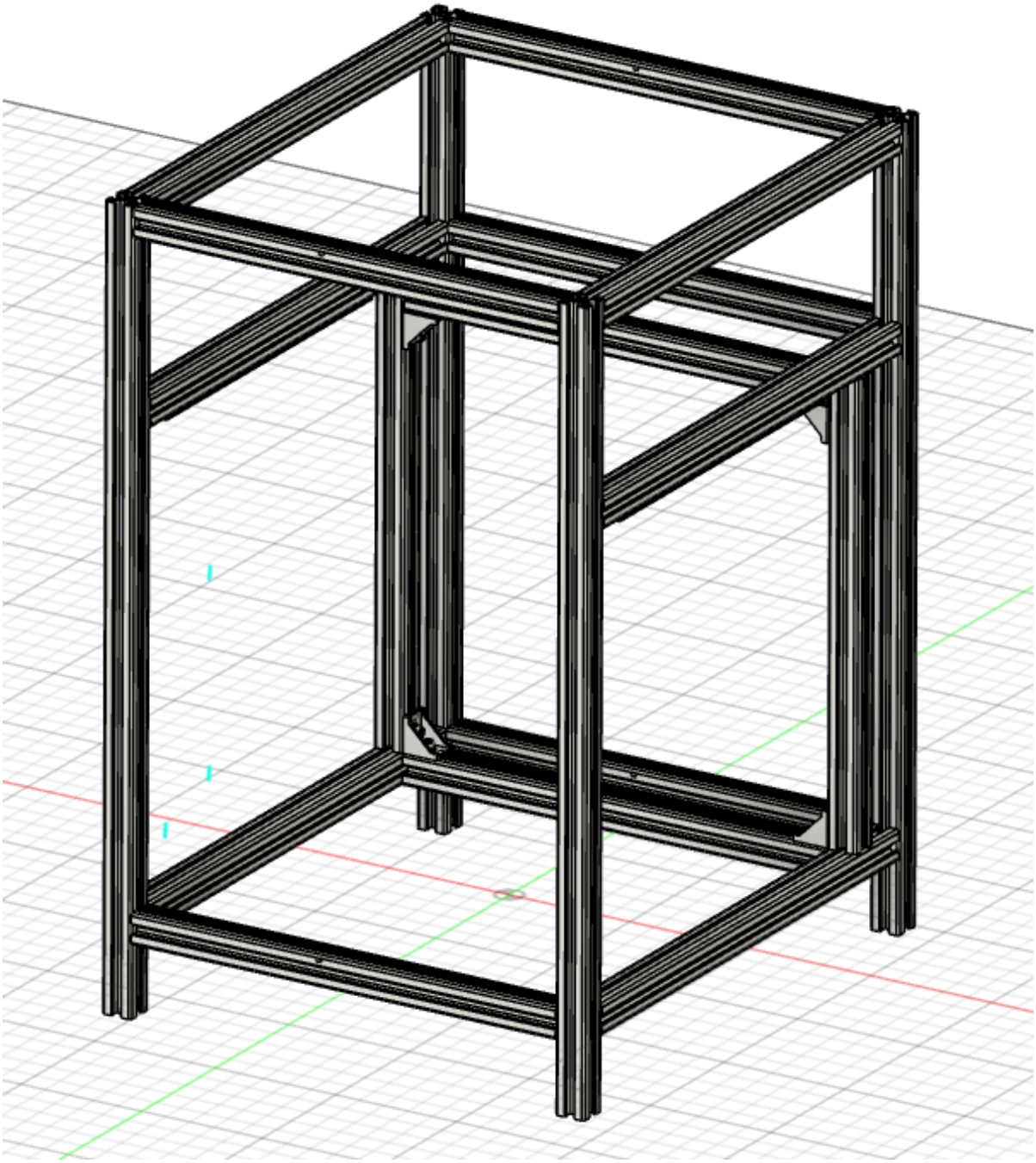
You can assemble the 2 middle parts / SINCE LAST REVISION THE CENTRAL RING IS UNIFIED

EPAHT can handle 25Kg on ech disc without issue

Other materials can see this number bellow, but we need less than a 2Kg resistance in a VC300. This design is made to last or be used in a very heavy solution, like 8-10-12mm bed for custom size VC 800+

Motor Blocks Assembly :

I assume you should have the frame preassembled already at this point



-The frame here got feet to accommodate the motor Block, If you have a RR 3.x standard Frame kit, I will soon release some custom feets for it. The CAD of this frame is available on my GIT if you want to deep look into it.

-If you want to use the RR 2.0 Enclosure kit, a future revision in the next days will feature some modification for the ARM design, ATM the design is based to the prior rails orientation of the 3.0, in the inner side of the front Z 3030, and is incompatible with the 2.0 RR

enclosure. This choice result of a better arm stability in this orientation (3.0) than the 3.1 orientation.

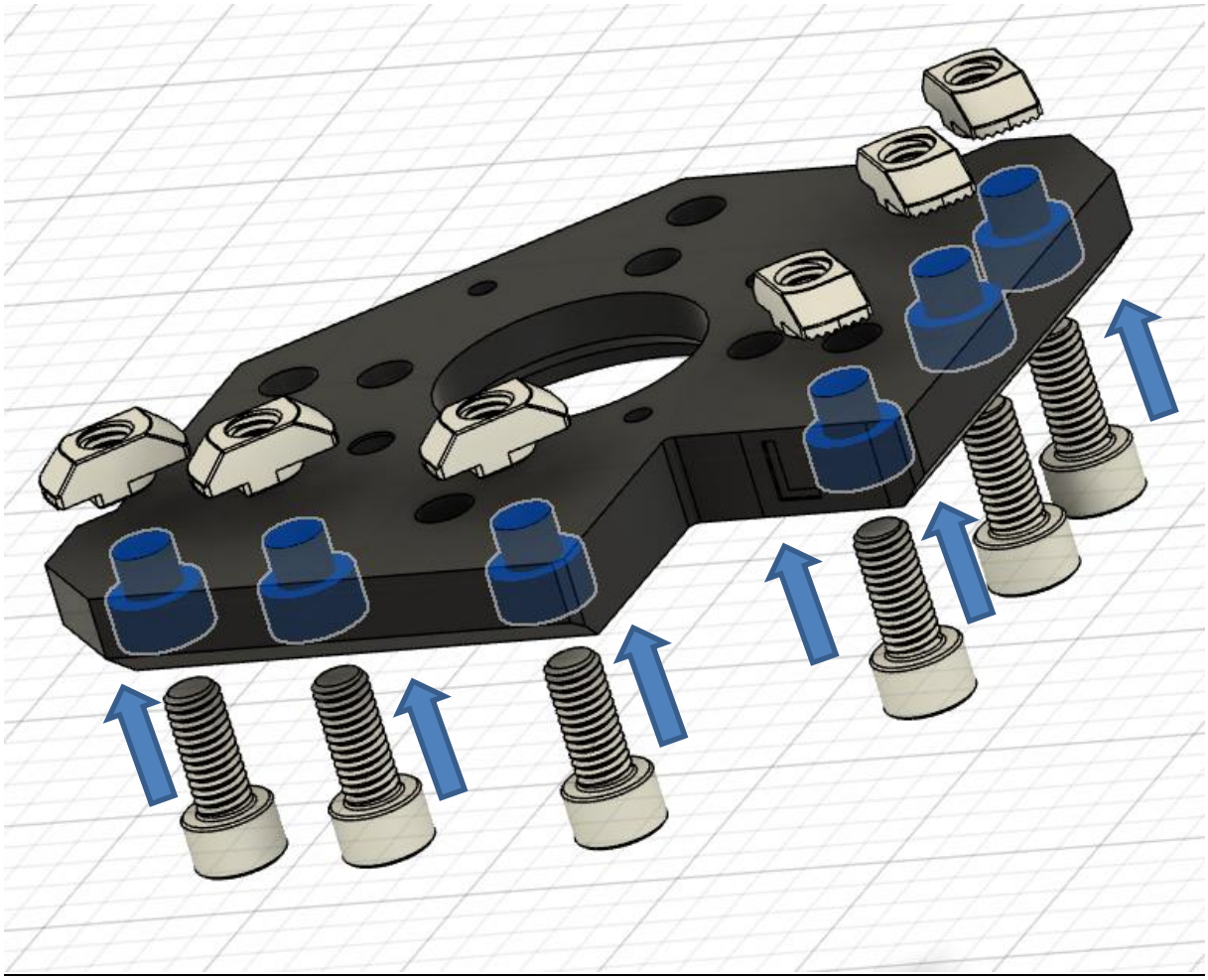
-The Z-Upgrade 2.0 use the Open Frame front idle 2.0 design with a new plate. For thos who already have the Open front 2.0, work is already done 😉

-The DXF of the underplate is still under work, and will be released soon

A/ FRONT

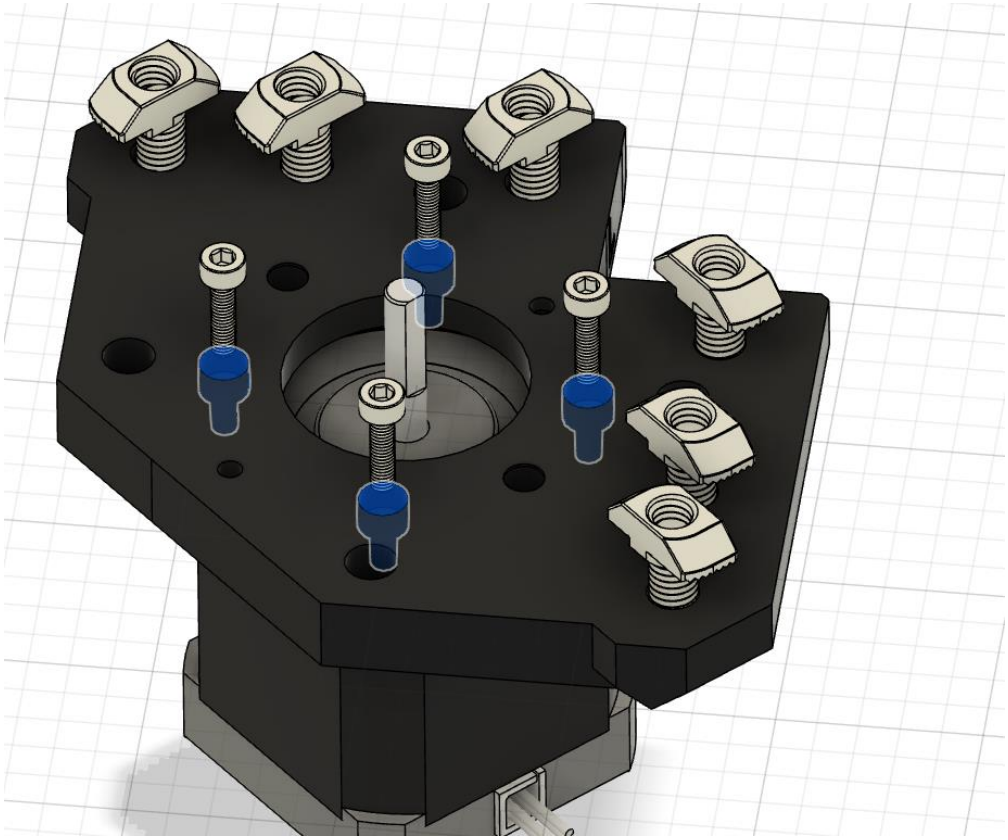
1/Lower plate

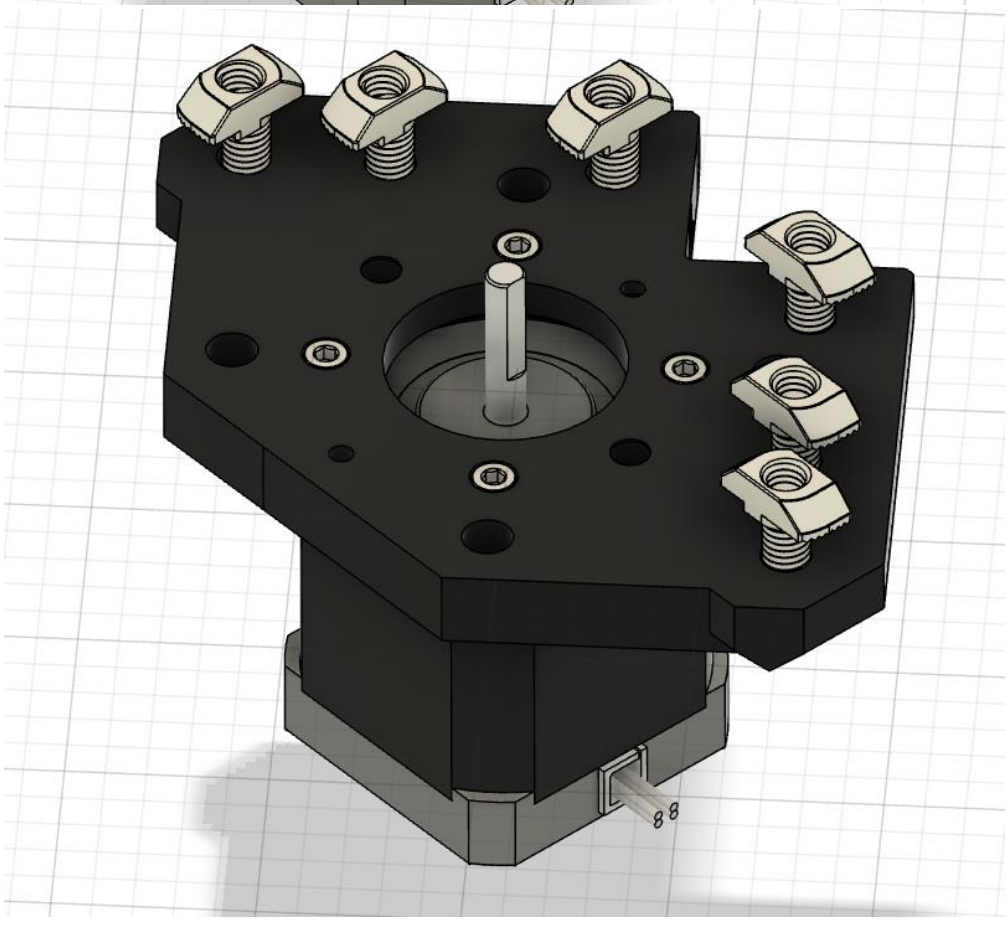
Install a M6 screw with a T nut for each 6x hols on both R and L underplate



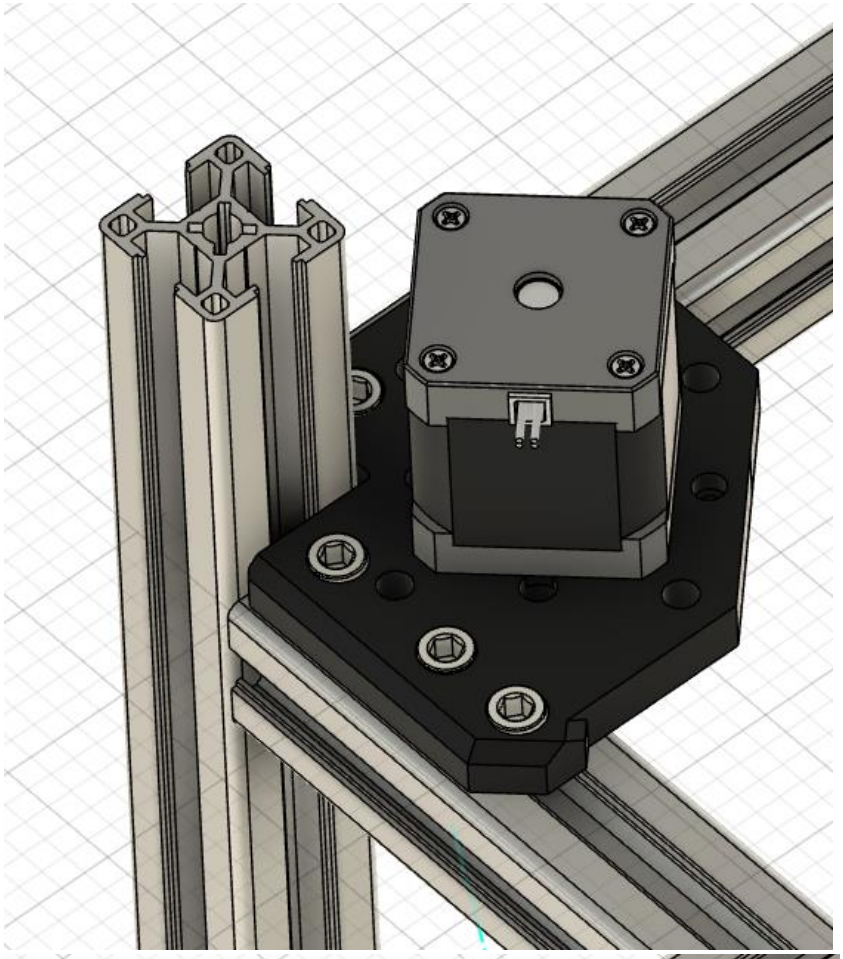
If you plan to use NEMA17, Install it now with the according M3x12 screws

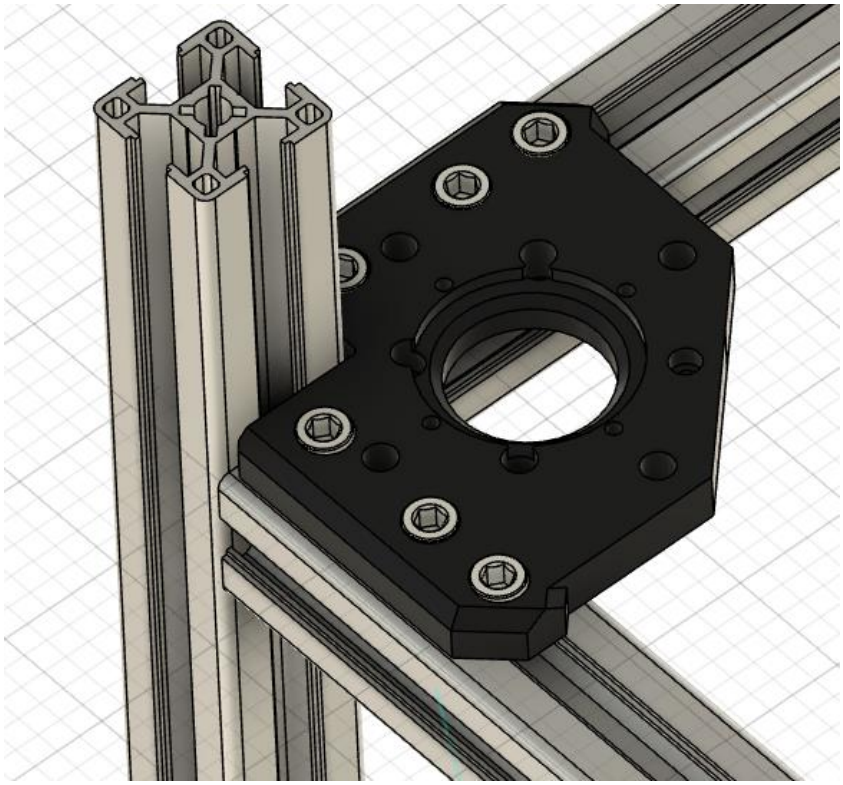
For NEMA23, we will install them a bit later





Then install the bottom unit to le the front lower section

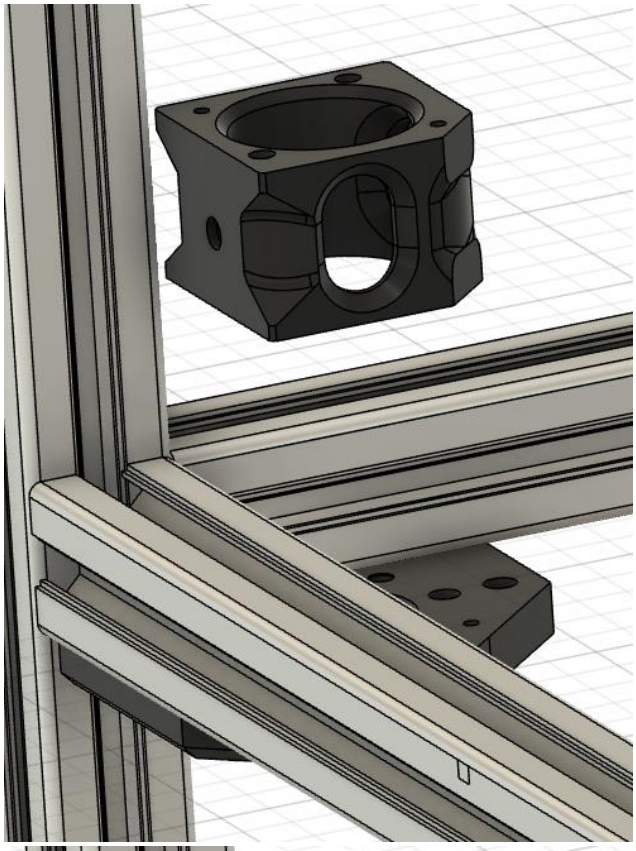


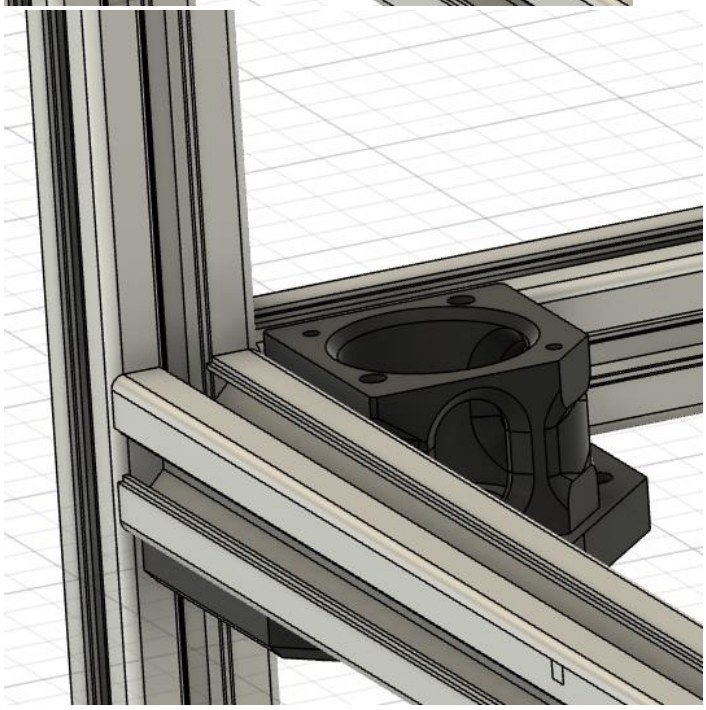


For NEMA23 you have the second figure

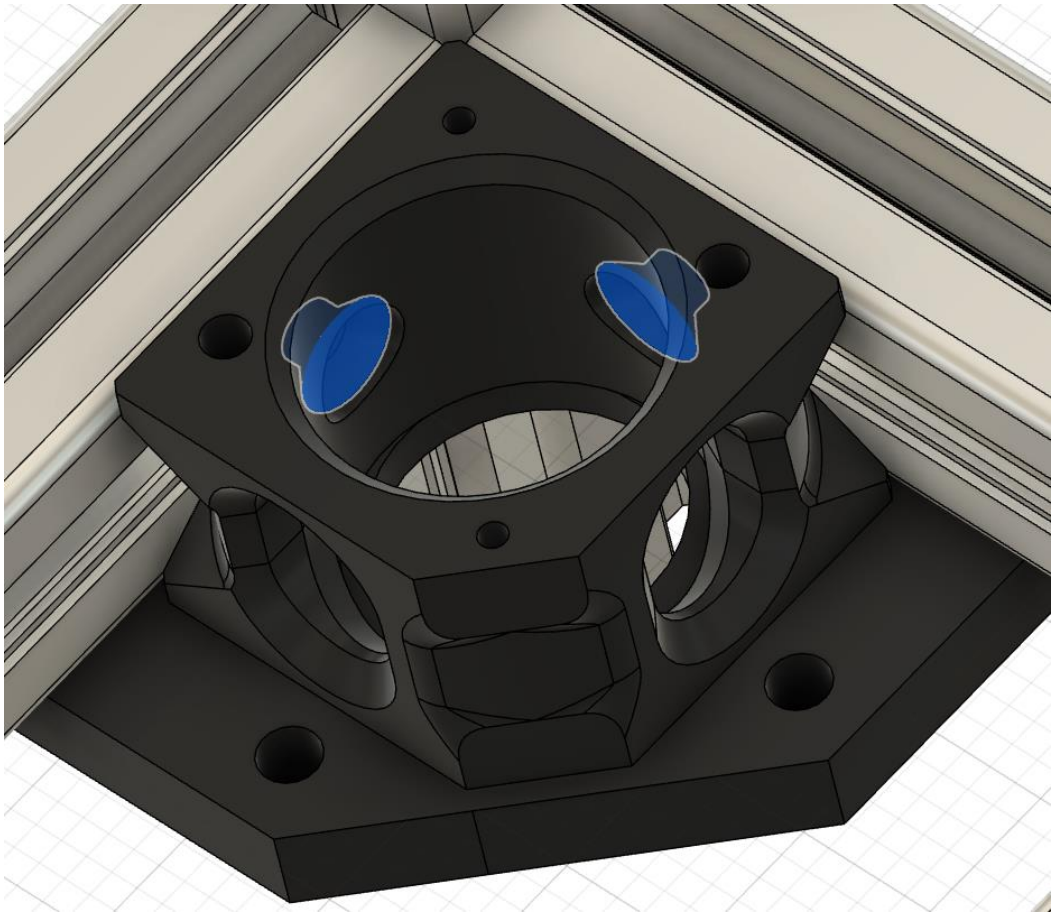
2/ Middle Spacers

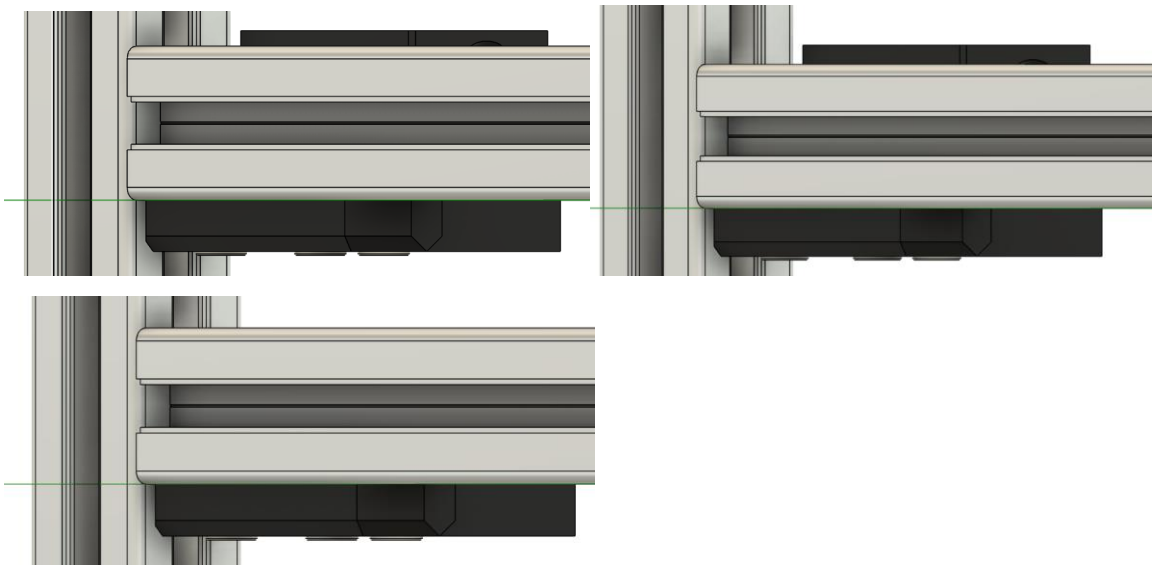
The middle spacer are used to fill the gap in the Block mechanism. It is here to accommodate the height id you are, or not using a bottom plate to close the machine. By default, the 3mm is used, you are free to modify thei part by removing 3mm of it, to flush with a system without plate, or increase it for a 4mm plate by addig 1mm on it.





You can fix this part with a countersunk M6x12 and a Tnut here but that is not mandatory

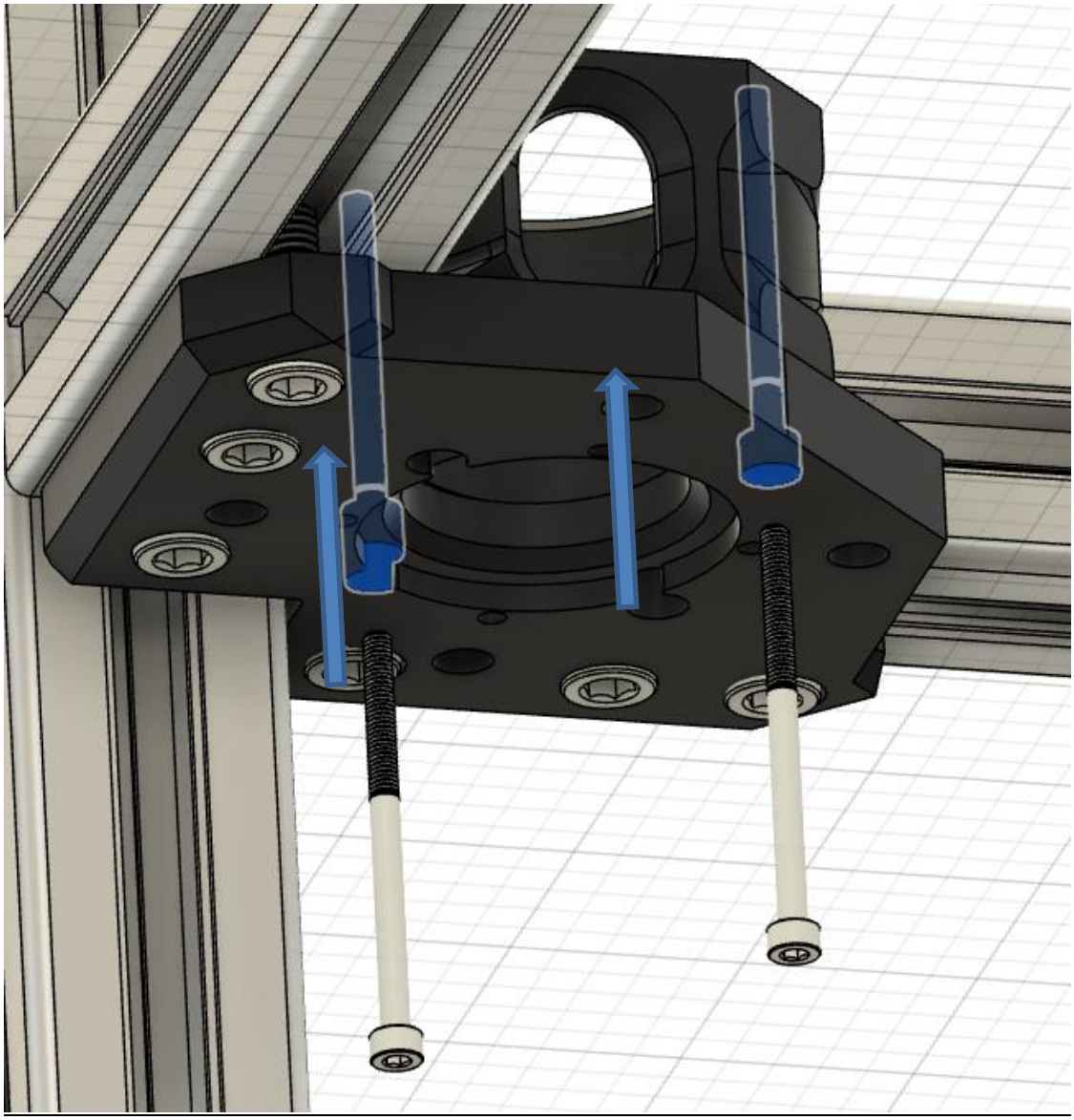




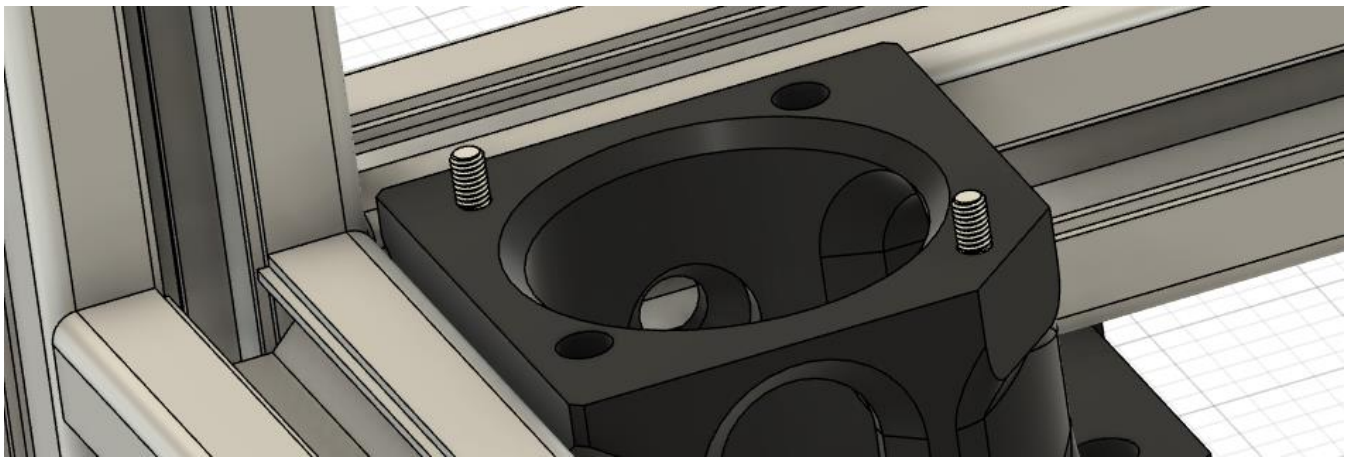
+3mm, +4mm,+0mm

The rest of this manual has been made upon the 3mm version, meaning accordingly to you setup, needs, few steps can differ, either as few screw length, please consider using the CAD as a material to plan it.

3/TOP Plates

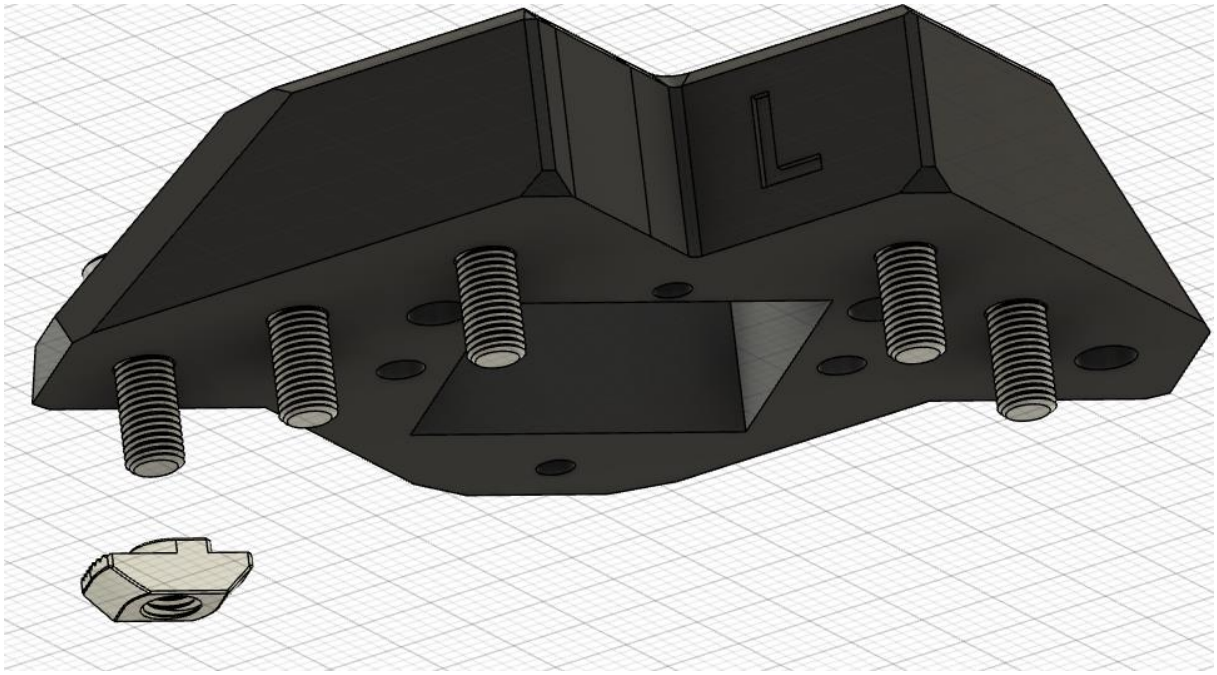


Install 2 M3x45 all the way inside the 2 parts

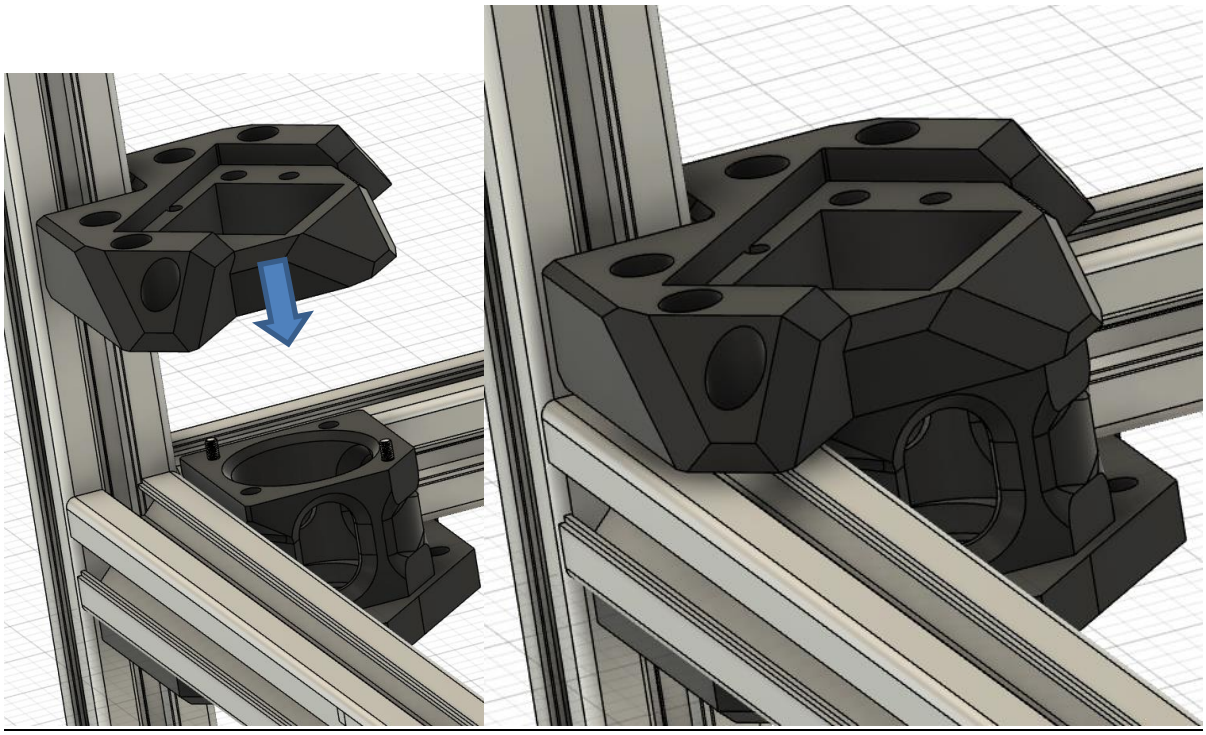


Here what you should have to the top

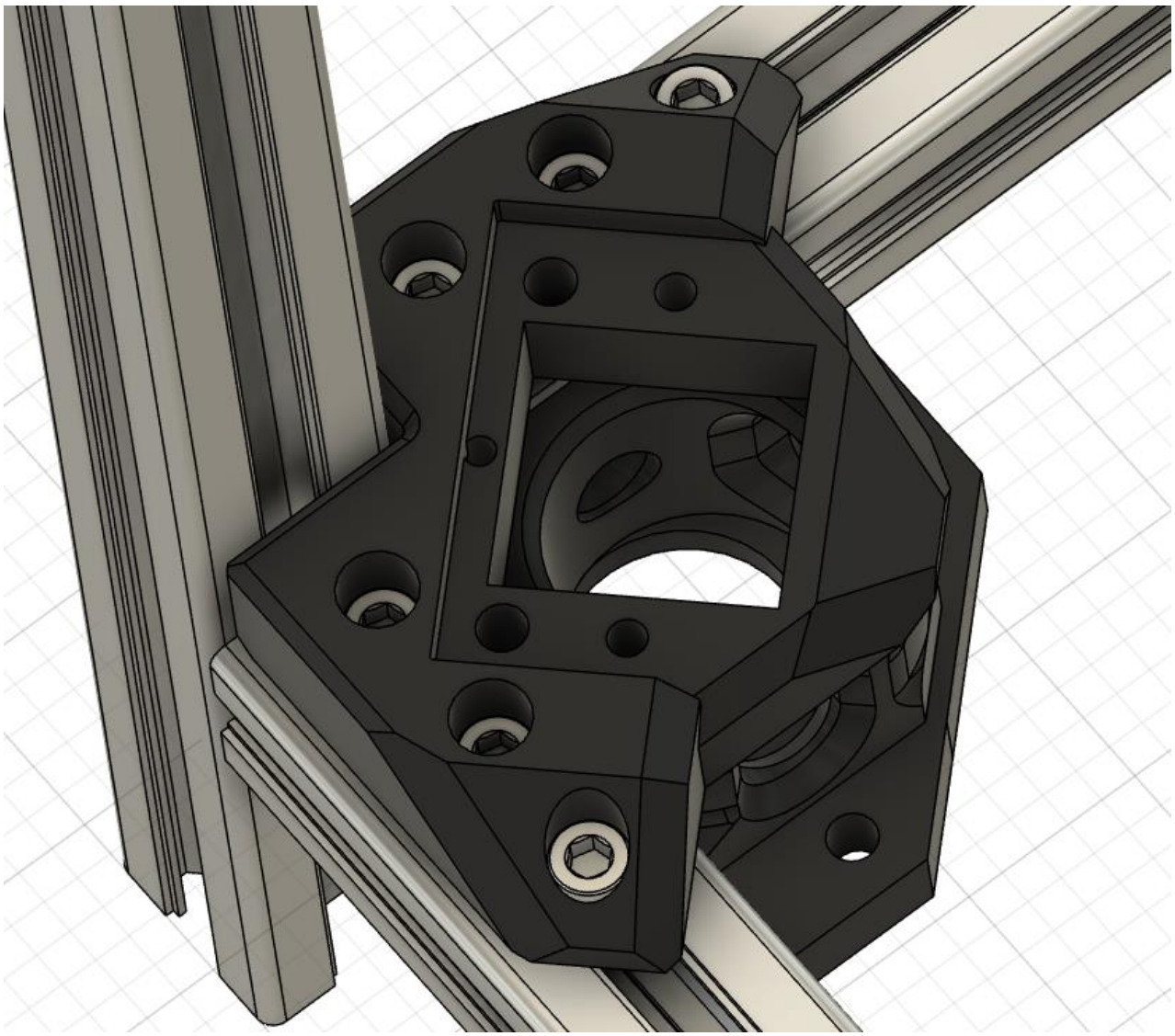
(In the NEMA 17 assembly, a hole is blocked, just ignore this screw)



Install the M6 screws with the T-nut the same way than before with the bottom plate



Place the top part and tight a bit only with the m3x45



Do not tighten everything now

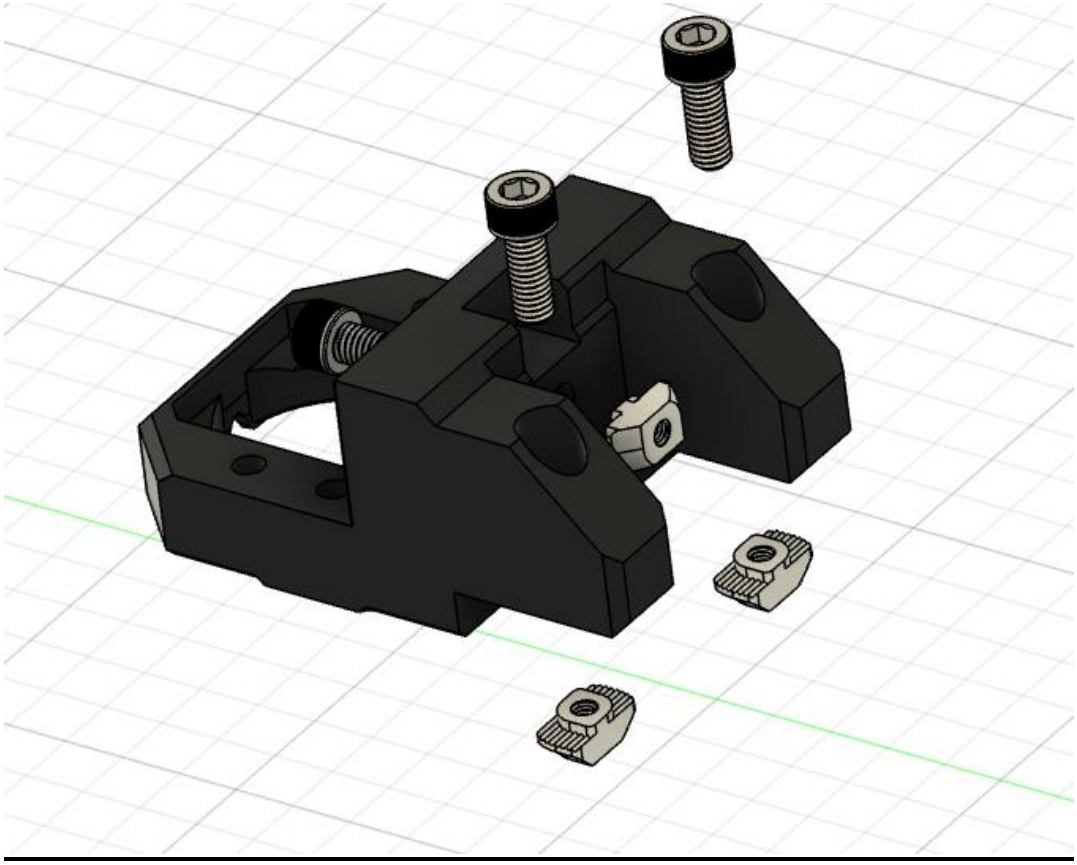
FOR NEMA17:

Slide the coupler on the shaft of the NEMA from the top and secure it

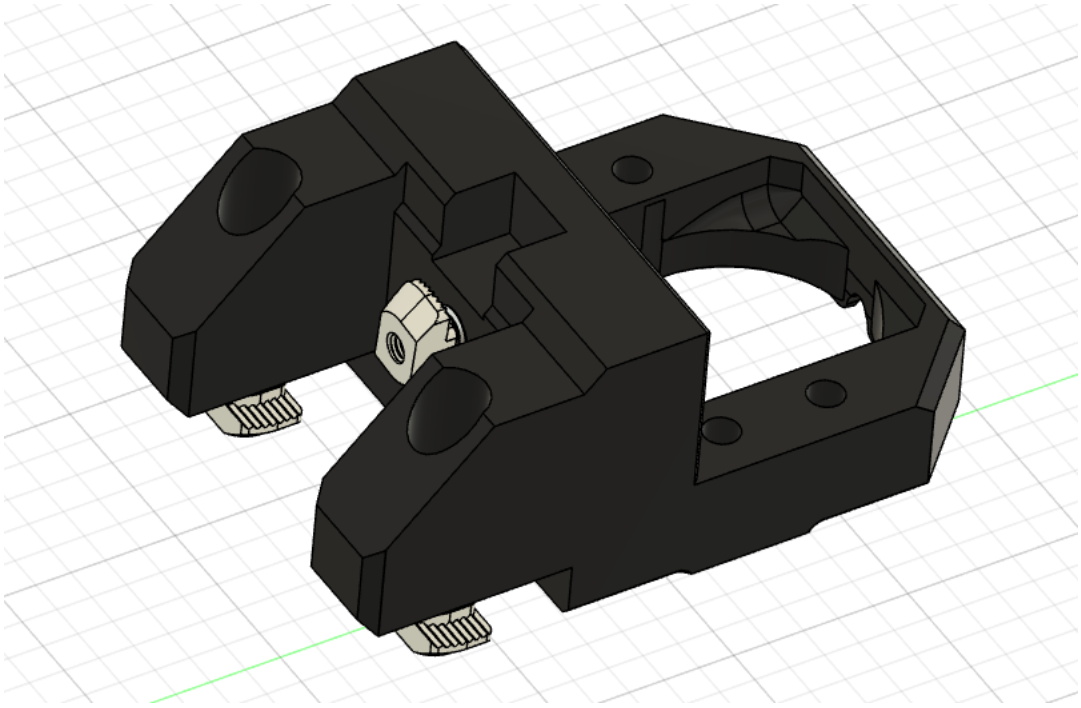
FOR NEMA23:

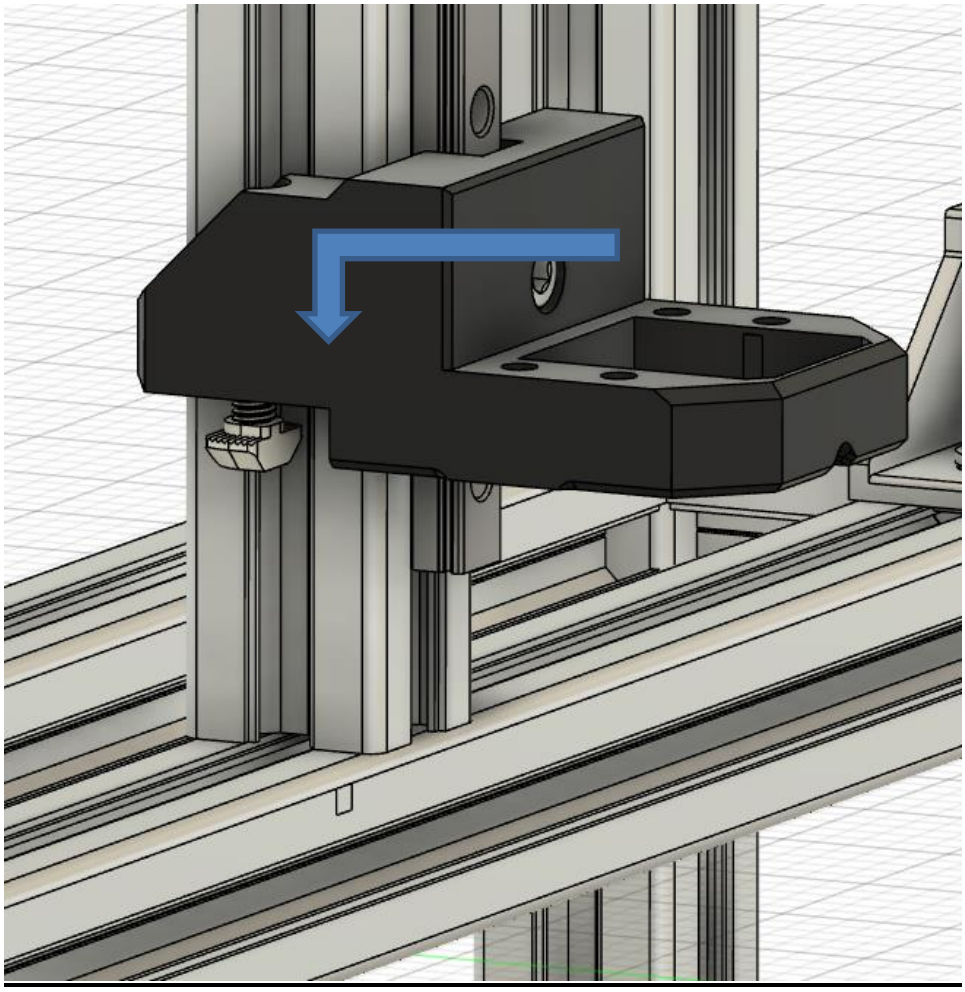
We will slide the coupler on the shaft of the NEMA from bellow at the end and secure it

B/ REAR BLOCK

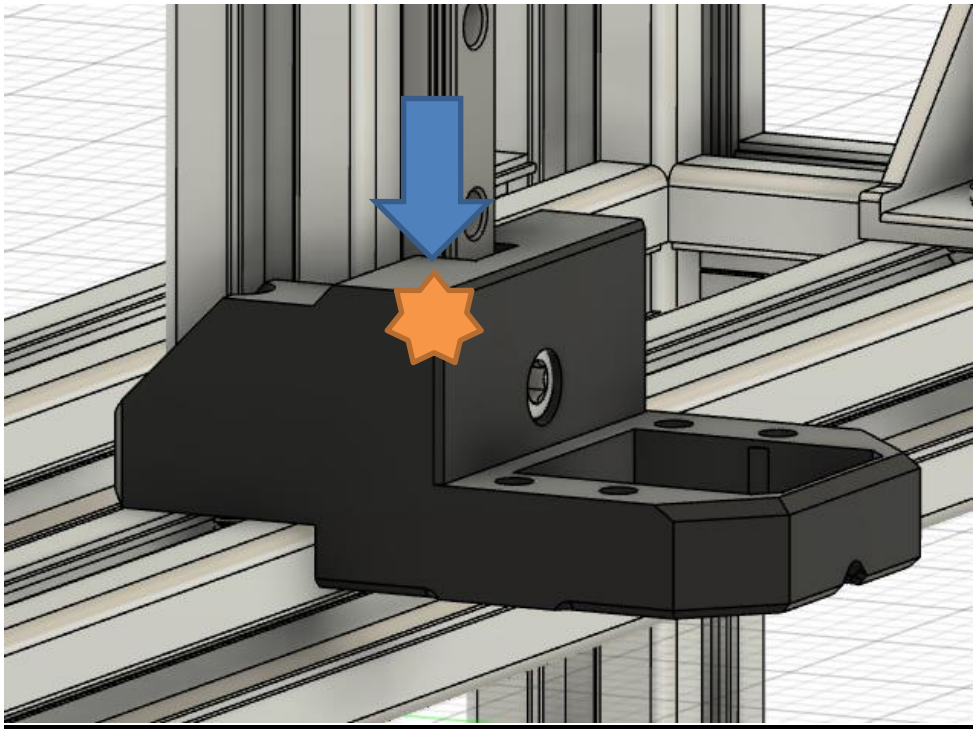


Install M6x14 screw with M6 Hammer T-Nuts

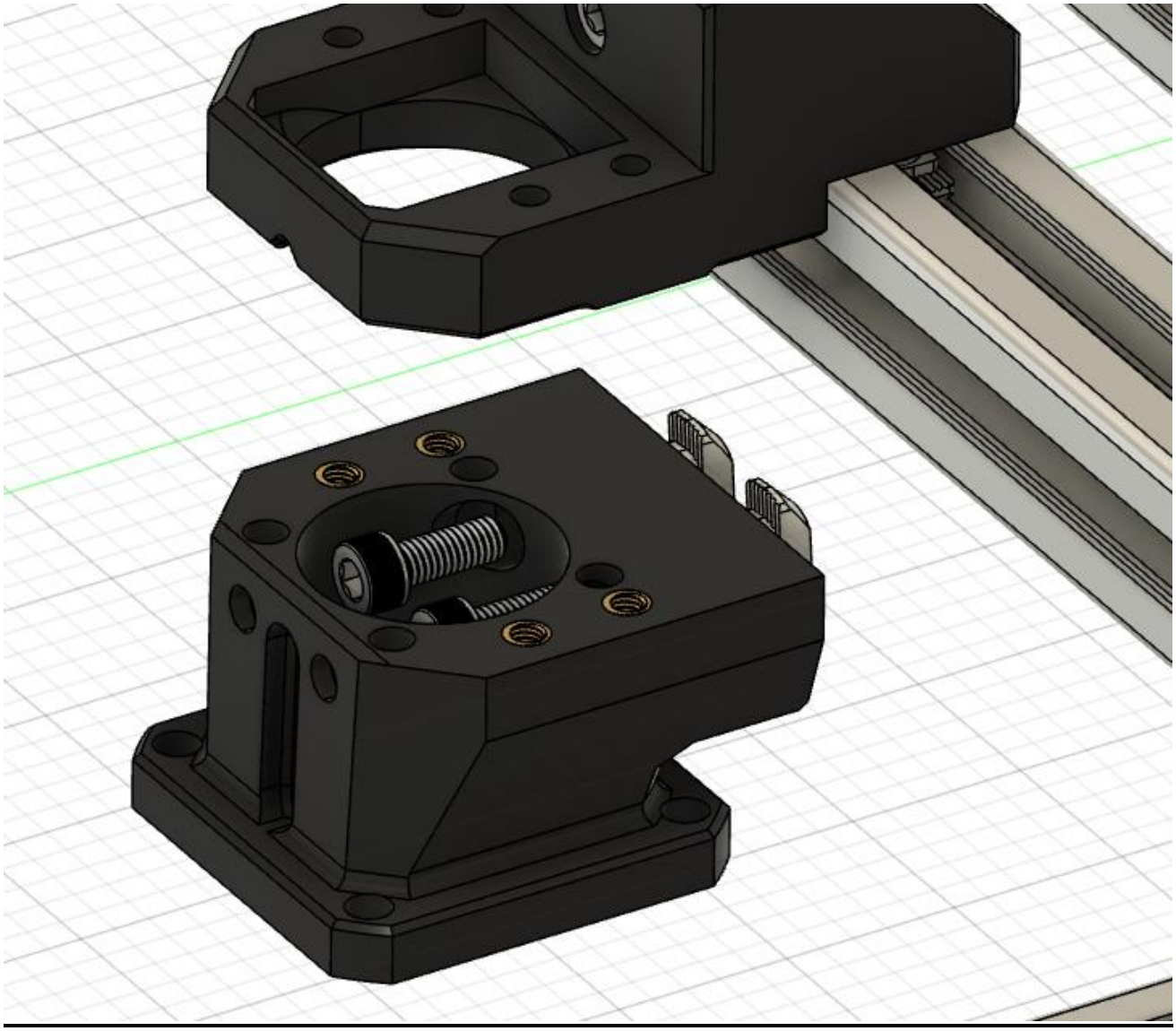




Position it for the center T-nut to go in the vertical 3030, then glide it to reach the bottom 3030, you can tighten everything up, this part is centered if the middle 3030 is centered.

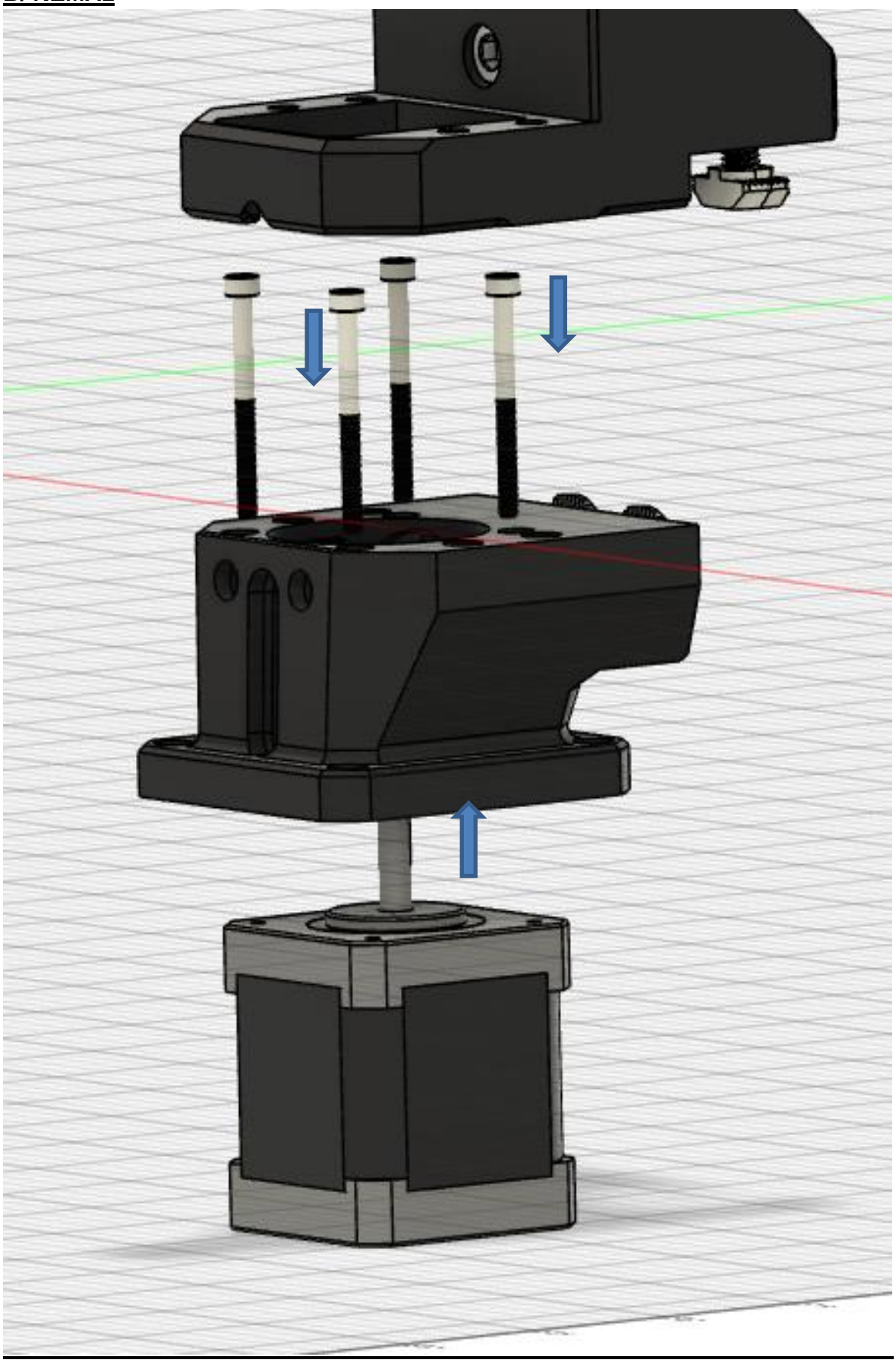


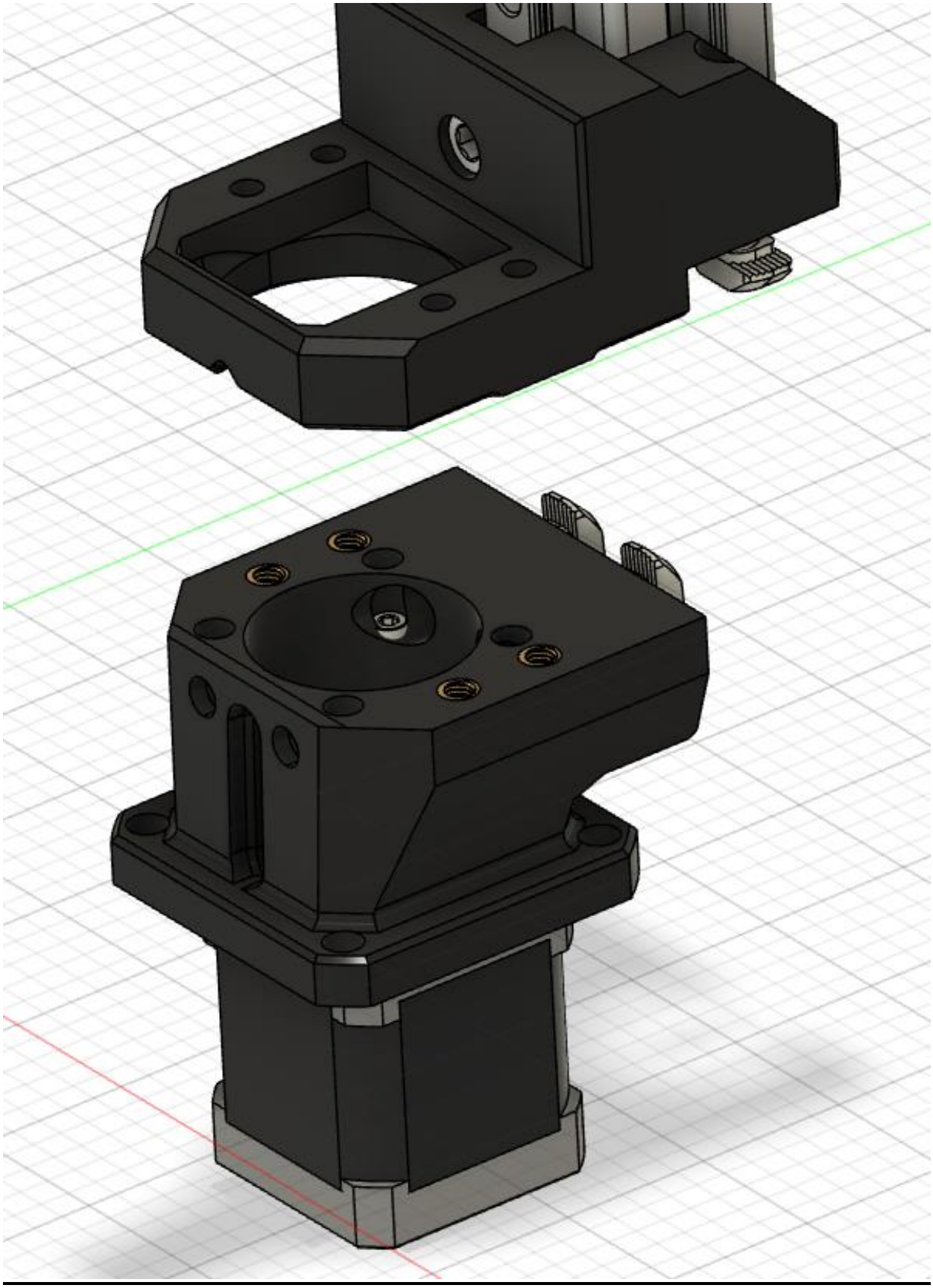
A/ NEMA23



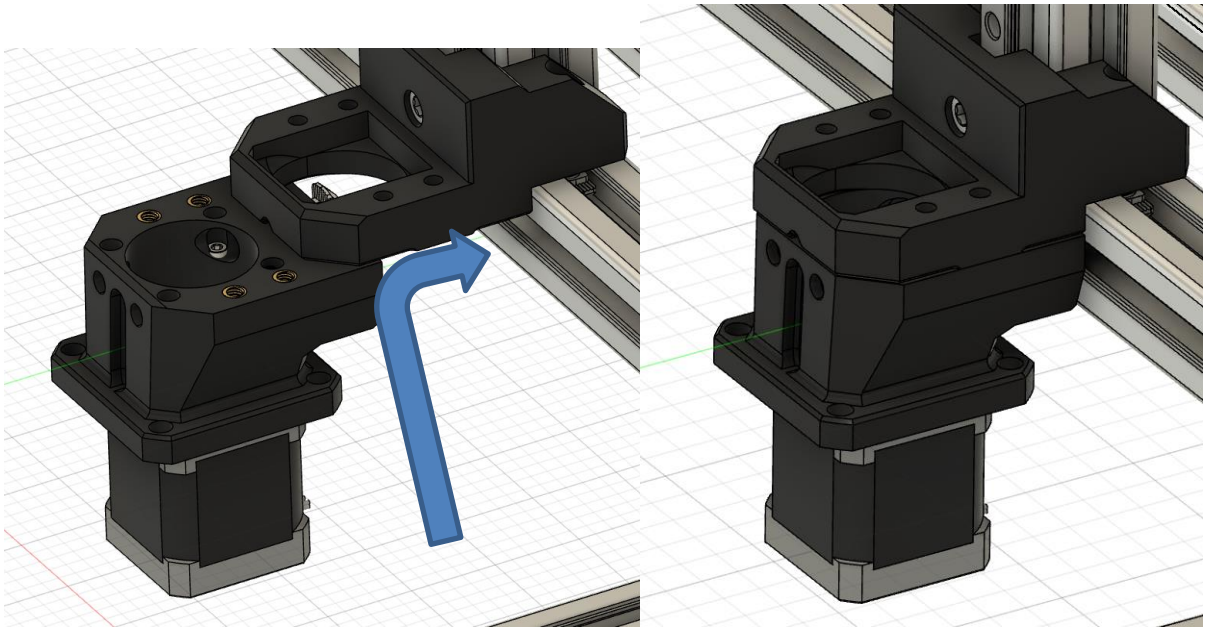
Preinstall 2x M6x14 screws with 2M6 T-Nut

B/ NEMA1





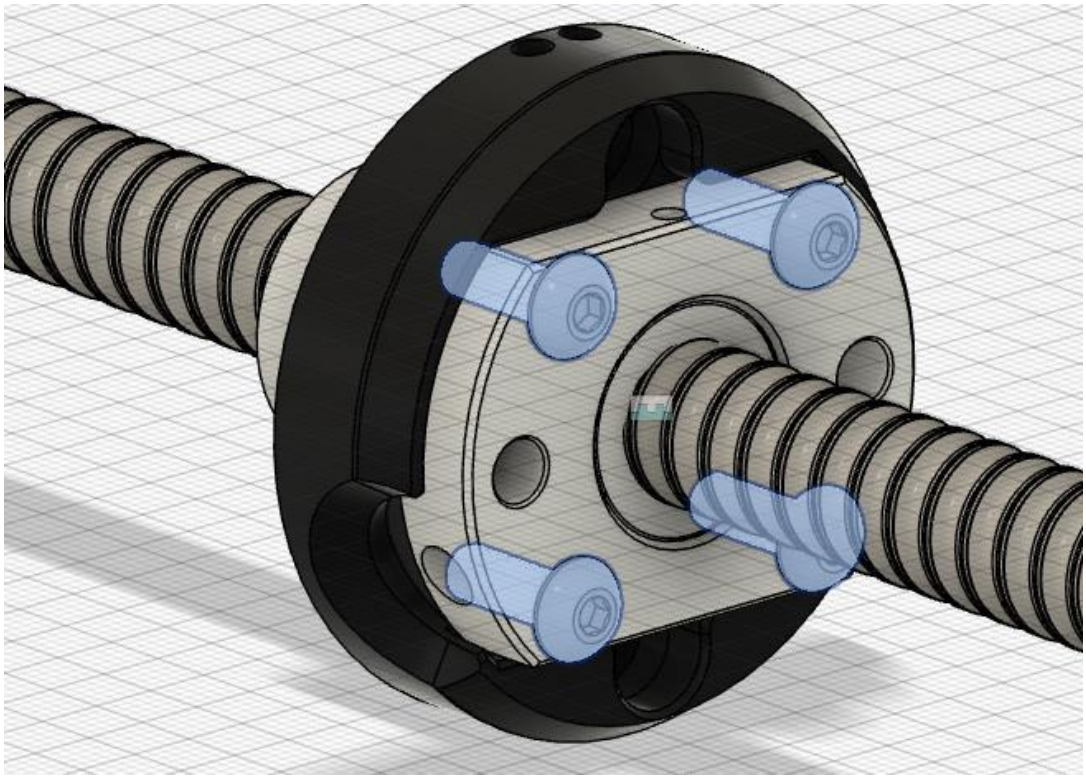
Insert 4x M3x35mm to secure the NEMA17



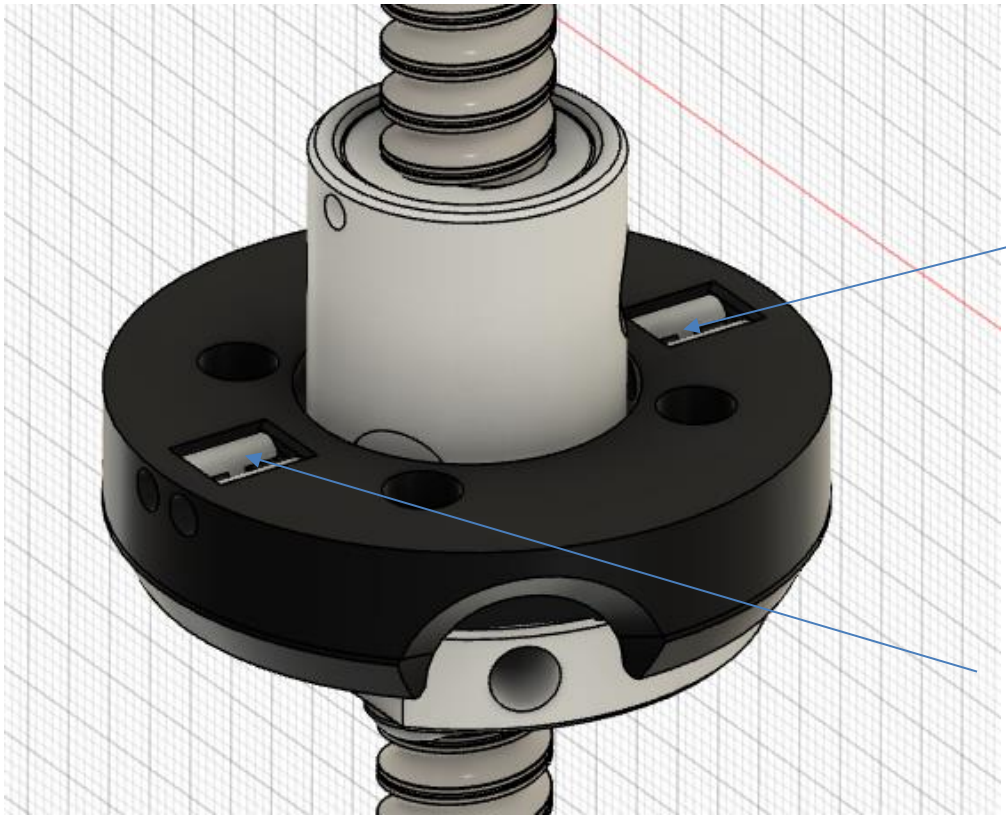
Insert the lower assembly on the top assembly, you can tighten the 2 back M6 to hold the structure for the next step

SFU Assembly :

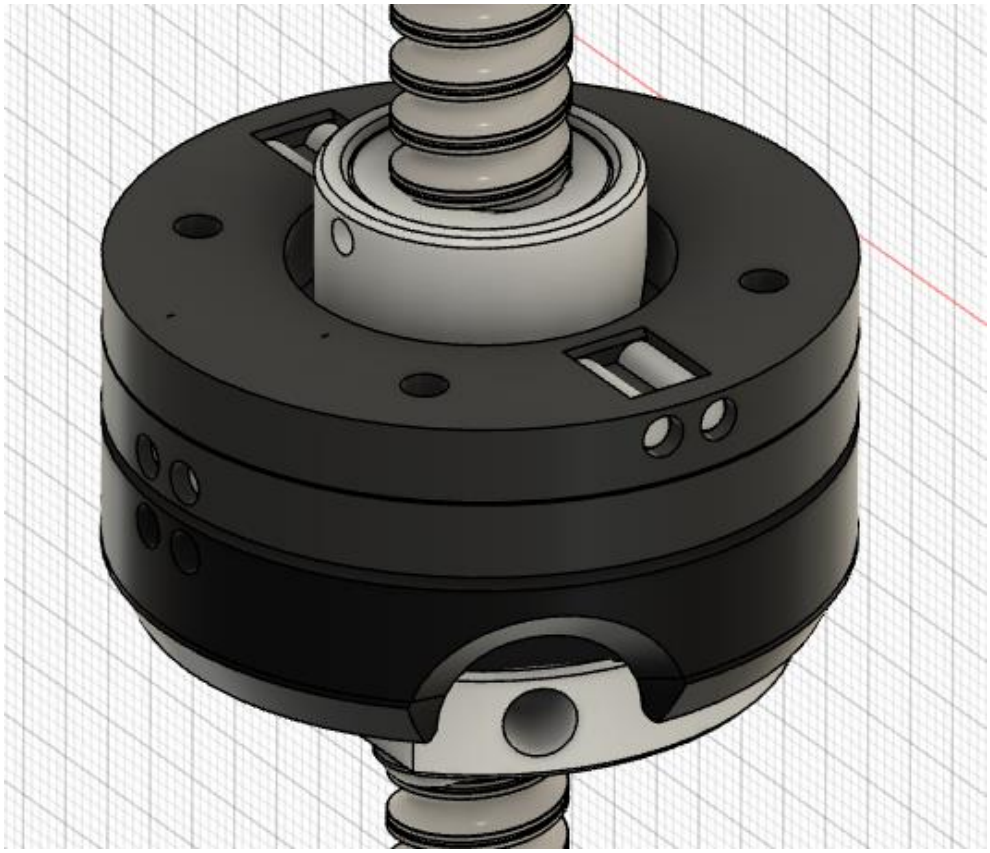
SFU 1204 version



Install the lower disc, 4 m4x12 are needed for each



Install 2 ball bearing on the dowels. (4mm nominal diameter, but you can go for more)



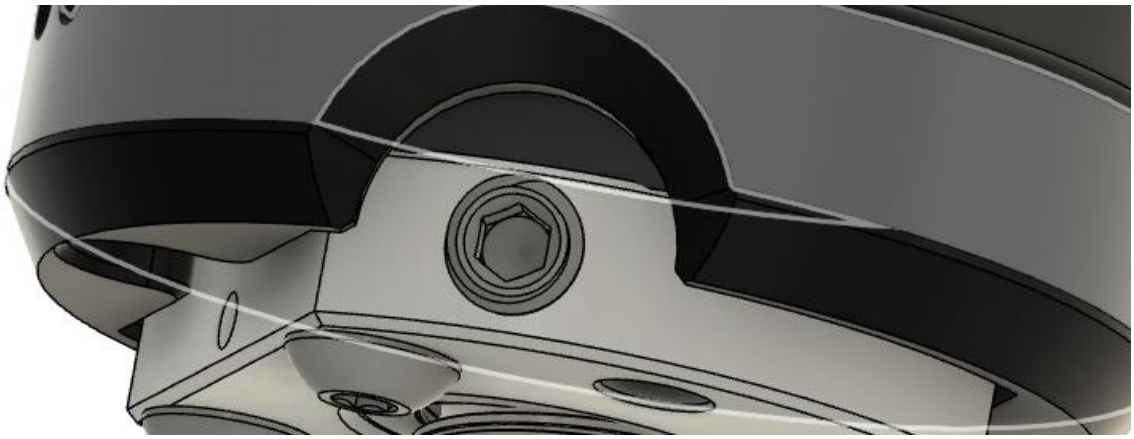
Stack the assemble central disks and install the 2 other balls bearing

Stack the upper disk

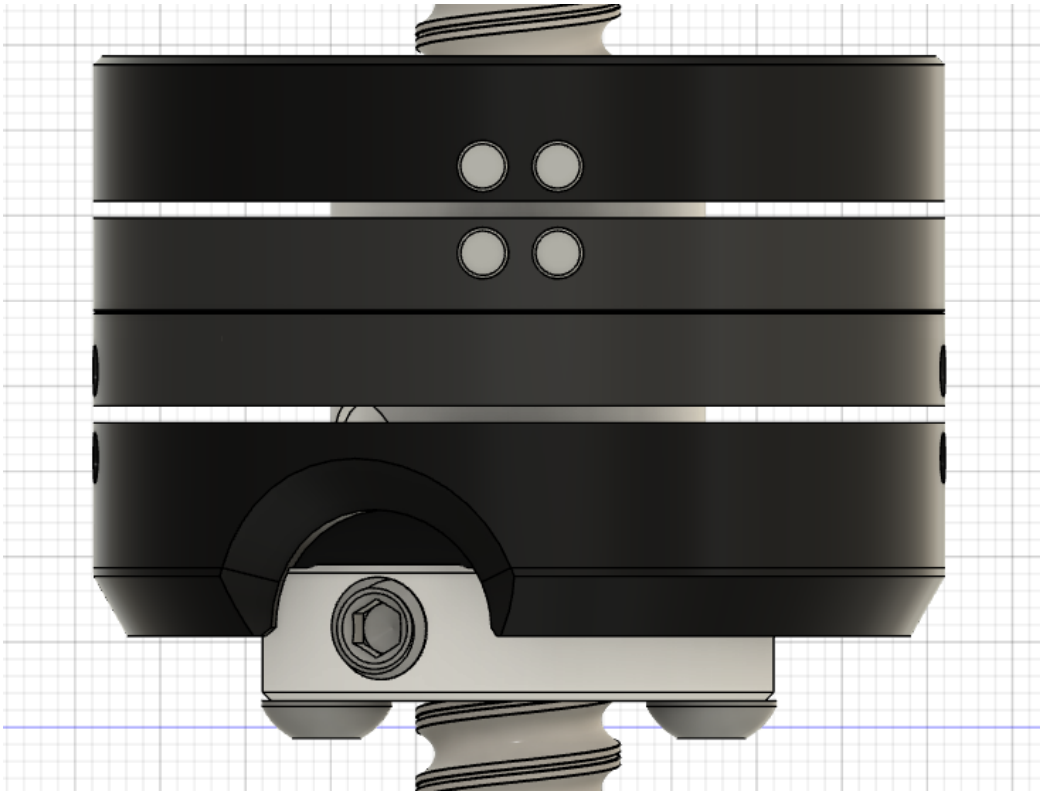
Before fixing the top to the Arm, make sure everything is in place and can wobble without any hard point. The ball bearings can be a bit unstable, the load of the bed will secure it in place.

-Grease it !

Apply grease un the nut, you can know if it's full by looking for grease presence under at the seal of the ballscrew, half a mm of it should appears. Close the hole with a grease nipple or a m6 headless 5mm screw



-Final checks



Check that the disks are paralells to each others

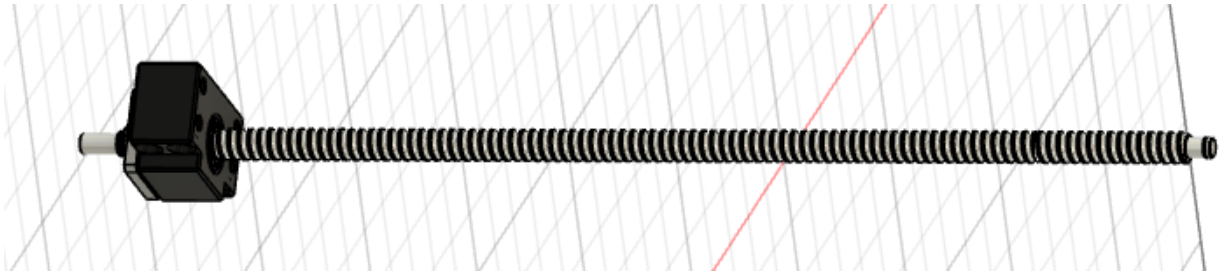
Check the balls bearing still in the dowel chanel

Make the kinematic works a bit: try to simulate a wobble by hands

DON'T FORGET TO TUNE THE Z_MAX distance in Klipper

Z Axis assembly on the Frame

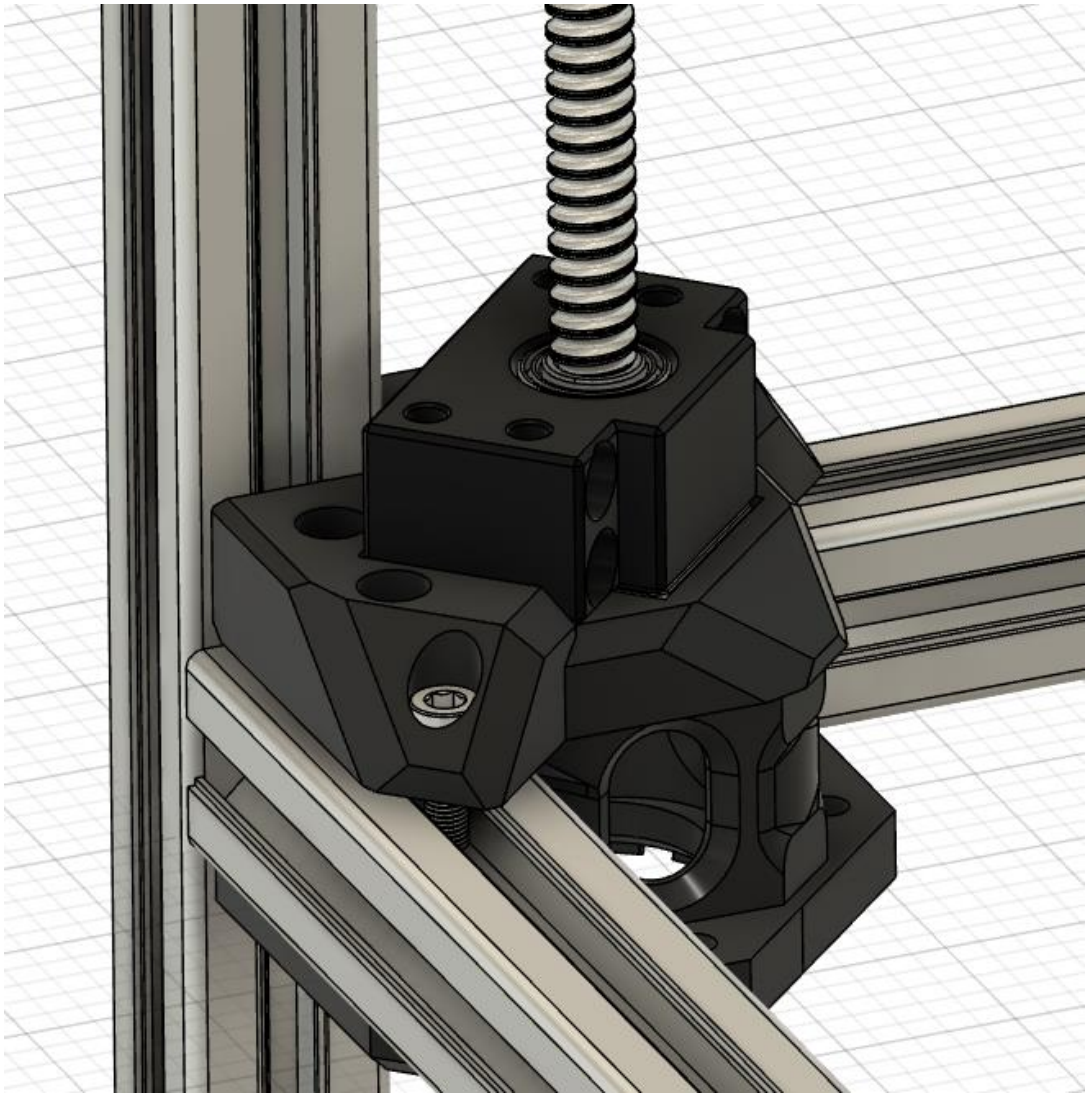
1/ Preparation

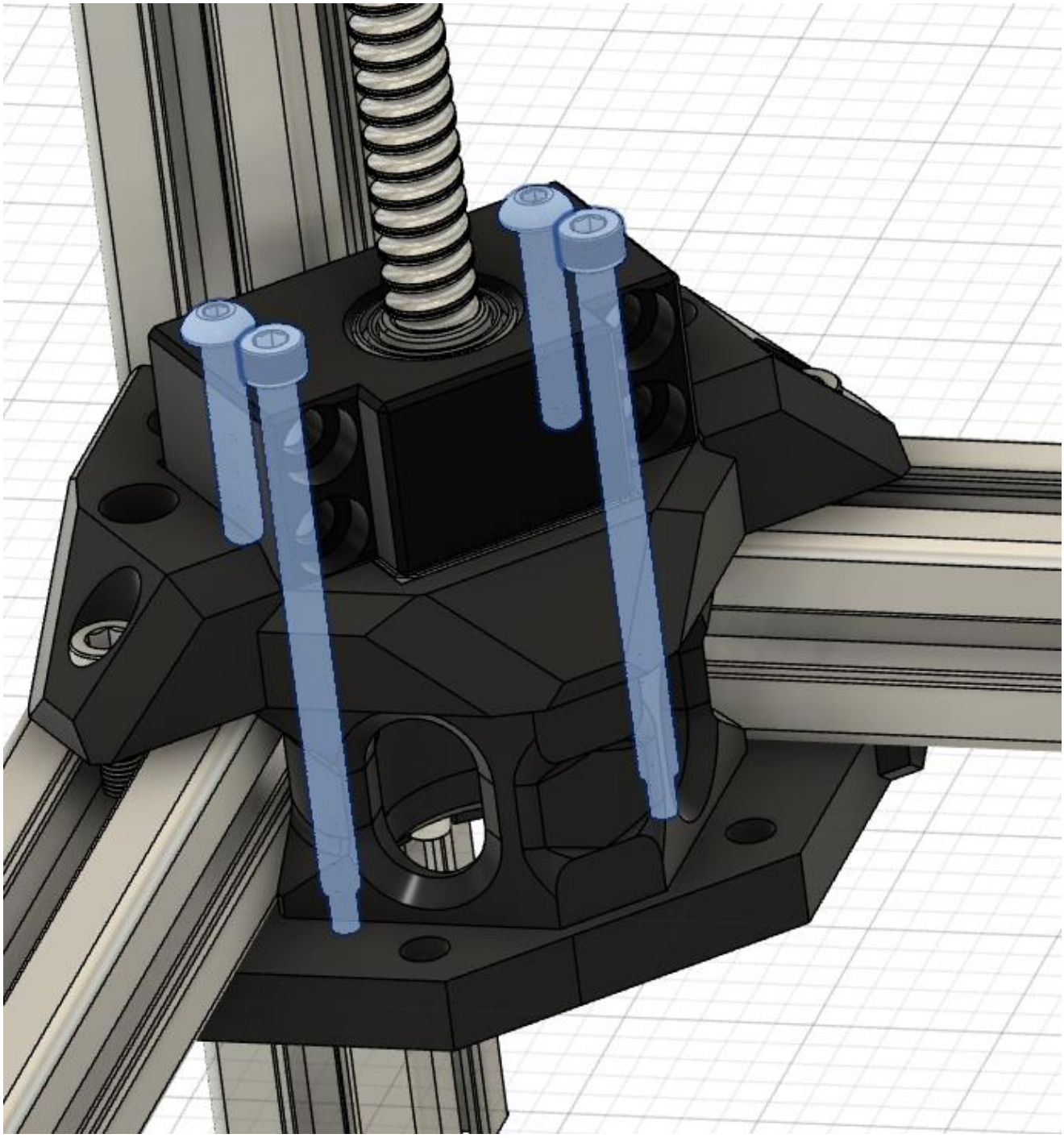


Install the BK10 on the Spindle, Add the nut locker, secure it half a mm below the block

Install the Rails, On the internal 3030 face (3.0 style) or on the rear 3030 face (3.1 style)(You will need to print the ARM31 from the git for this one)

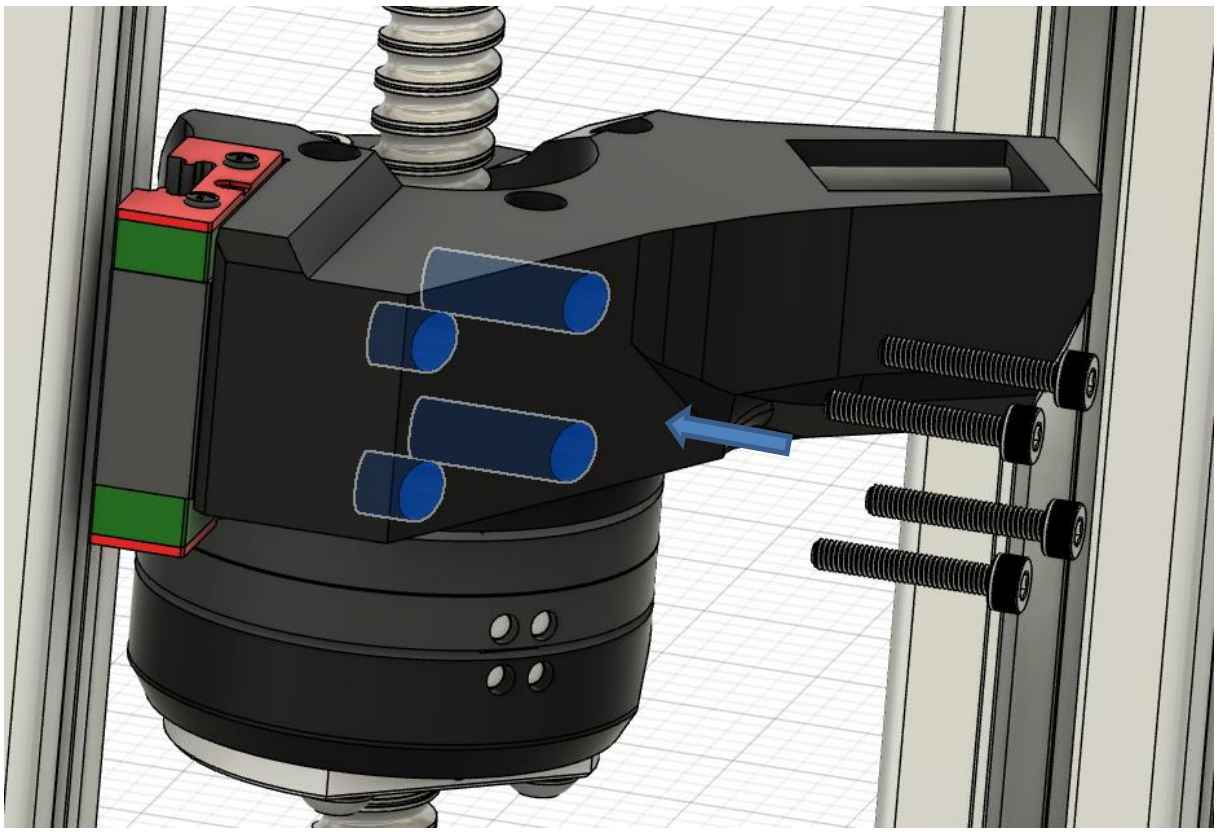
Place the BK10 on the motor block and secure it with 2 M5x80 throught the whole block, and two m5x30 on the rear holes:



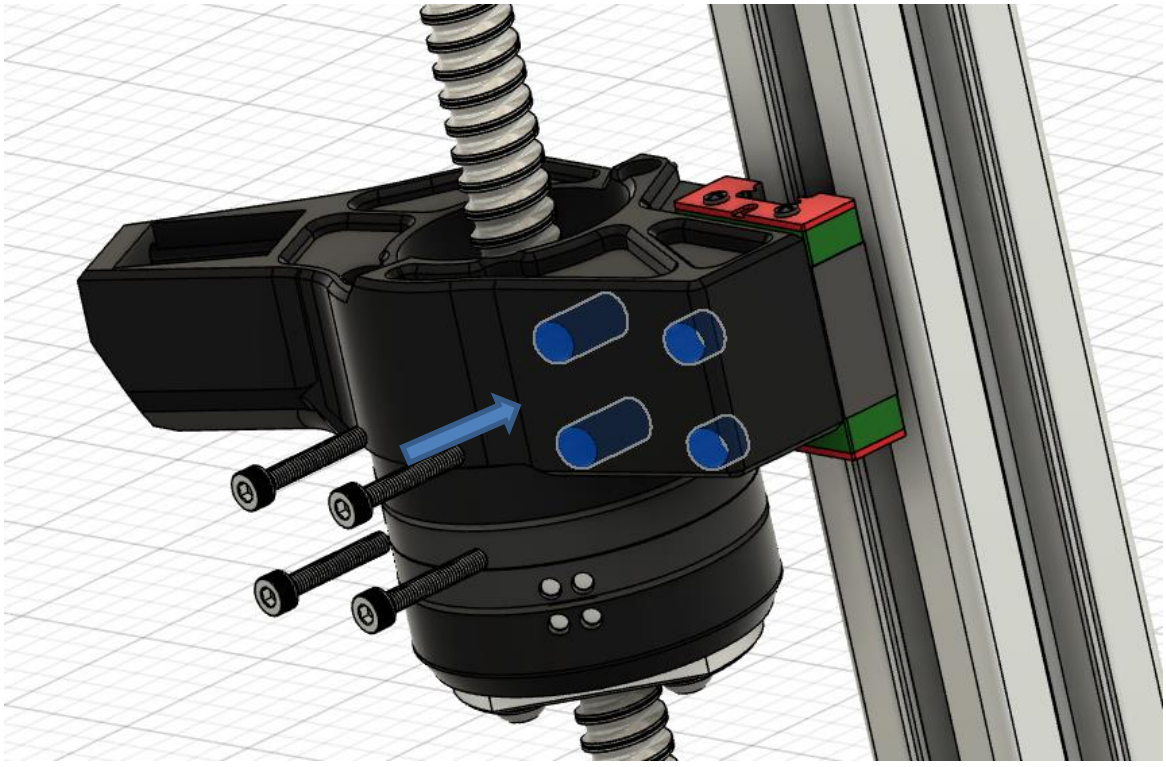


Don’t tighten it fully yet

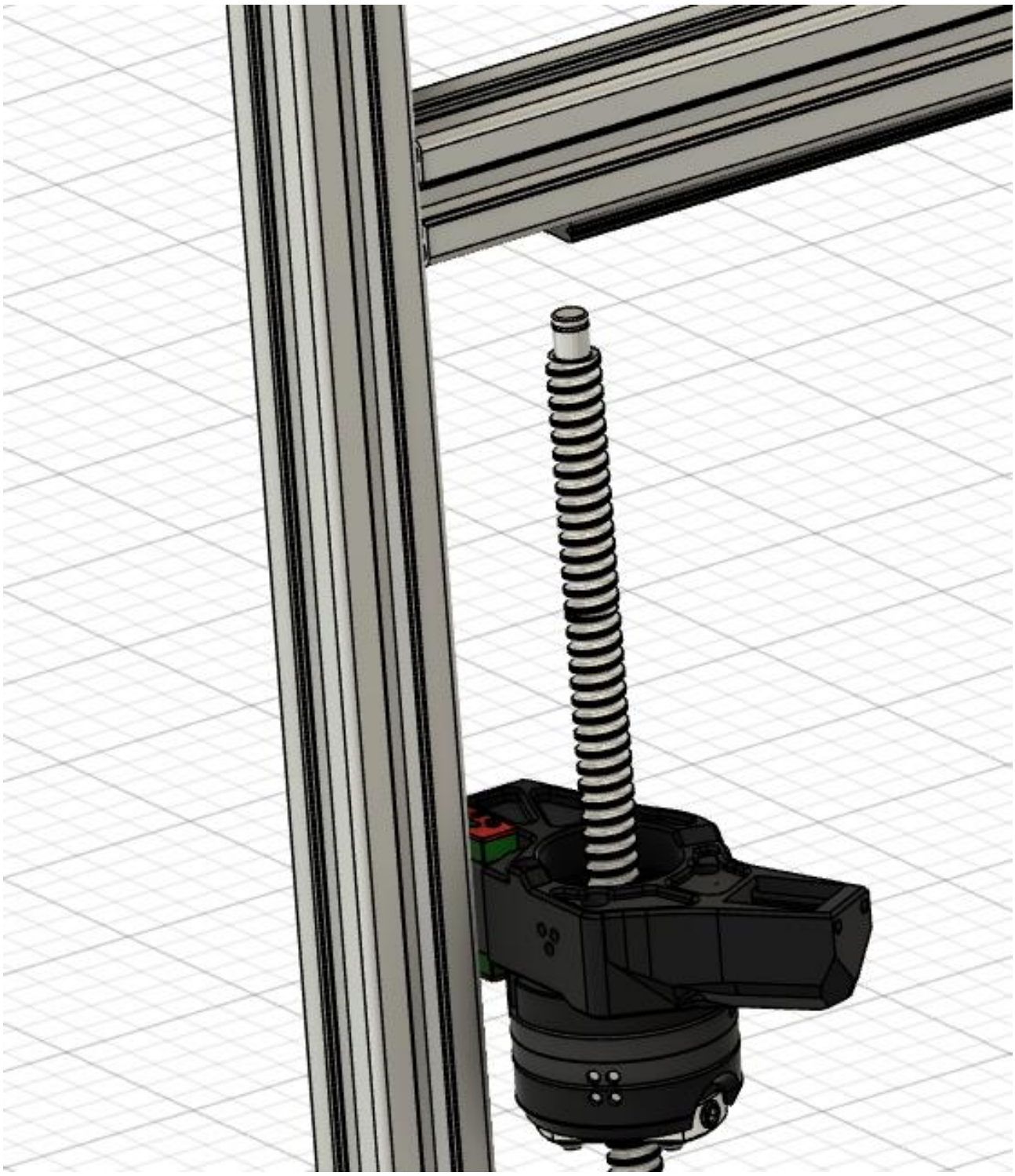
2/ FRONT ARMS



Install the front Arms (3.0 style here)

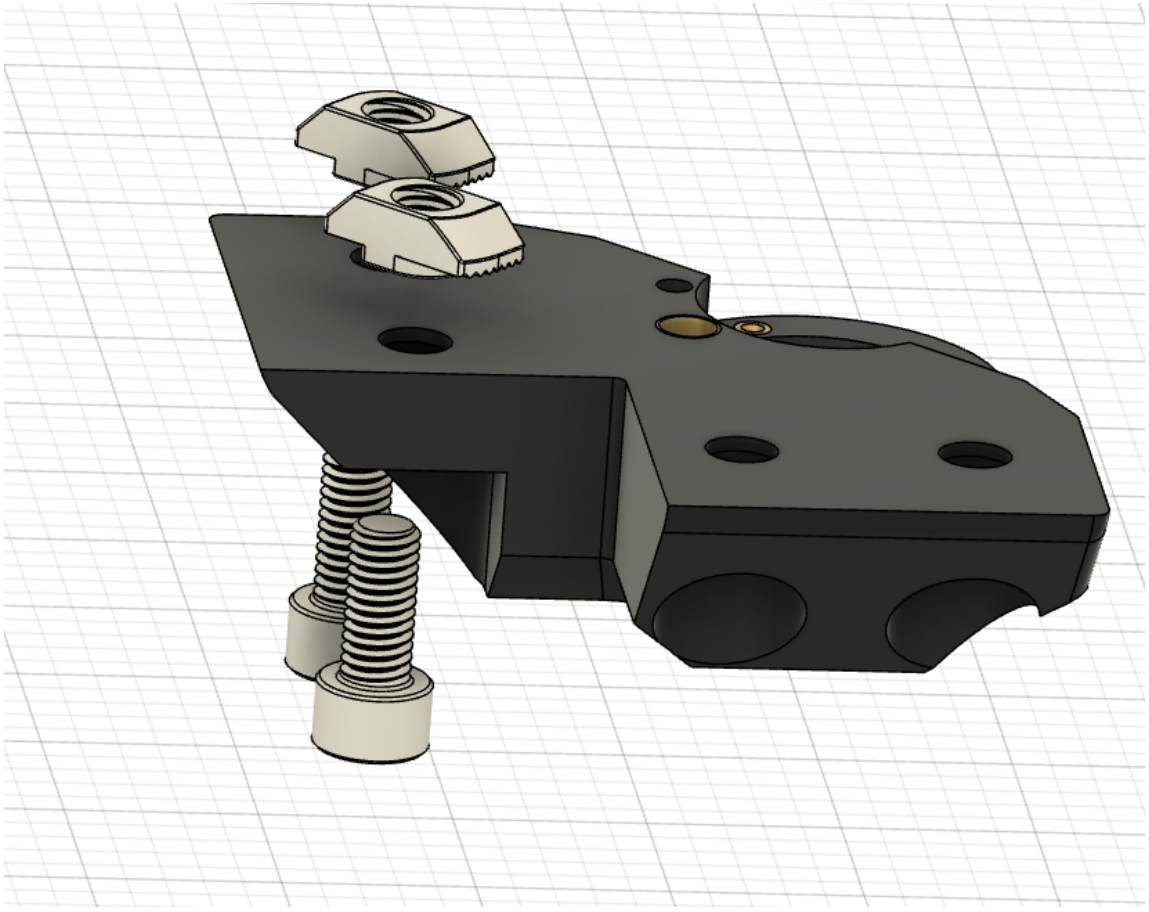


(3.1 style here)

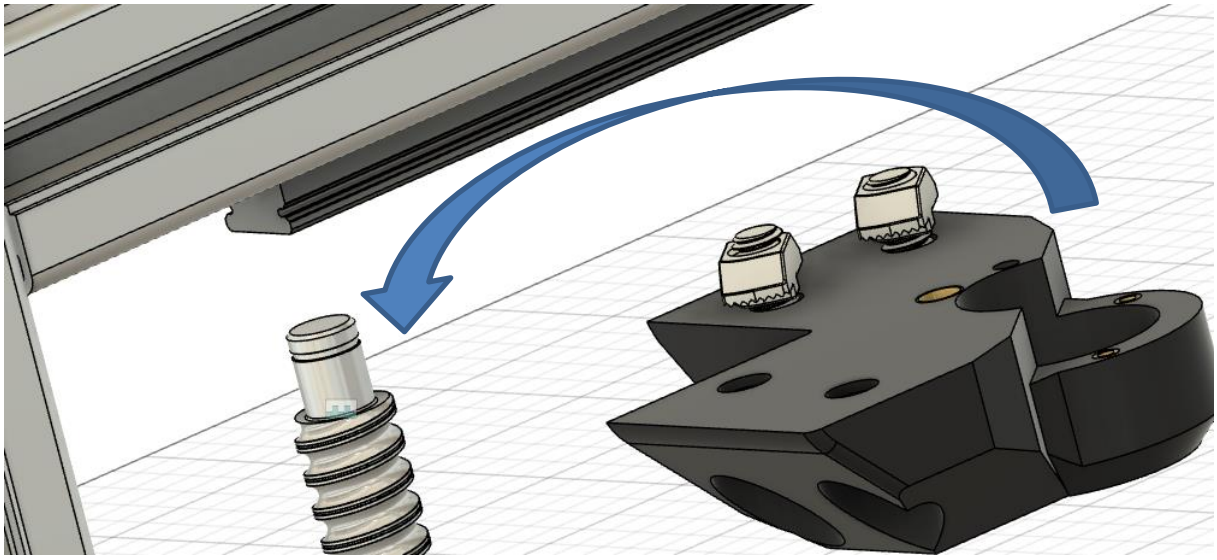


This should end like this; you can see some flexibility, and that will help for the next steps.

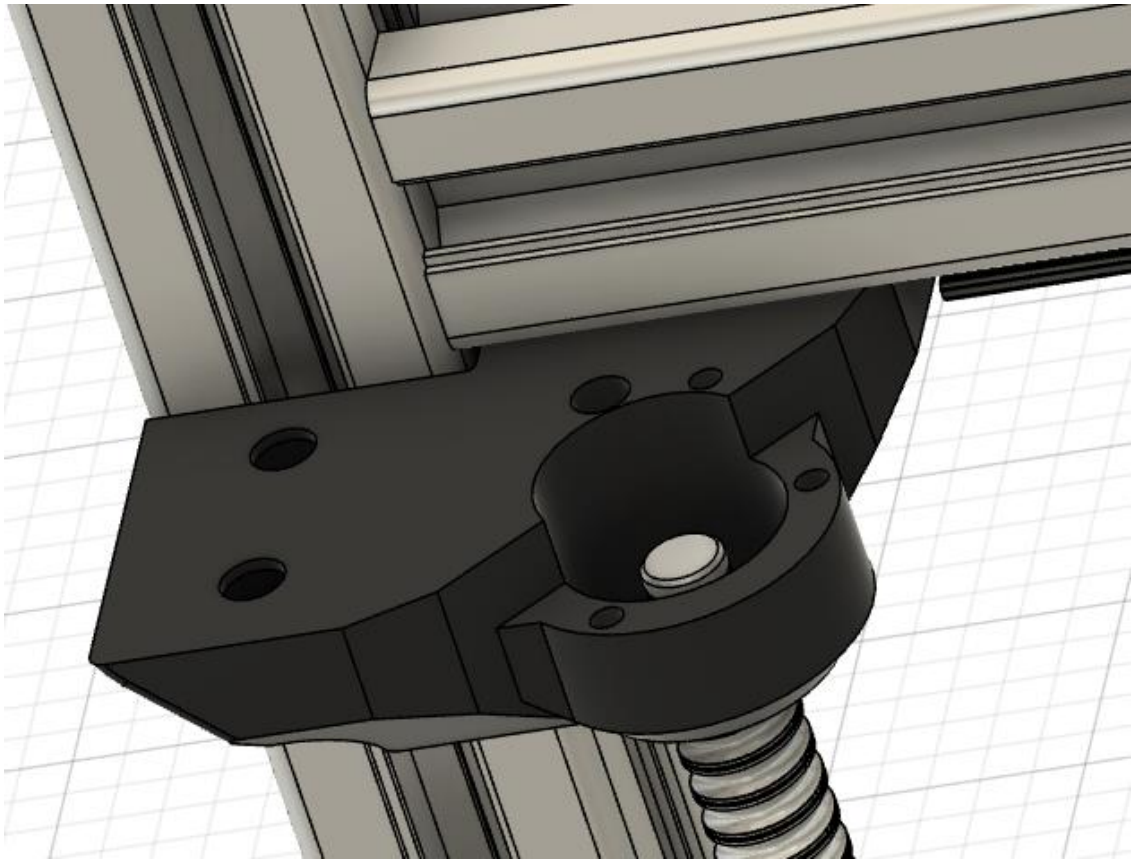
3/ Open Front Idlers/retainers

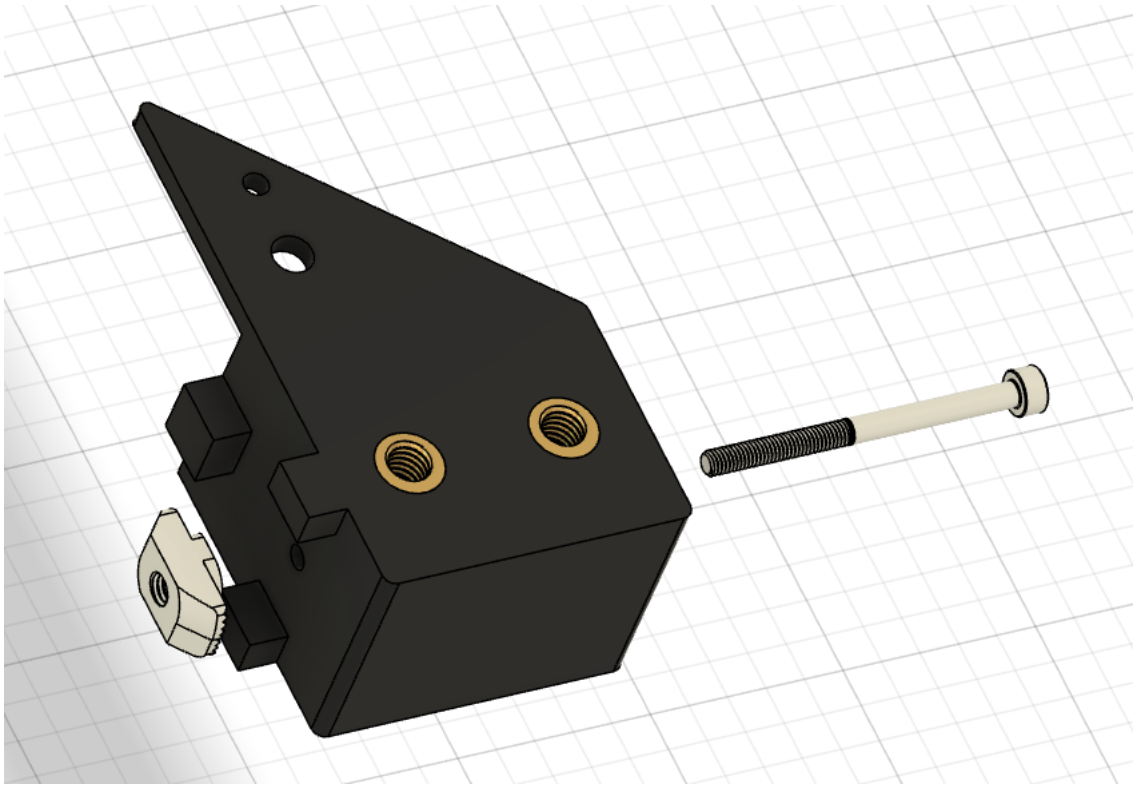


Install the M6x14 + the T-Nut

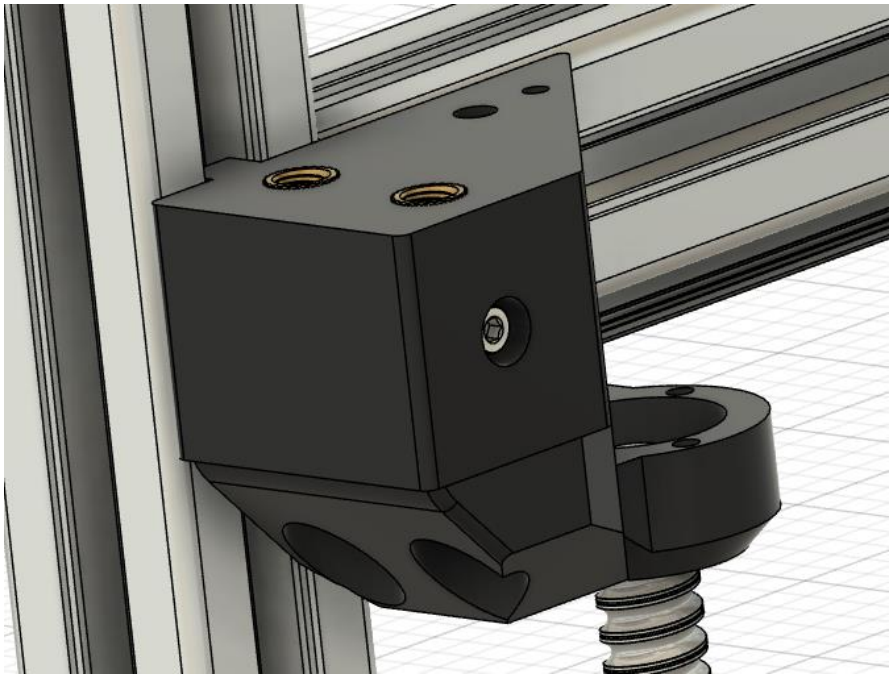


The objective will be to fix this retainer to the frame, since we have a bit of flex now, wiggle it a bit and this will take place. You can tighten the 2 M6to secure it in place

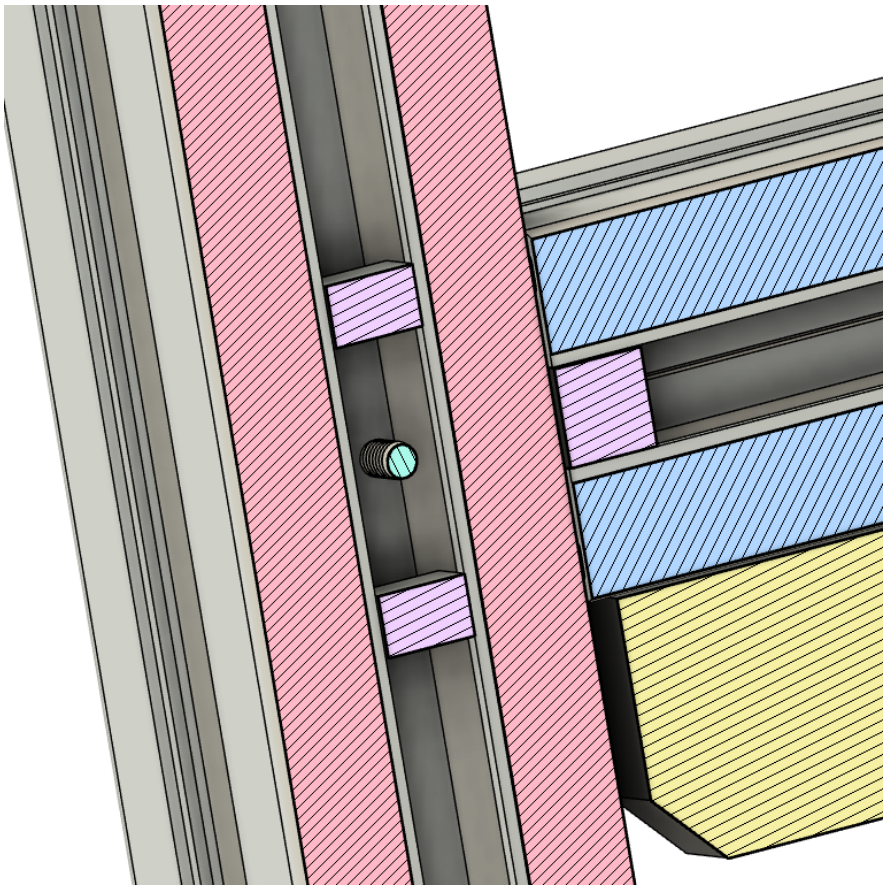




Prepare Middle front part, by placing an m3x40 with a M3 T-nut.

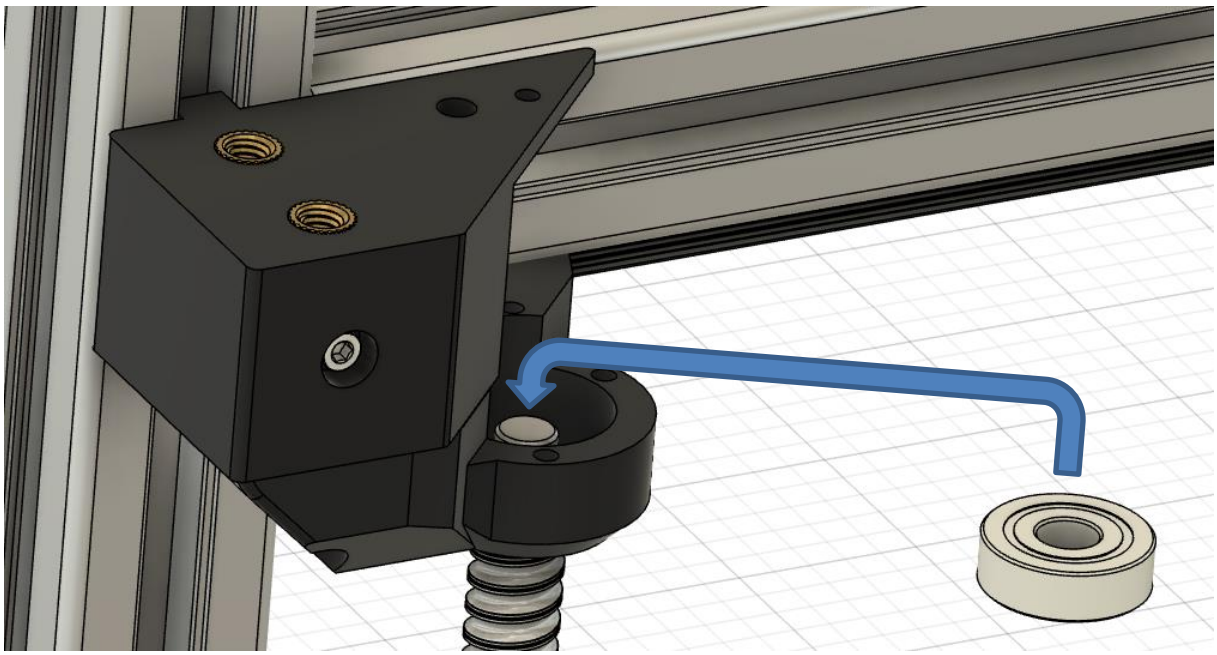


Slide it in the front junction

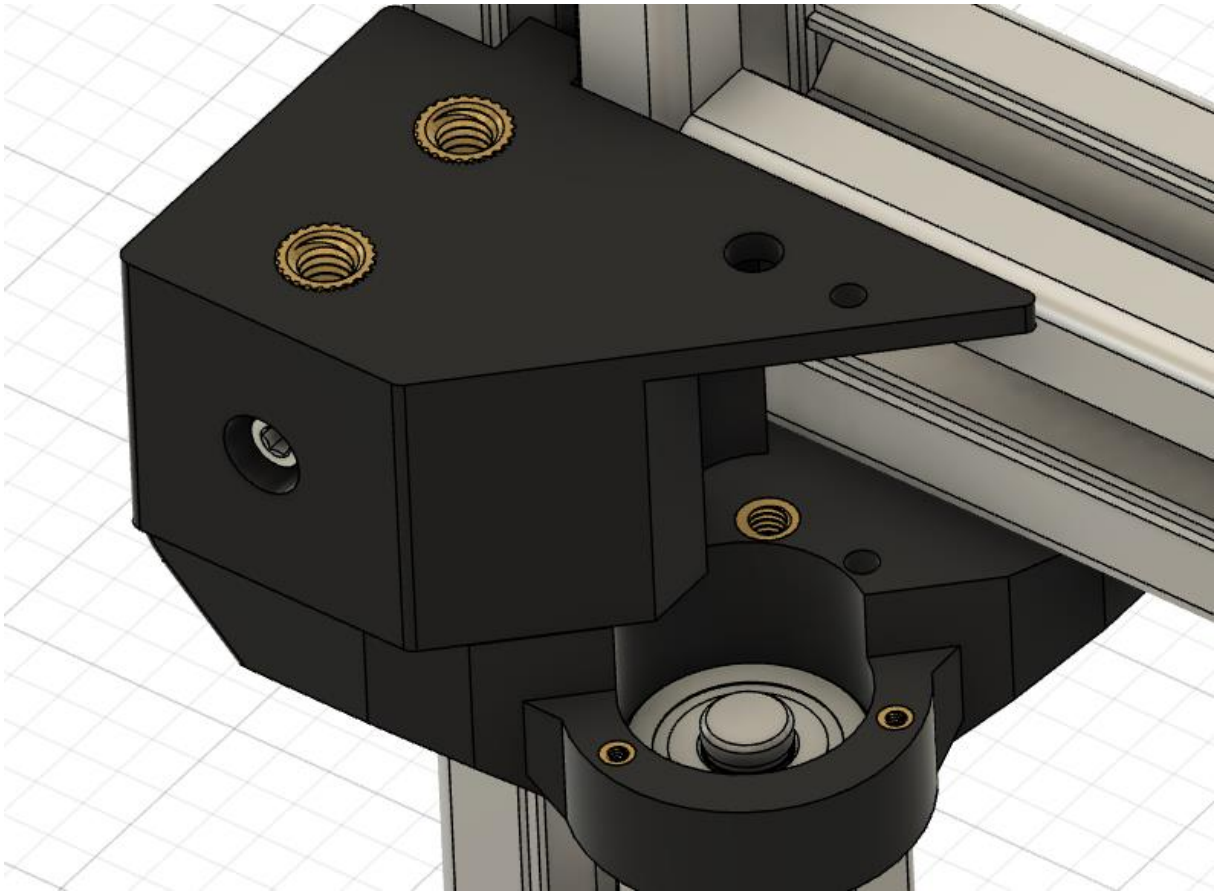


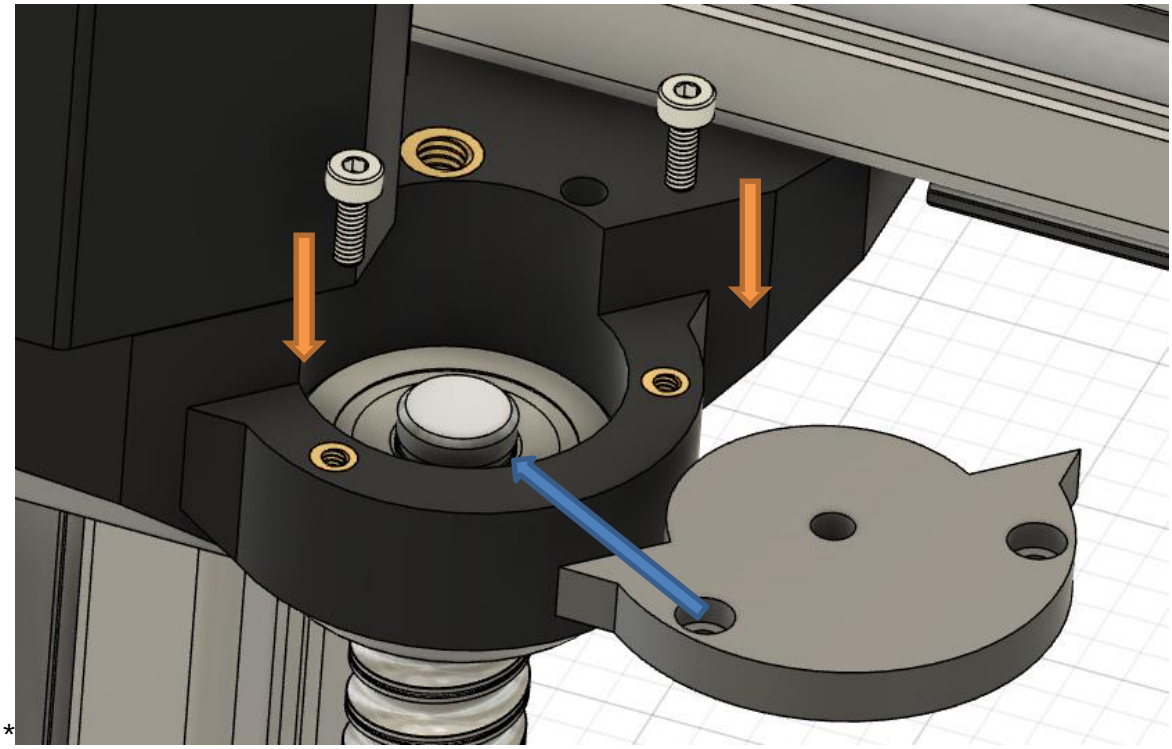
The 3 plots should auto-lock the part position, You can tighen the m3x40

And then place the 2 M6x14 **BUT don’t overight them** since the inserts can pull over.

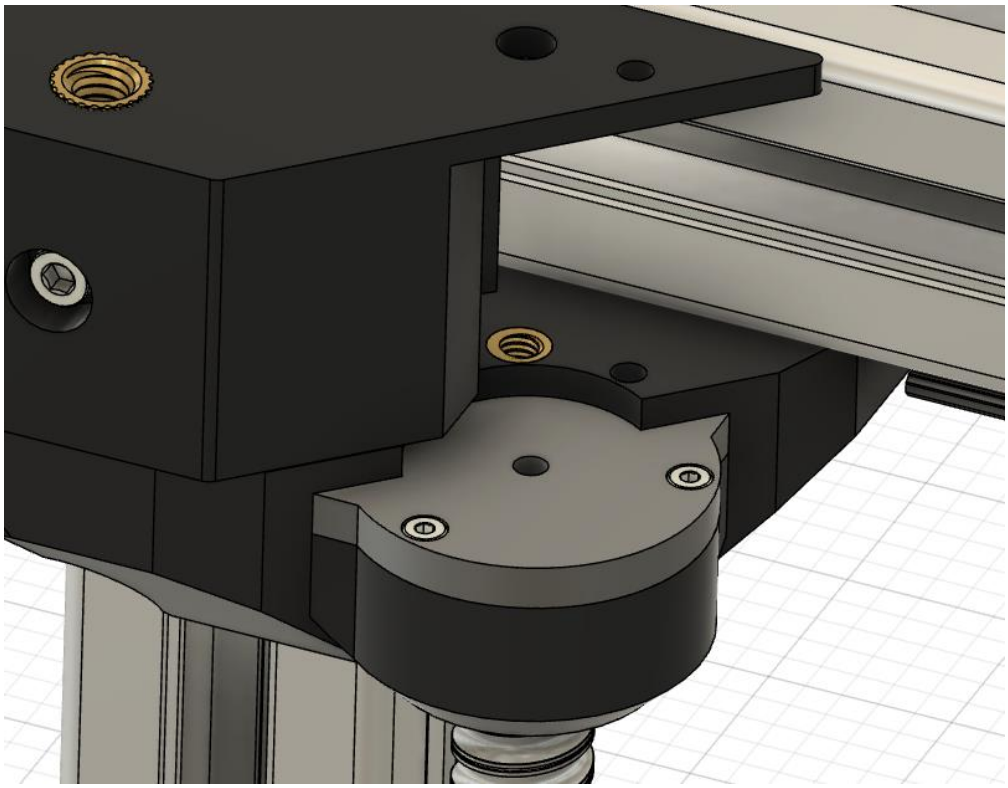


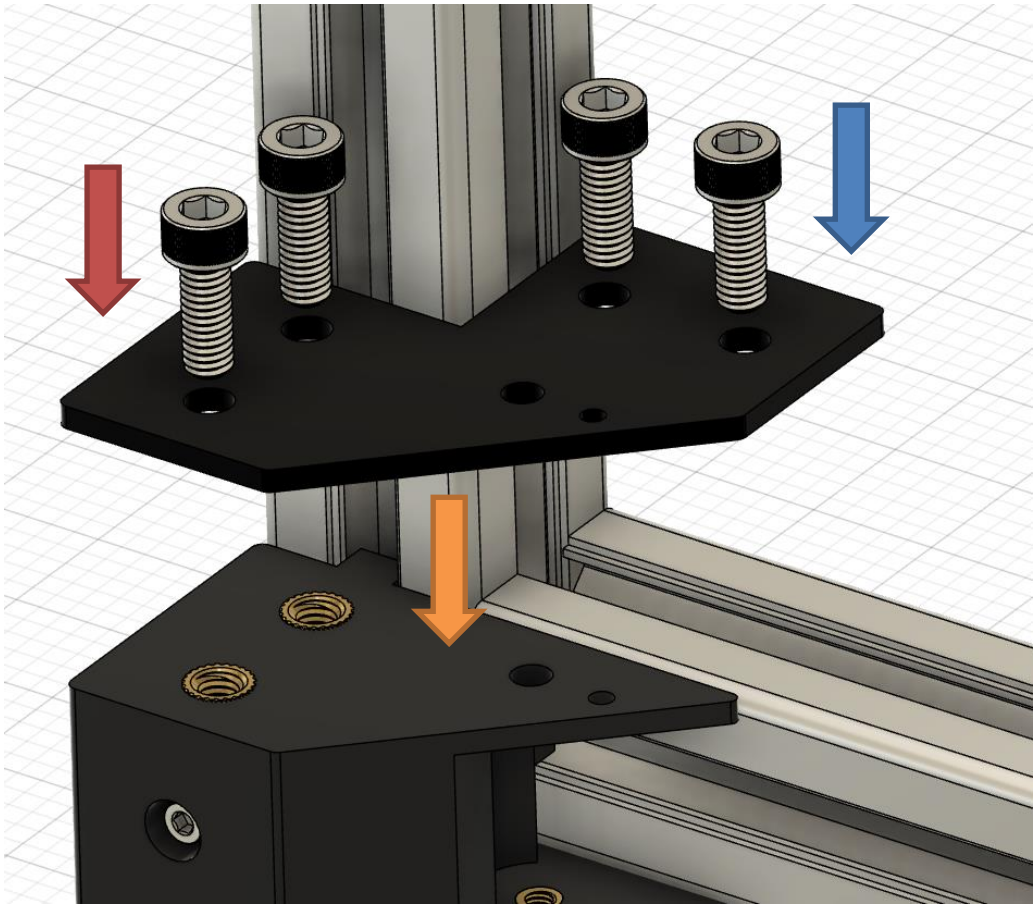
You can place the 608zz bearing in the SFU spindle to the flange of the part.



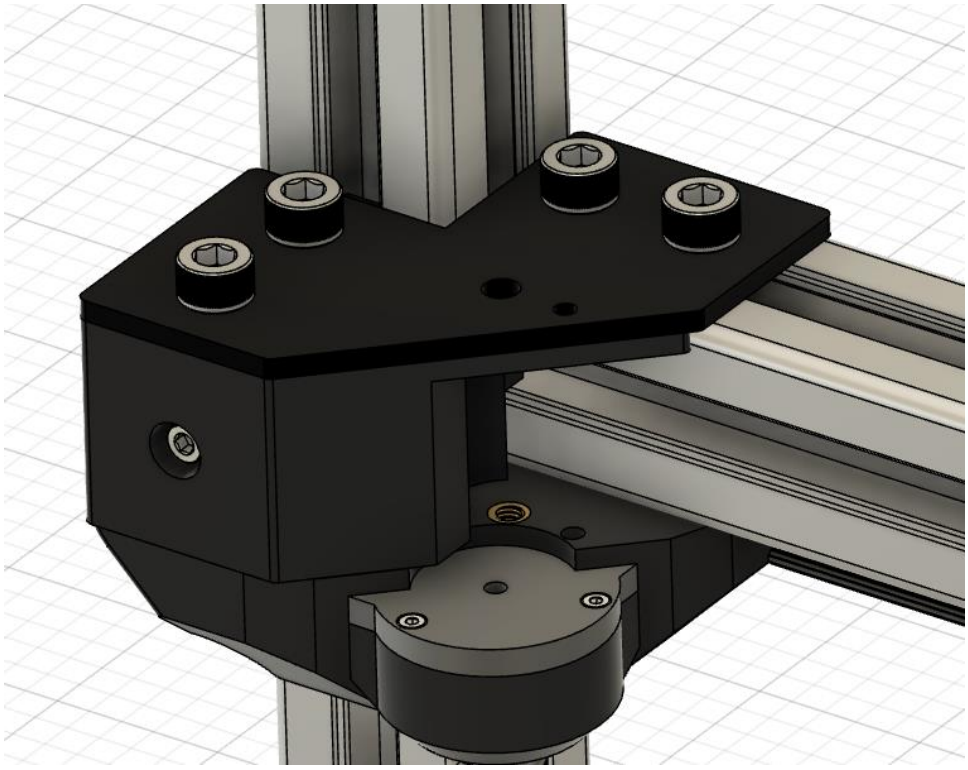


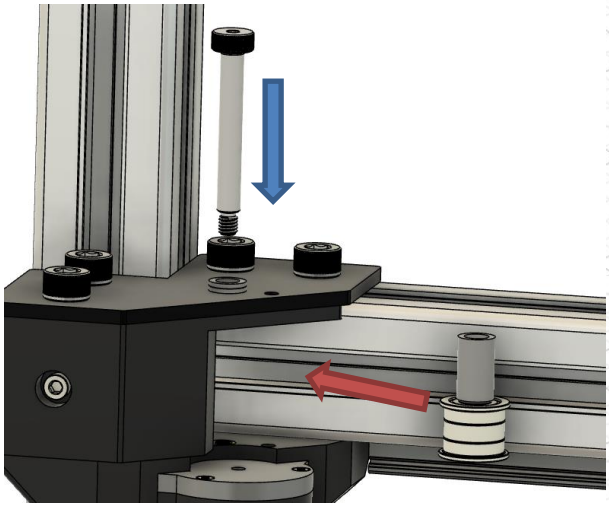
Place the protection top, then Secure it with the 2 M2x8

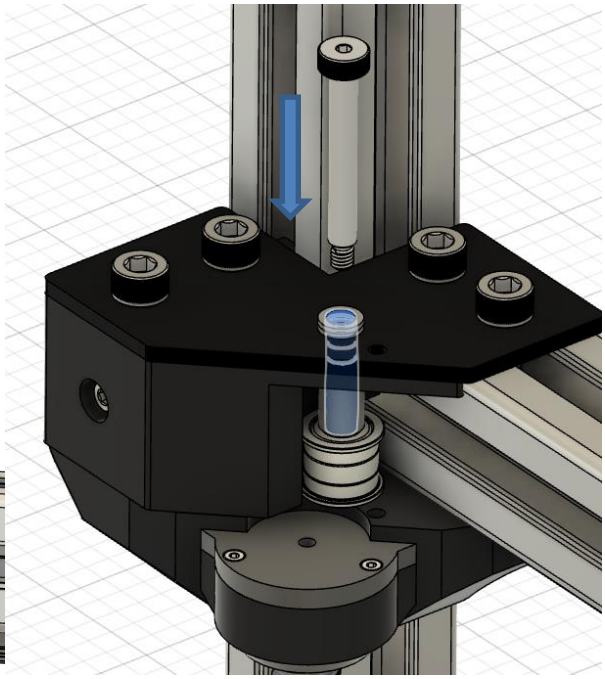




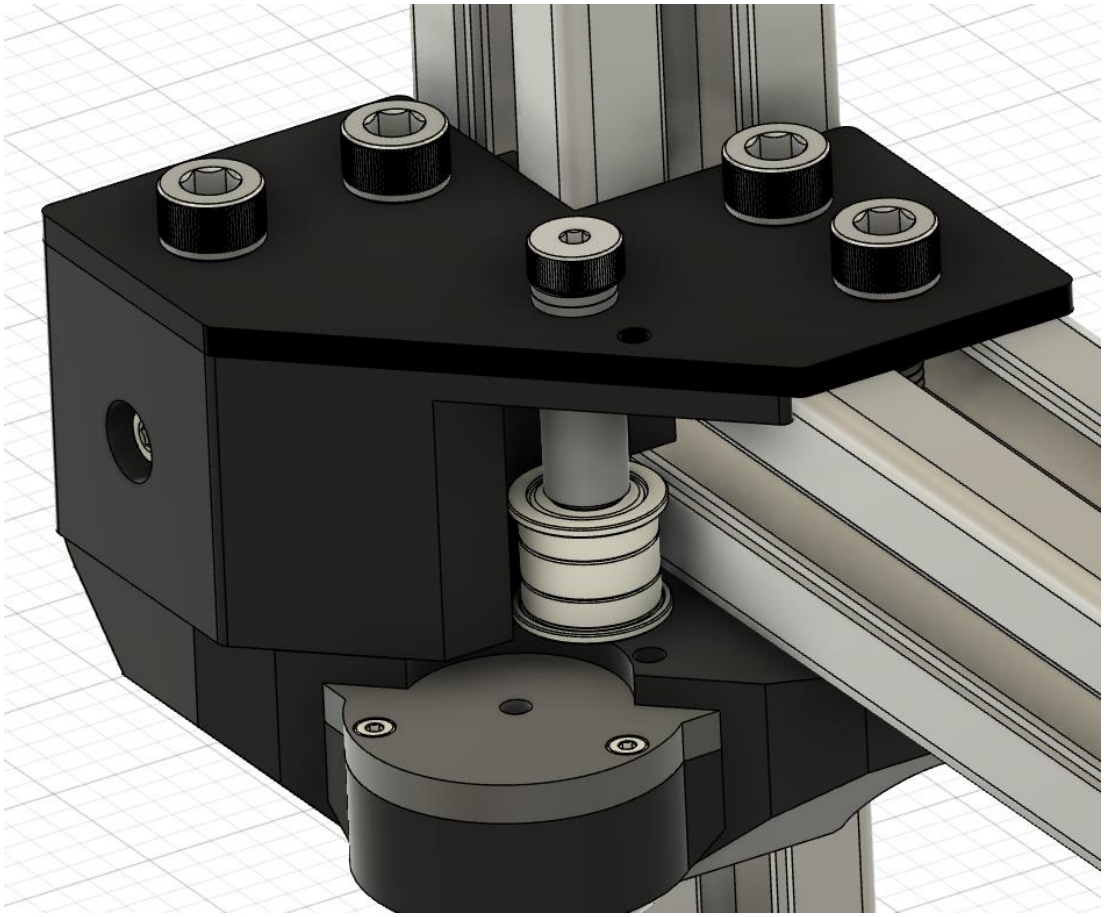
Place 2M6x14 with 2x Tnuts, Position the plate on the top assembly, secure everything on the front side with 2x M6x14

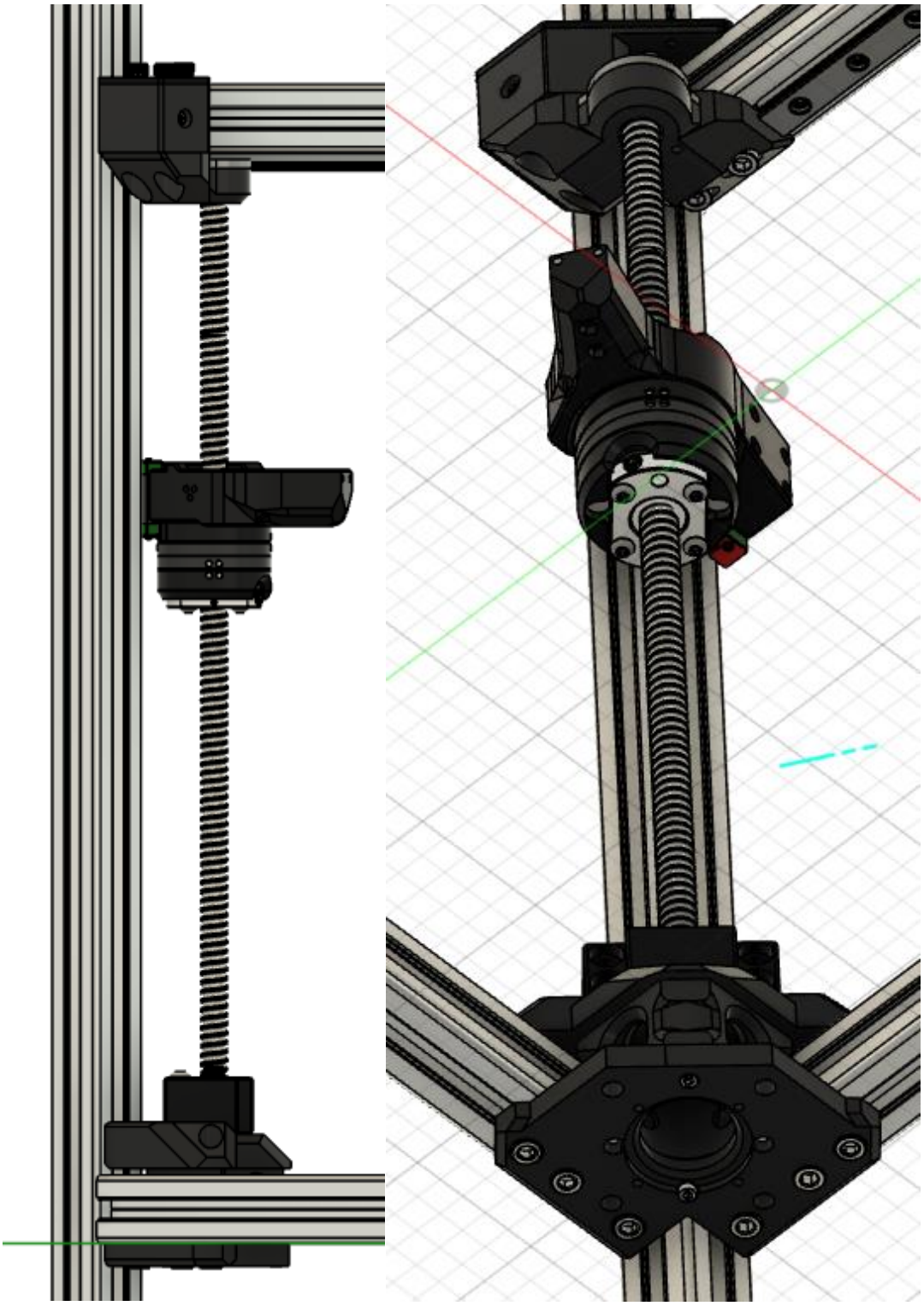






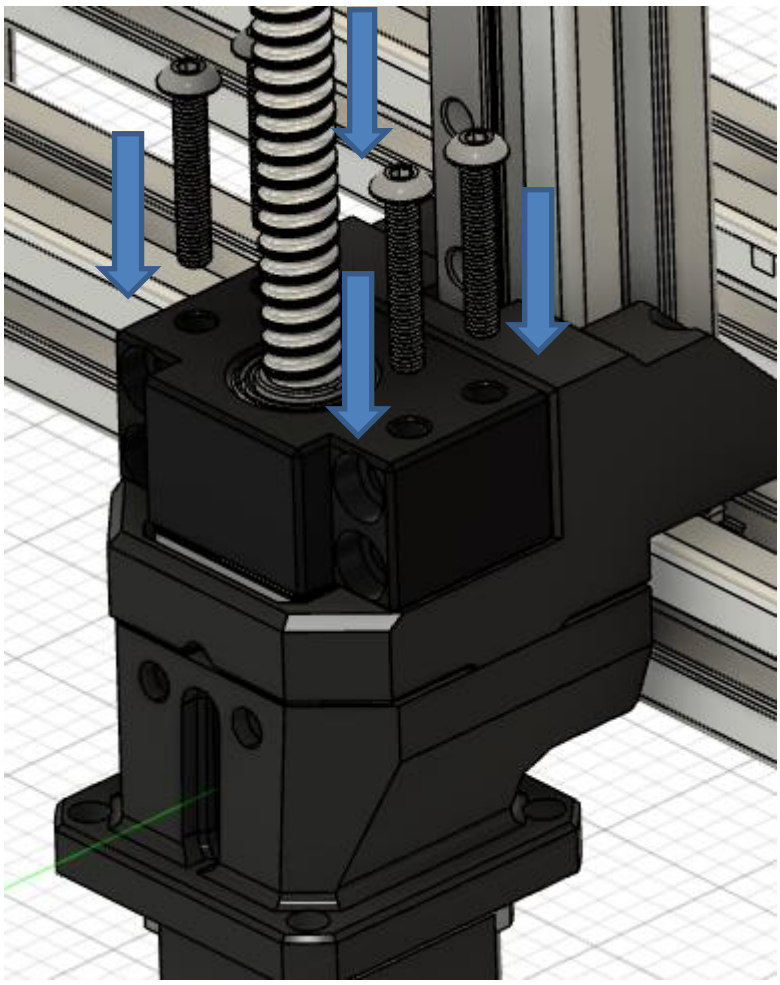
Prepare the idler stack (1mm shim-F695-695-F695-14mm Spacer)(Same logic than the RR 3.1 manual), then slide it inside the assembly, it will be very tight that is normal, then secure It with a 35mm D5M4 shoulder-bolt. Use shims to level the Shoulderbolt on the top plate





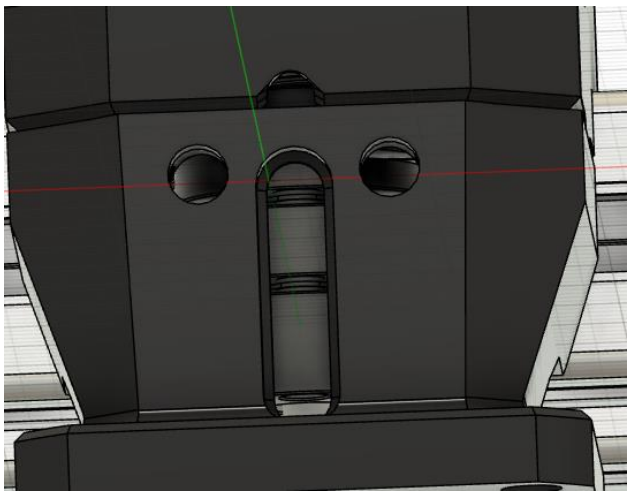
This process is the same across both front Z axis, only the idlers swapped place in the order of it.

4/ REAR AXIS + ARM



Insert the x4 M5x50 to secure the whole block

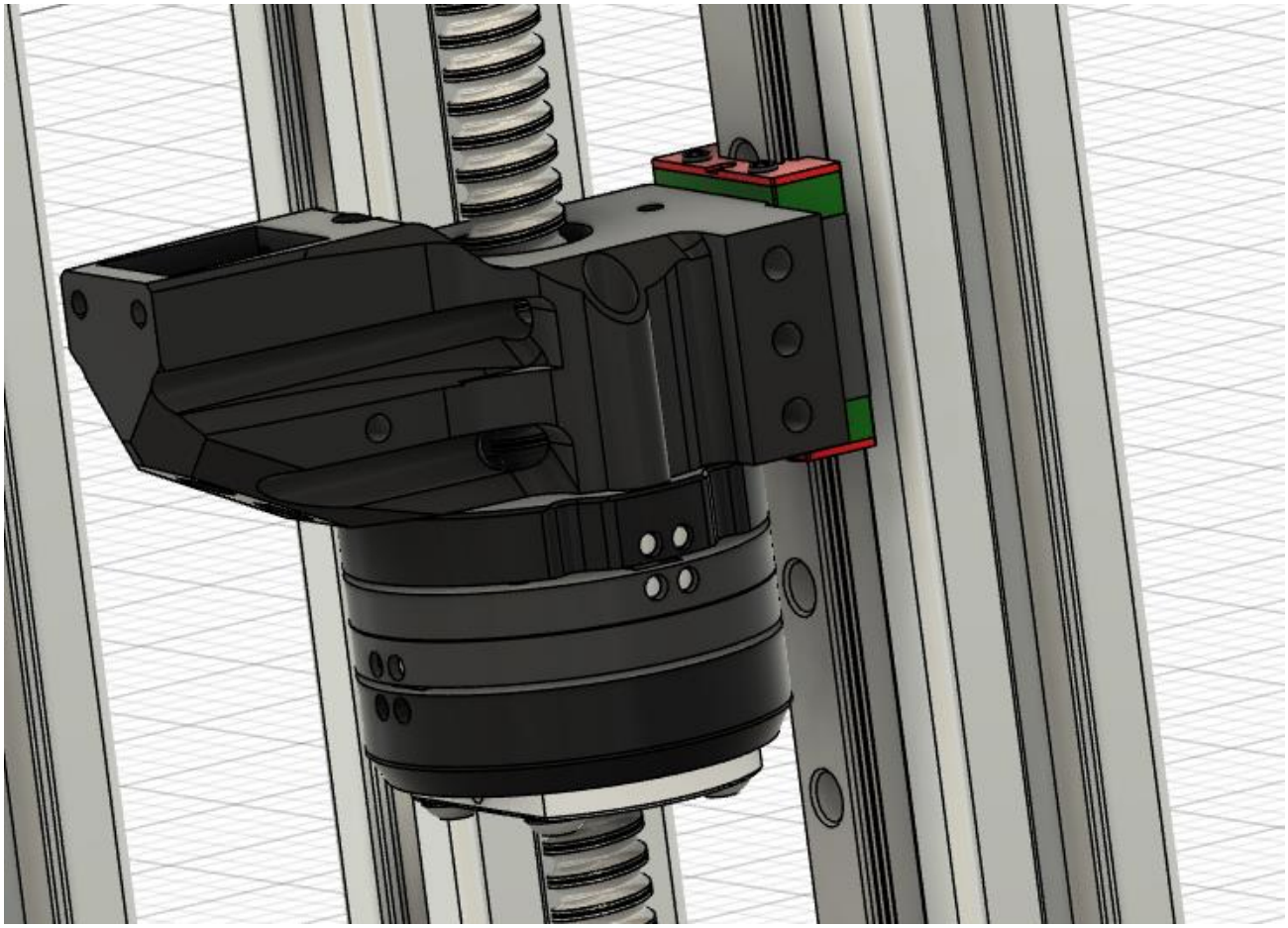
-For the NEMA17 installation, install the coupler on the nema17 shaft before assembling the BK10/Spindle

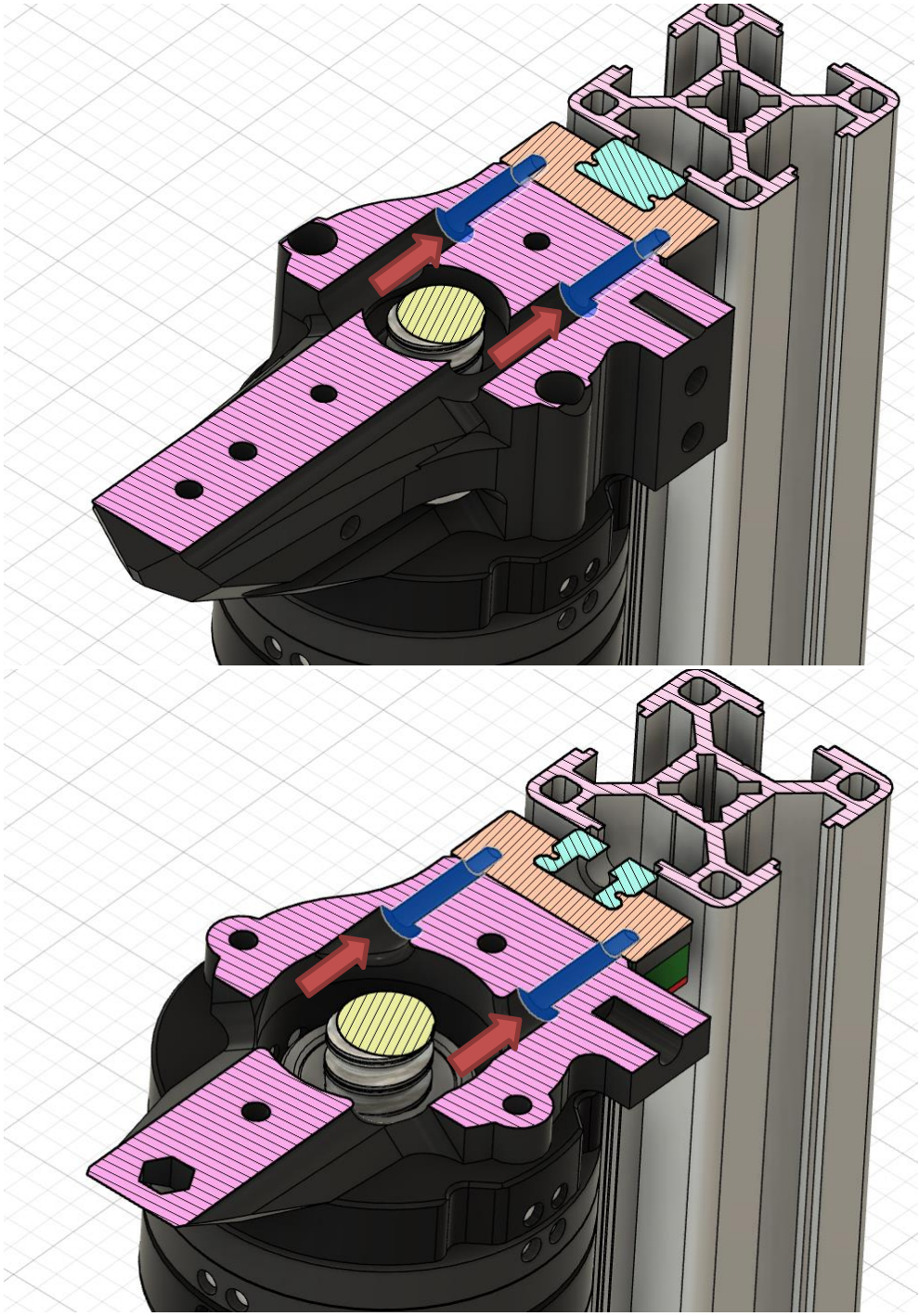


You can now tighten the coupler via the holes here, it can be a bit hard to access but it works fine at the end 😉

For NEMA23 the installation will be at the end!

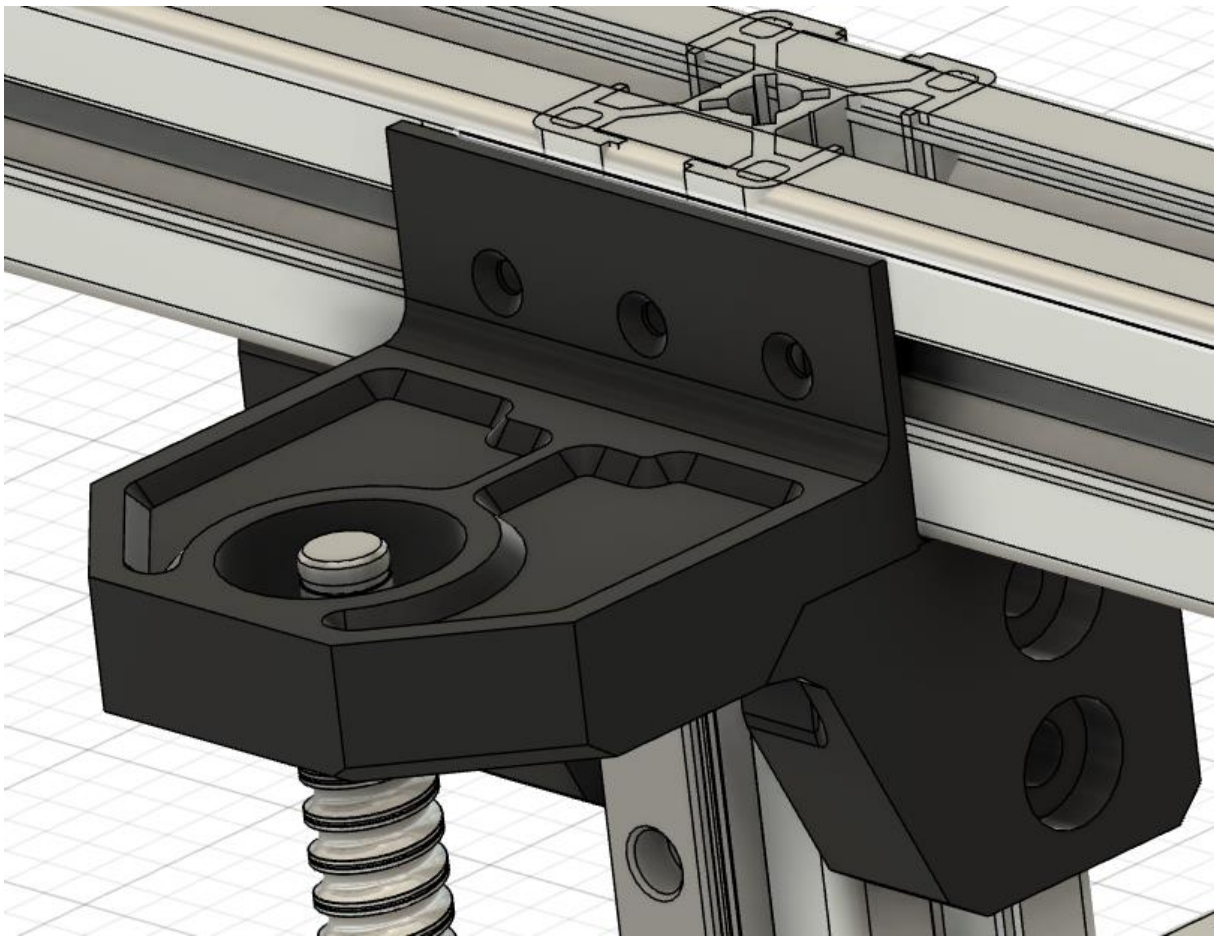
At this point you can install the Back arm, pretty straight forward



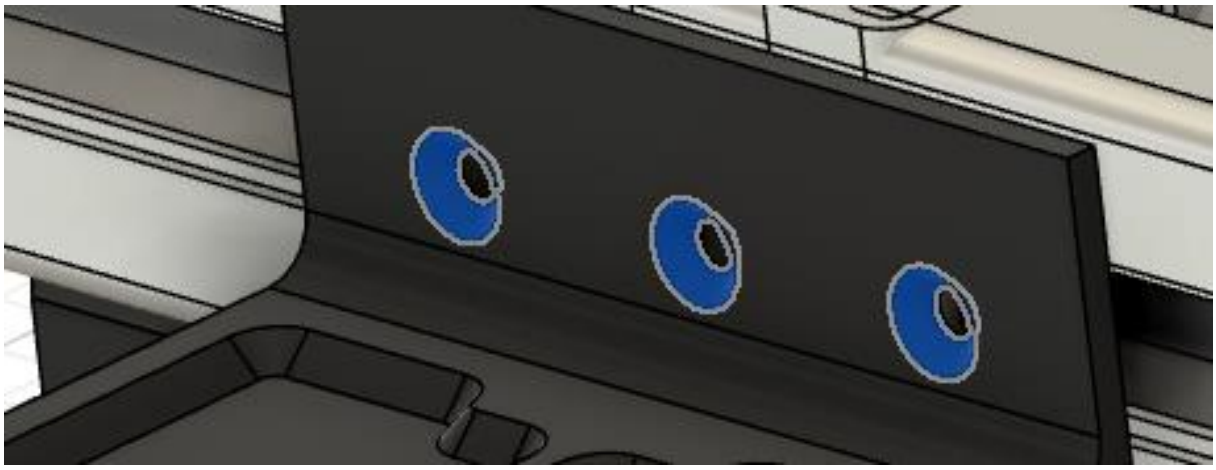


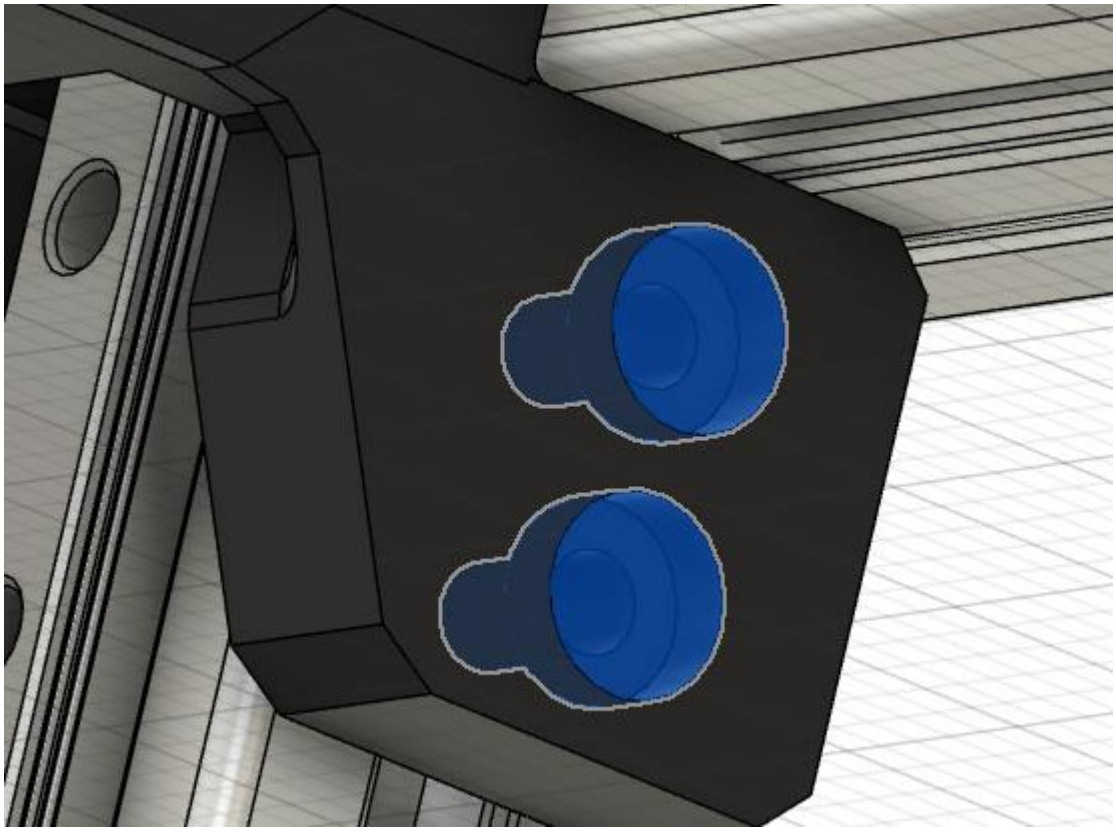
4x M3x15 via the 4 specific holes.

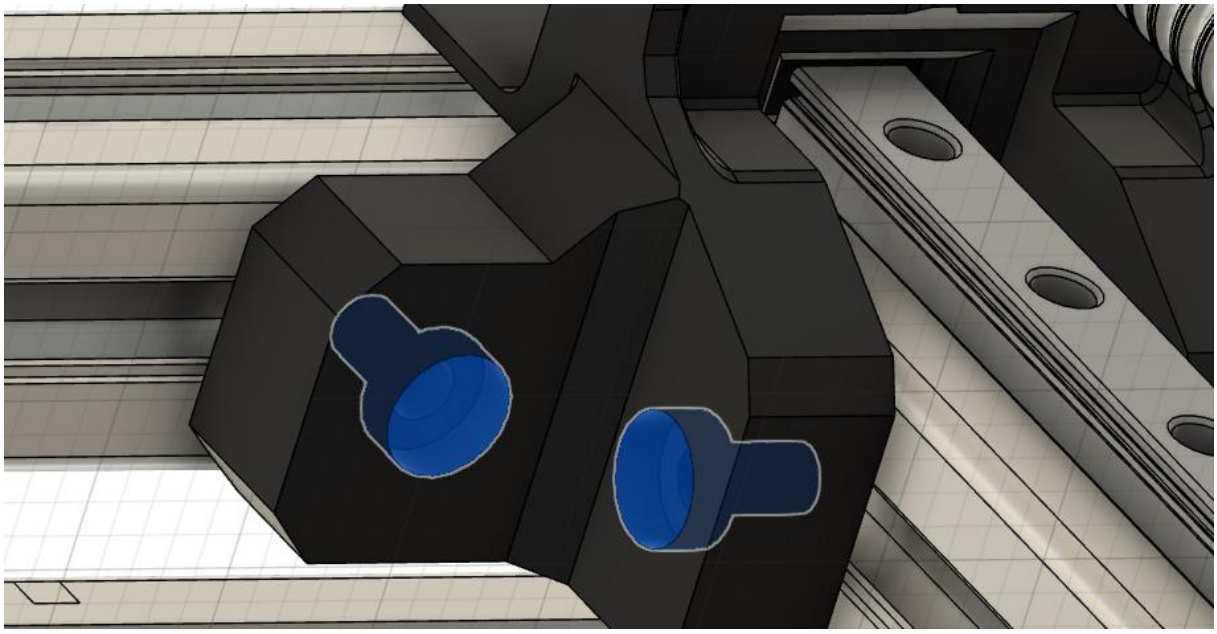
The last part is a bit of a pain, but with the help a a magnet it is completely possible



3 countersunk m3x8 with 3 M3 T-nut

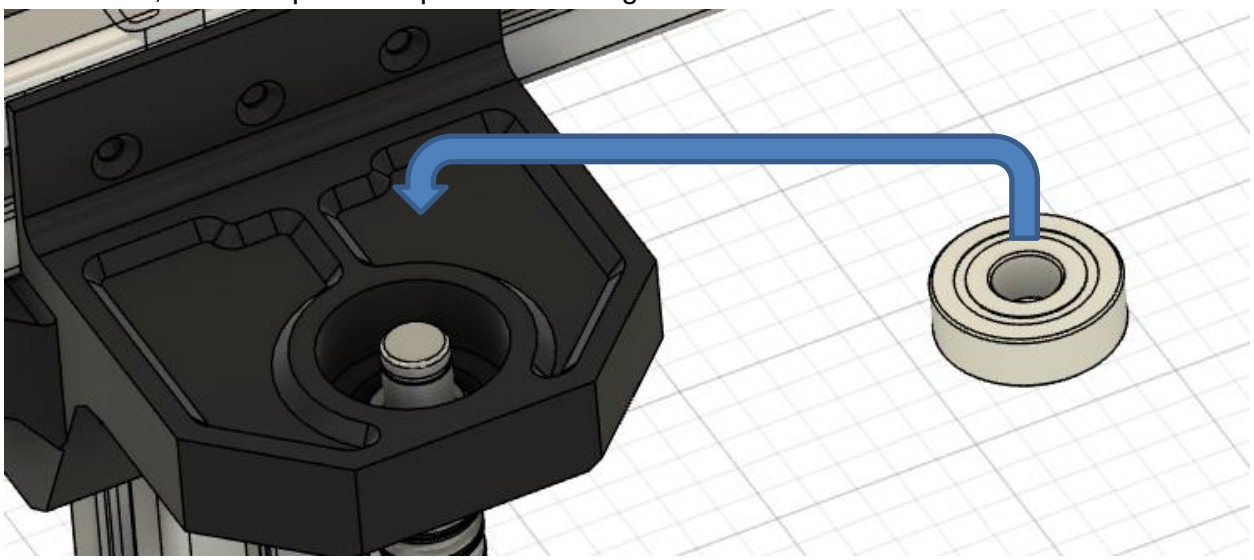


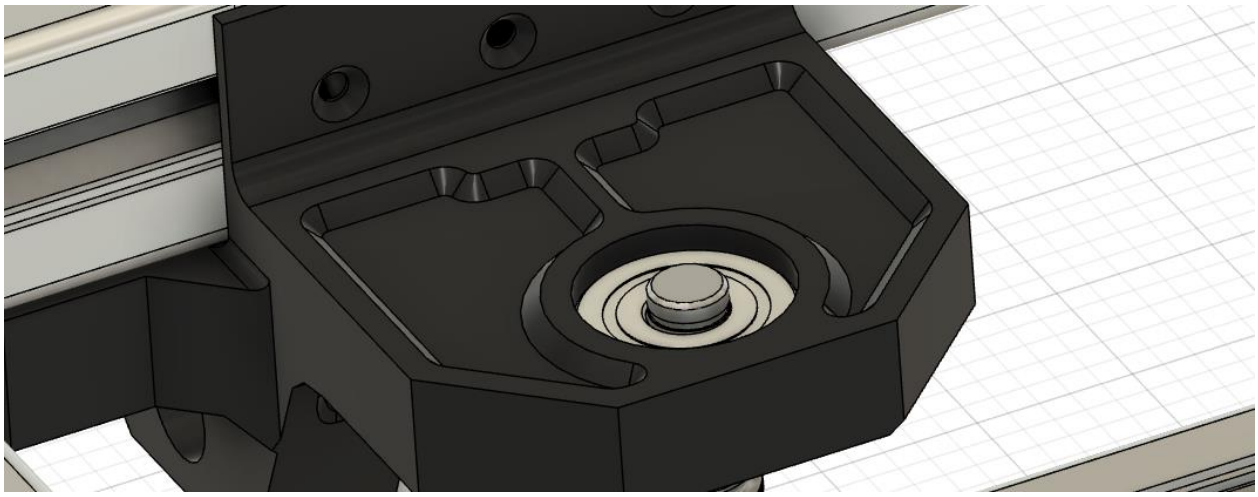




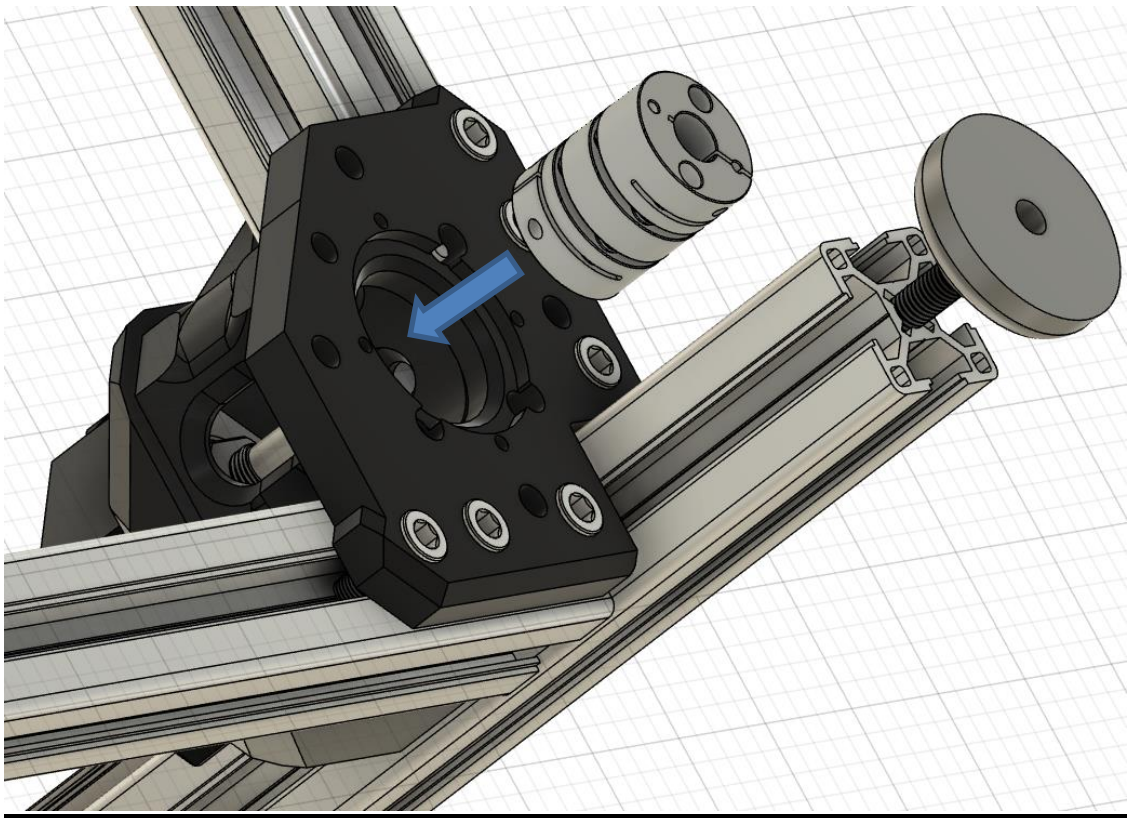
And 4 M6 with the according tnut

Once done, You can put the top 608zz bearing

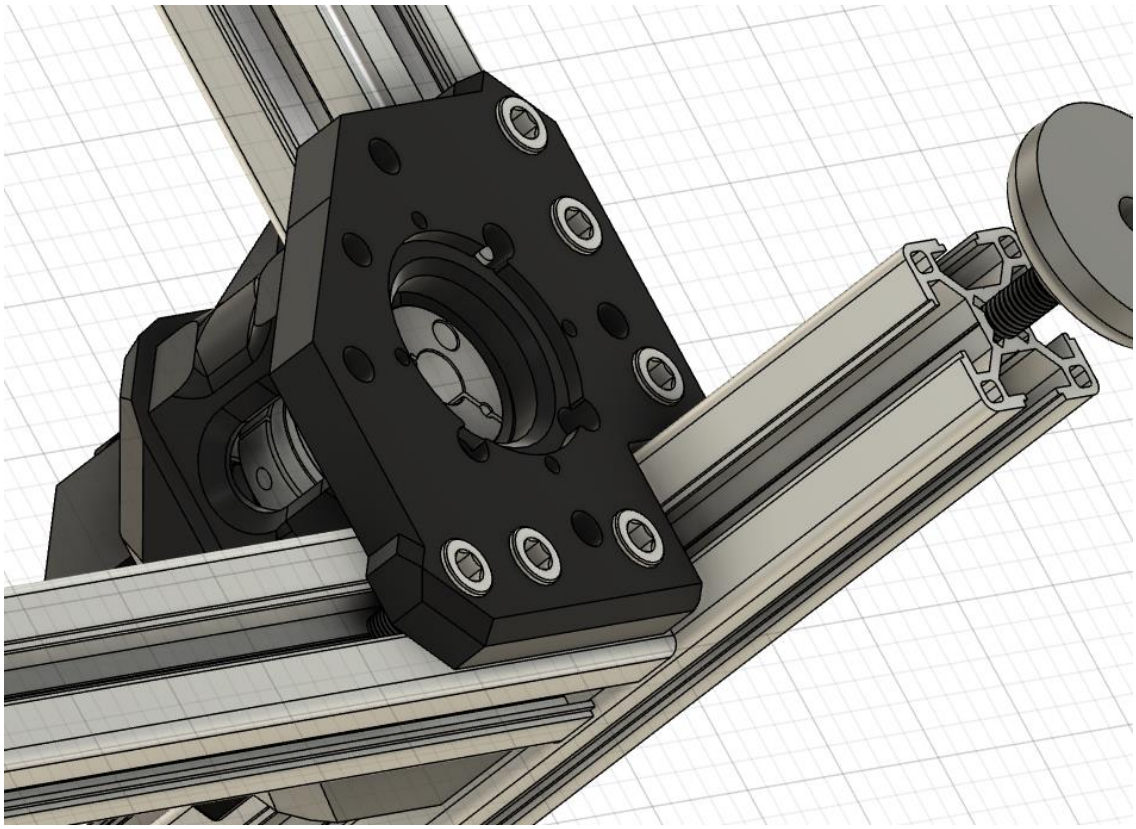


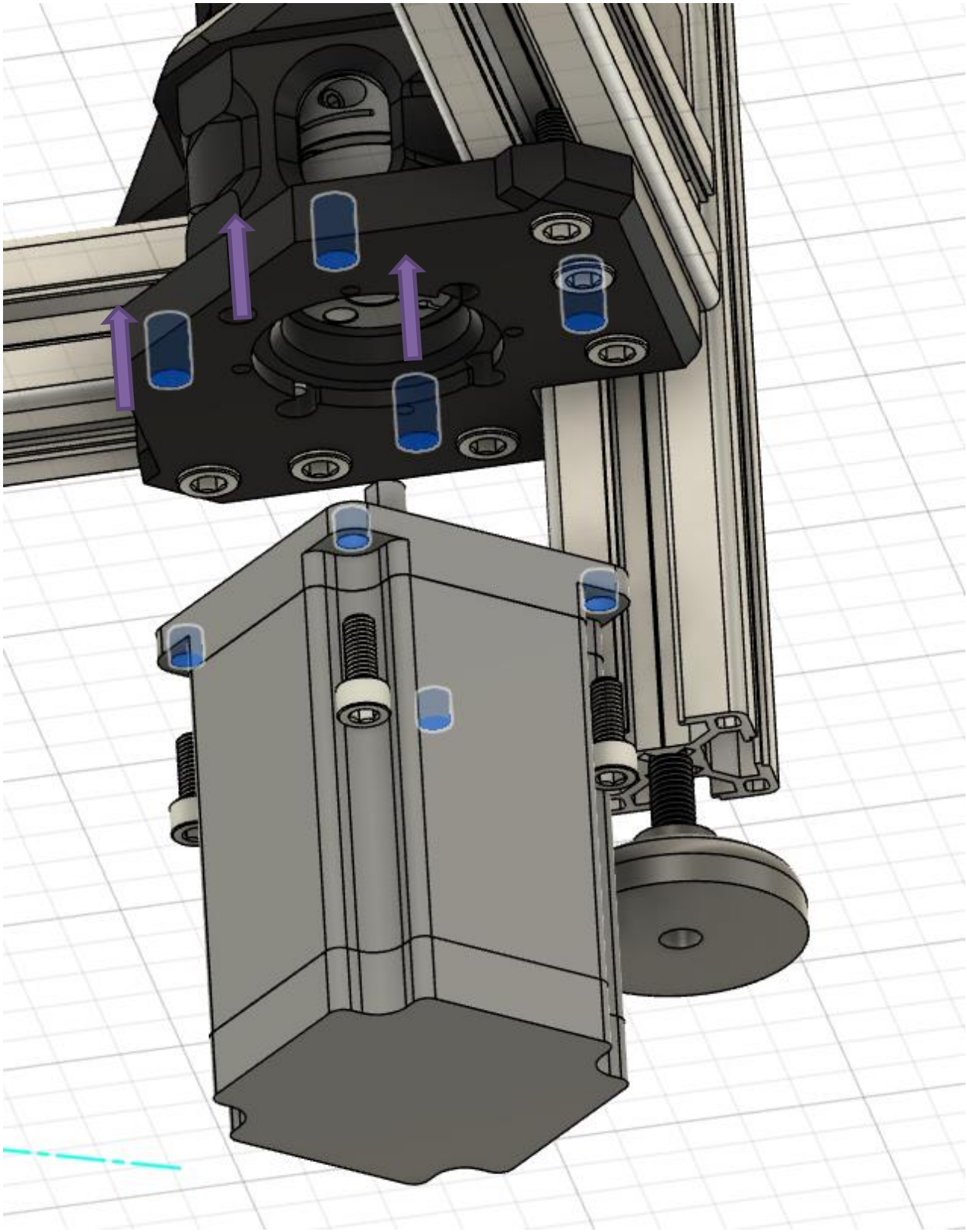


5/ NEMA23 Installation

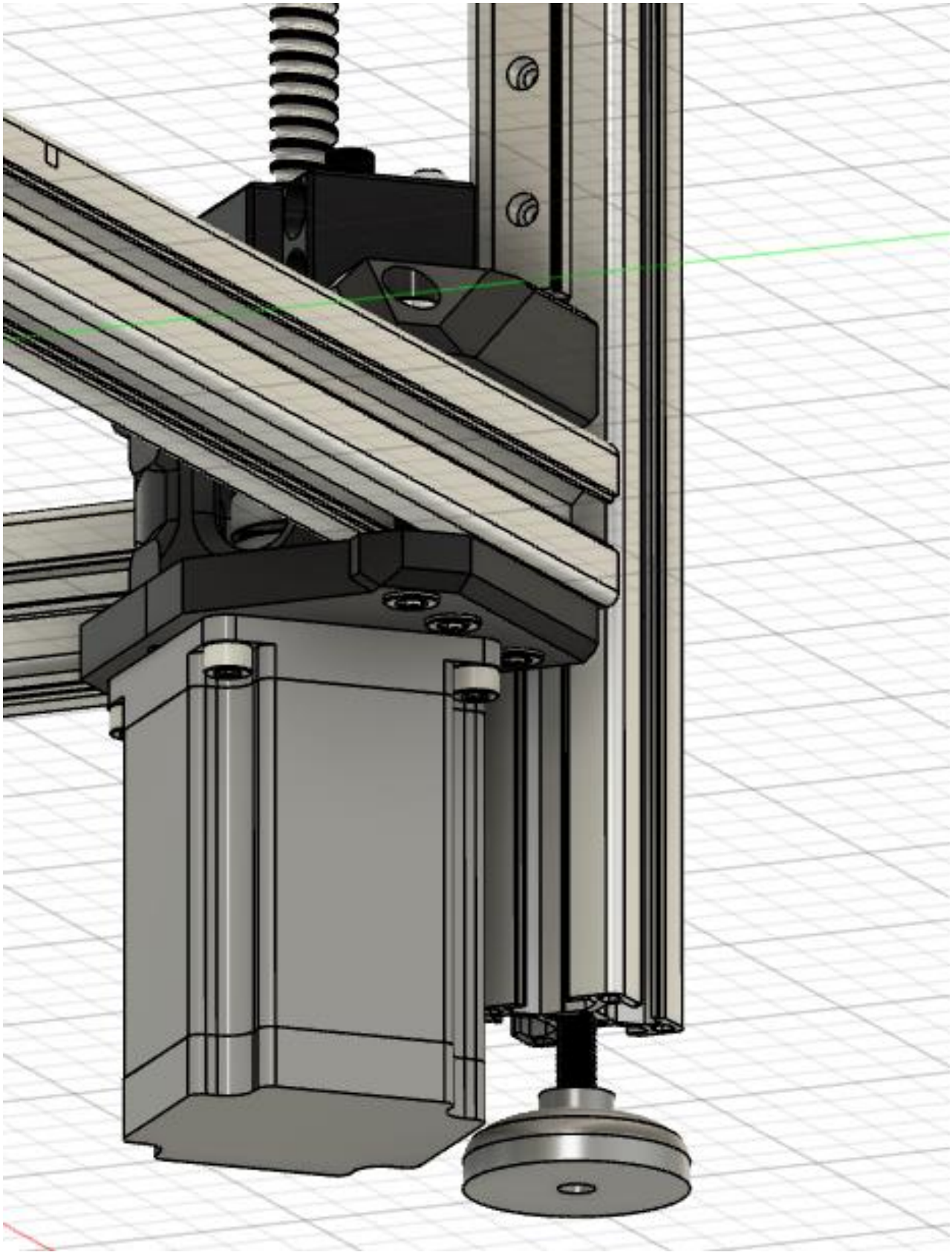


Install the coupler from bellow



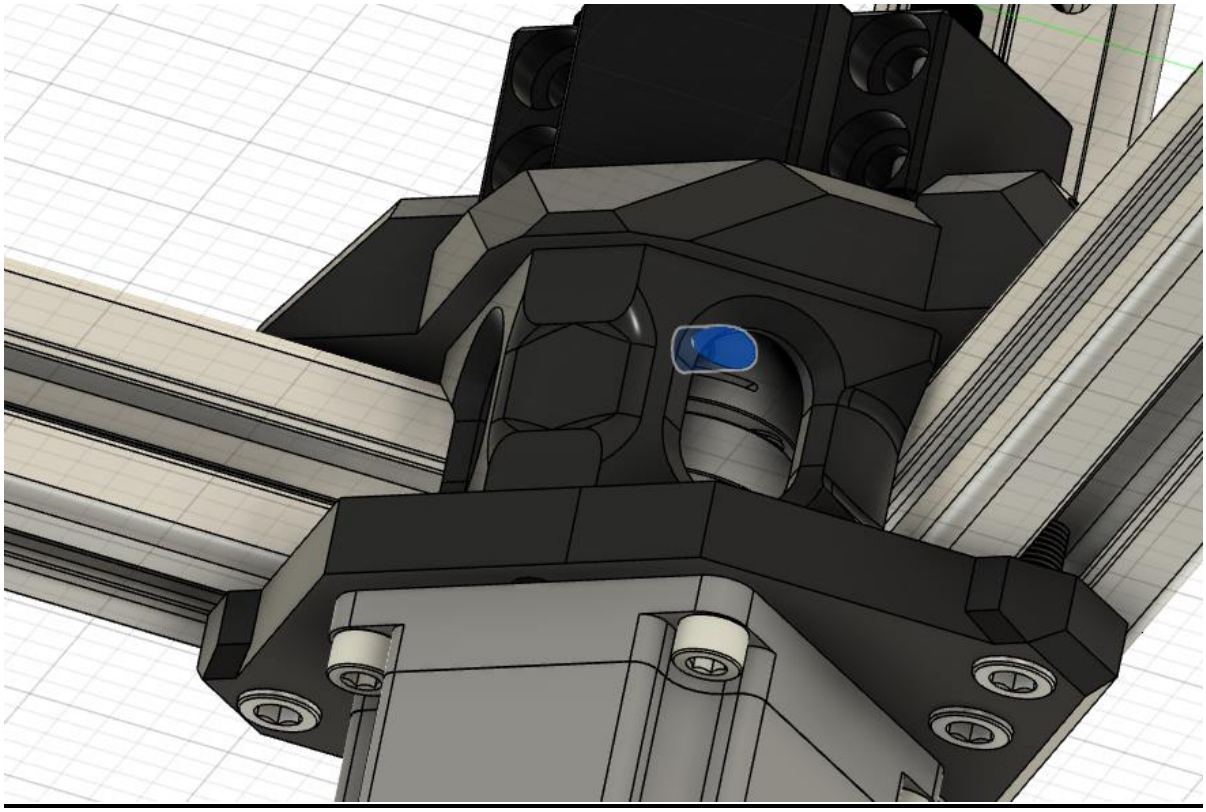


You can fix from bellow the NEMA23 (same logic for the rear pillar) with x4 M5x12 in the inserts.

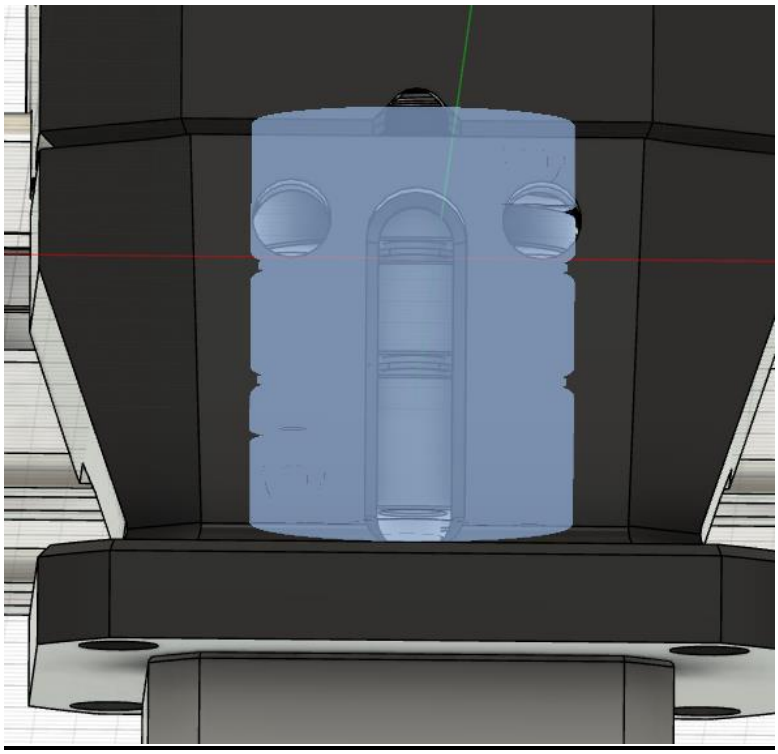


Depending the Size, an additional foot can be needed! This foot here is taped inside the 3030 M8 thread and give the opportunity to level the machine depending the flatness of your floor! It can basically same a BED MESH 😉

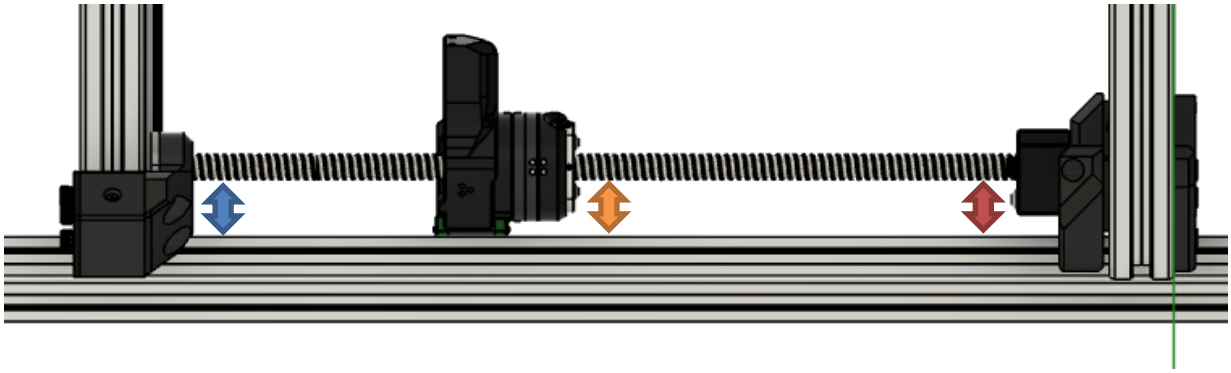
6/ Secure the Coupler

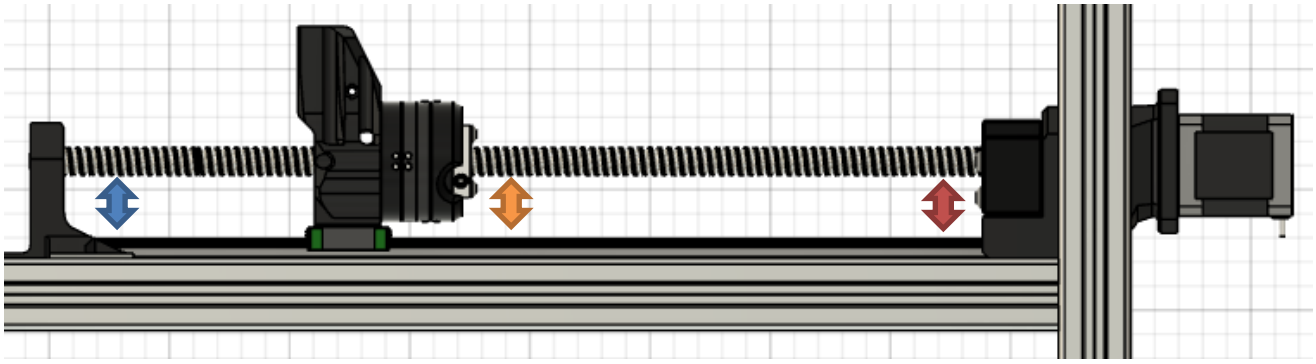


Through the Middle part openings, you can access the M3 screws to secure each axis



7/ Alignments Checks:





Check for consistent NEMA/BK10/Ball Screw/retainer alignment.

If no mounting errors have been made on the Vcore structure, or on the printing of parts, or on the insertion of m5 inserts, the alignment should be correct.

Tighten completly the 4 screws of each BK10, couplers, brackets.

You should be able to rotate the SFU spindle to see if the rotation is smooth

Control a rotation without hard points, without deviations.

Double check the screw

Install the circlip (optional)

Strictly recheck the alignment of the screw in relation to the upright of the printer, finish tightening the low supports as soon as the dimensions are satisfied

Check the rotation without hard points, without excessive deviations (there will be some).

-Clean the ball screws with a clean cloth and lubricate them with a HIWIN GS04 type grease or any other lithium based grease compatible with bearings

CAUTION, grease loaded with particles such as Graphite, ..., are to be avoided, do not use WD40 (except cleaning), dry PTFE lubricants are also to be avoided

-Close the m6 openings of the ballnuts with grub screws or M6 grease nipples

Position the nuts of the screws at the bottom, control the rise of the arms by releasing the coupling from the magnetic decoupler, control a fluid and linear movement, without hard points and without the arm rubbing the SFU1204. Repeat the alignment if this not the case.

The decoupling wings or Oldham are capable of handling up to 2.5mm circular deflection. This is more than enough for C7 grades.

Control and / or adjust the depth of the Y endstop so that the distance between the back of the toolhead does not collide with the rear bar and the top of the binding.

It is mandatory to make your own limits and measurements to integrate them into Klipper's printer.cfg. The breakage of the machine or the ball screws is a risk if this step is not carried out rigorously.

For the Z axis, it is MANDATORY to modify the line [Stepper_Z] position_max: (your value). A ball screw can literally twist the frame or crush parts due to its high torque, **THE MISTAKE WOULD BE FATAL** for the machine or your fingers.

Final checks :

1- Check screw tightness.

2- Check Alignments

3- Hard Spot Checks

4- Lubrication Checks (Rails + BS)

5- Check motor wiring, order on stepper!!!! If not done; possible system break

6- Check engine functions in Klipper with “STEPPER_BUZZ STEPPER=stepper_z”

7- Z-probe check!!! if not breakable possible

Disclaimer :

The system is designed to operate on a properly assembled Vcore. Even a slight mounting error can make it impossible to upgrade. That said the quality of the design or the prints are strictly related to the assembly made by yourself.

If the parts to be printed are made by the customer, check the dimensions at the printer output. : Bad rib will block the assembly.

The machine will lose between 35 and 45mm Z travel

The kit is installed in the simplest way without destructive modifications of the machine, the old system can be reinstalled

This kit is an optional upgrade, its assembly and/or its function and/or its quality of execution are the responsibility of the customer. BRS-Engineering relieves itself of all responsibility in case of poor sourcing (poor quality and/or bad dimensions), bad customer assembly, or bad assembly of the basic Vcore.

The kit has proven are POC and its POW in quality control at BRS-E, As is, the design works with the expected expectations

By purchasing the kit, or having it done by BRS-Engineering you accept the GTC as well as the previous disclaimer

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