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
0.1	11/09/2023	MAJ + SFU1605 specificity	FBR

Rédacteur	Responsable X	Qualité
FBR	FBR	FBR

Intro

Some picture can refer to older revisions, if nothing is stated in this manual, it's surely because it doesn't act as an issue to make the full assembly accordingly, if something seems wrong regarding to your order, CAD or else, don't hesitate to contact me

For this Assembly, the best preparation is to dedicate a moment to it ; don't rush it, and try to have a bit of time in front of you to be the most efficient, it will save you headaches 😊

I Pre-check

BEARINGS

	
Low grade bearing	Hi grade bearing

It is a good idea to check bearings health before assembly, it can solve issue before spending time on a painfull full check especially the 625 which olds the Shaft.

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

-Chose quality bearings, Like ABEC 5-7 spec

-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

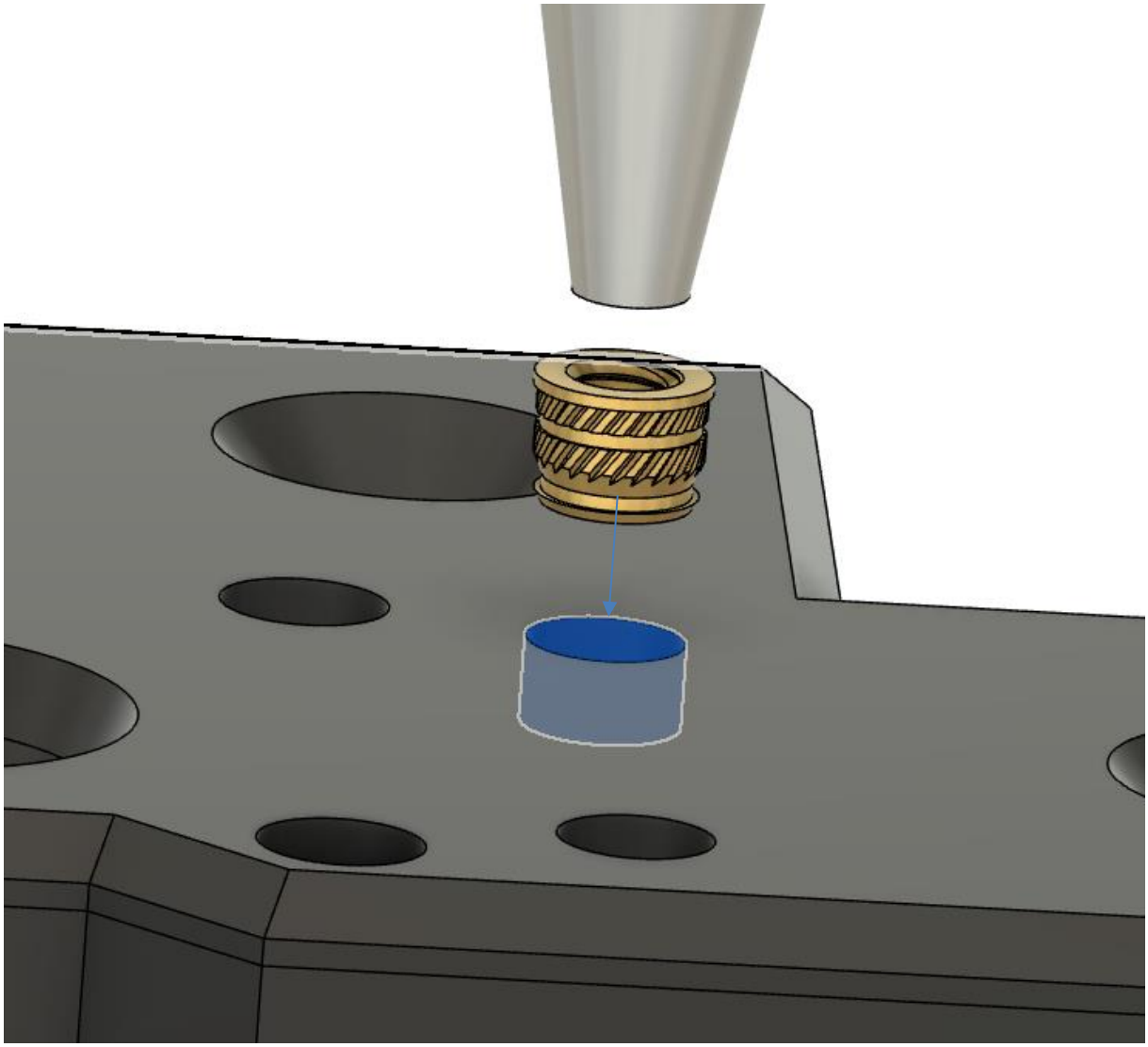
I always advised to use quality genuine Gates belts in order to have less issues in the future, be sure to have the good length (at least 15mm more on each side)

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 😉

II Part preparation (SFU1204/1605)

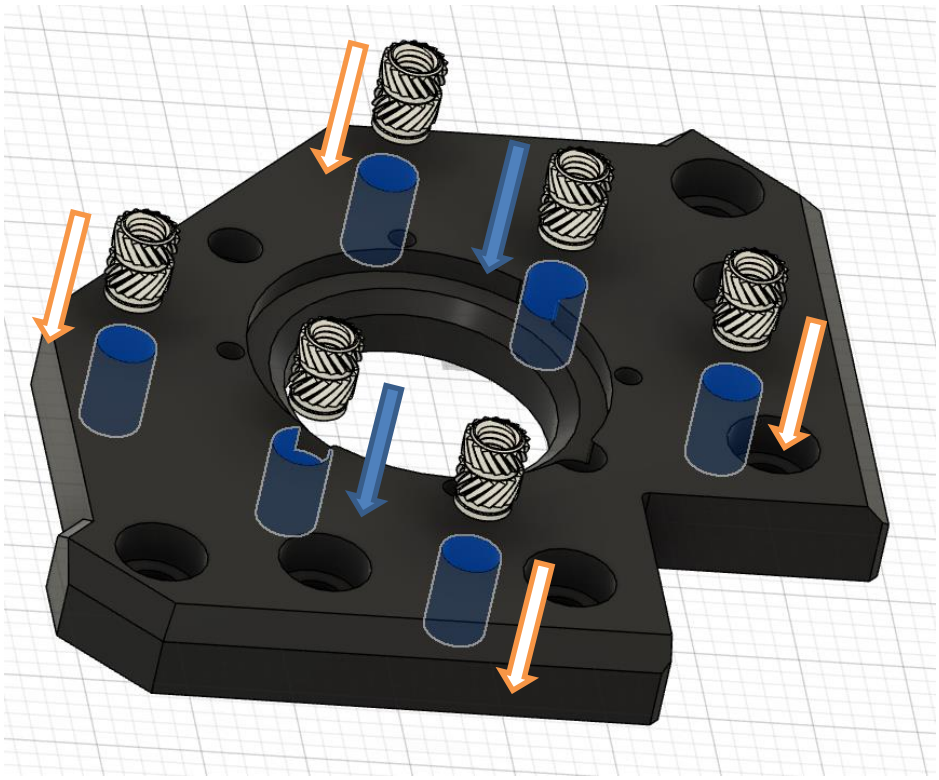
1/ HEAT INSERTS

Insert m4 Inserts in the required places with a soldering iron



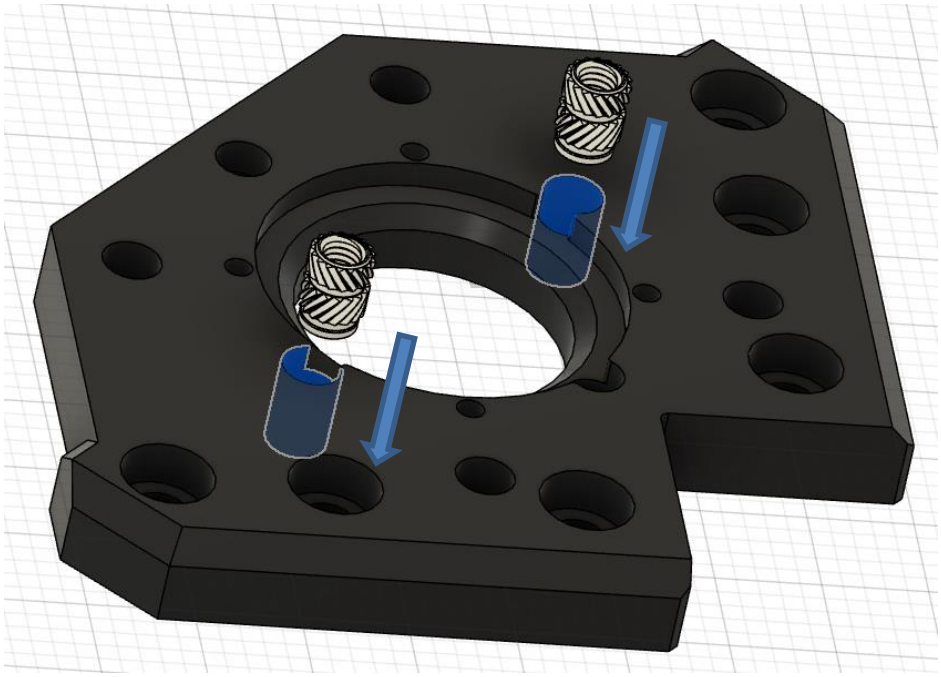
Exemple

A/ LOWER PLATES



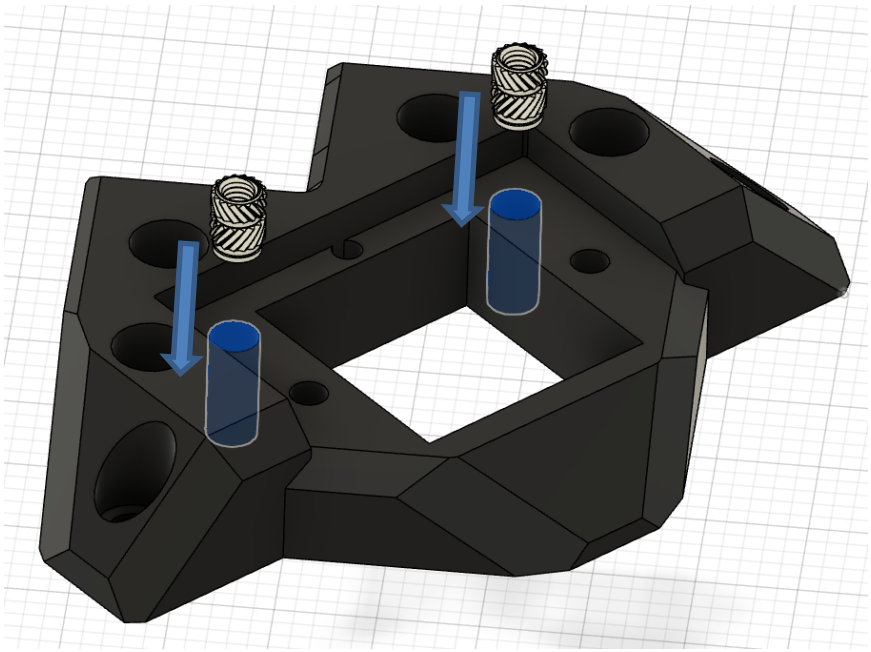
If you plan to use NEMA23, you will need to insert with M5 units the 6x holes like the previous figure

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



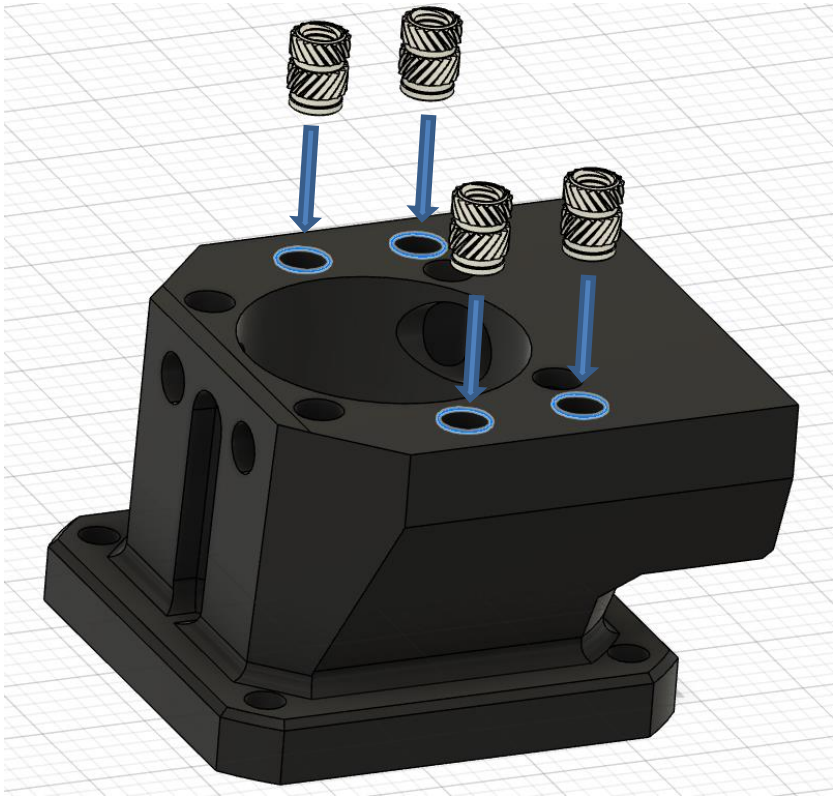
B/ UPPER PLATES

Insert 2x M5 insert here

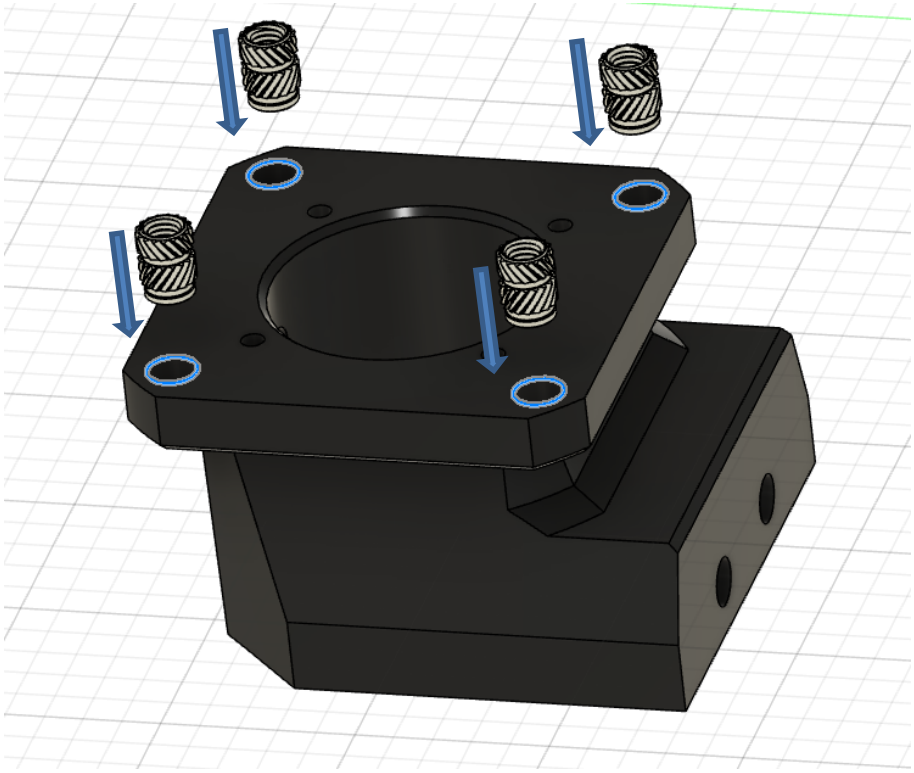


C/ REAR BLOCK

4x M5 Inserts here

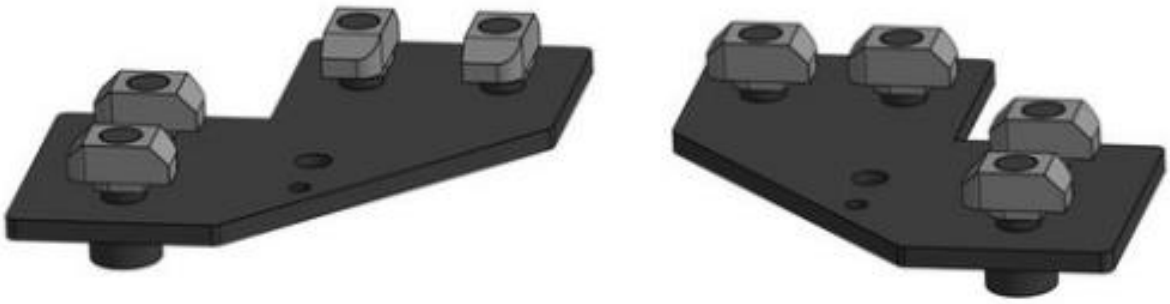


If plan is to use NEMA23, place 4 M5 inserts here



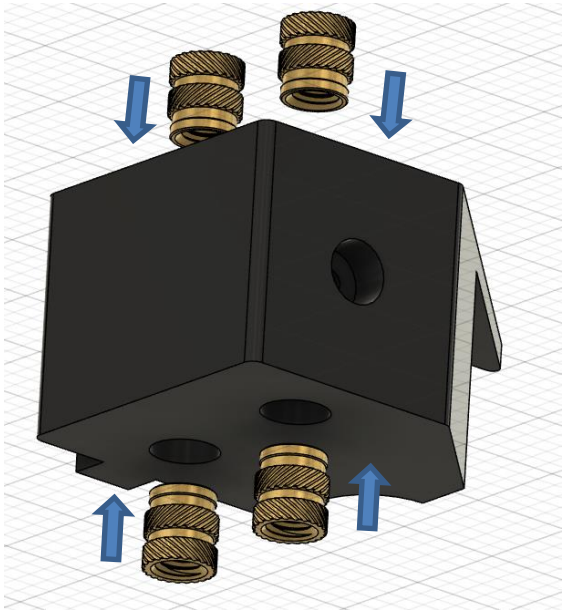
D/ OPEN FRONT IDLERS 2.0

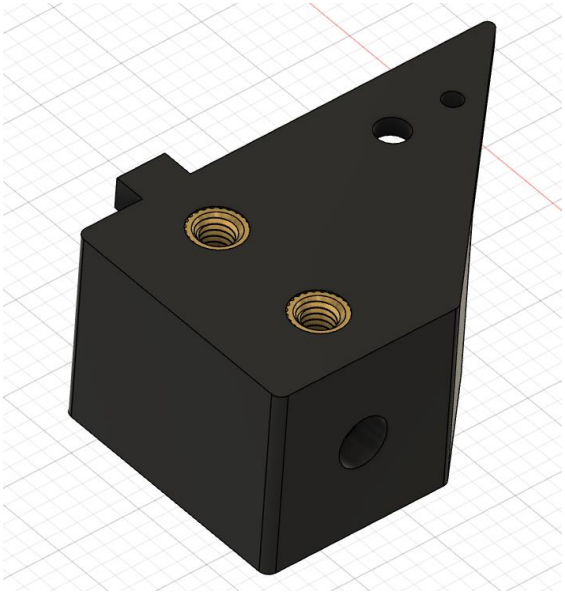
I/If you have those plates



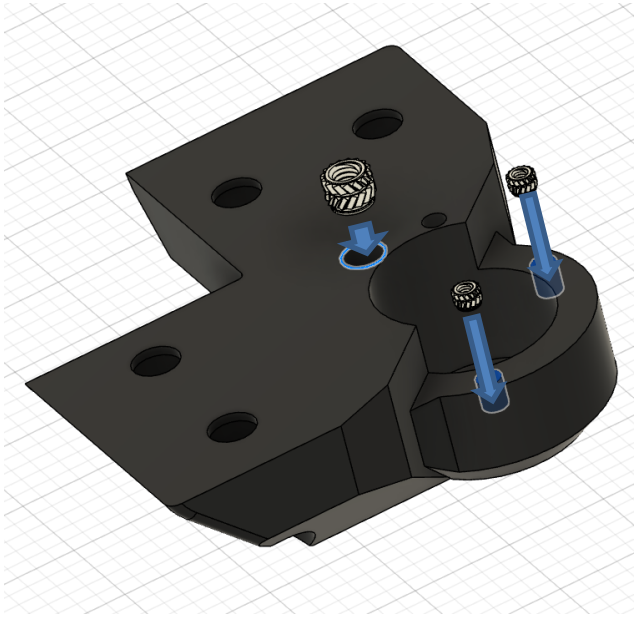
You will need to use this Open front idler blocks

Use 4 M6 insert here





The on the SFU relainers:

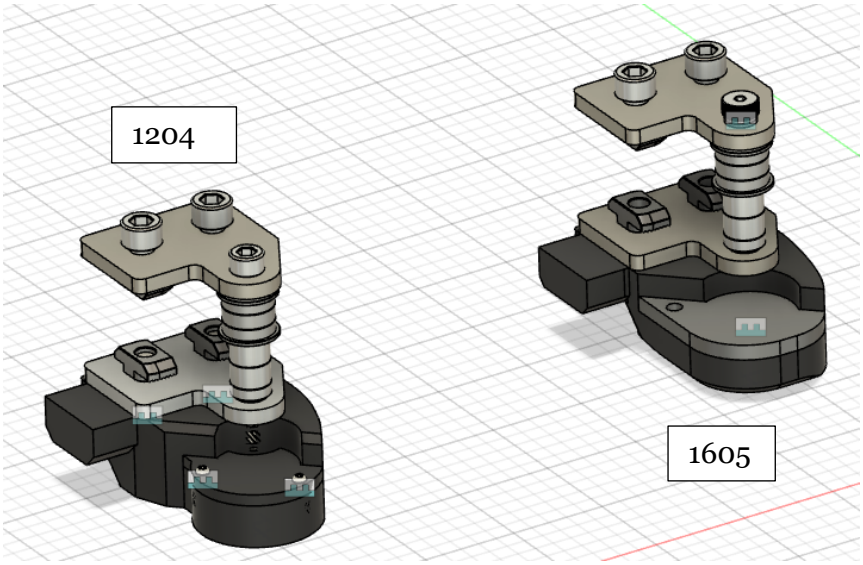


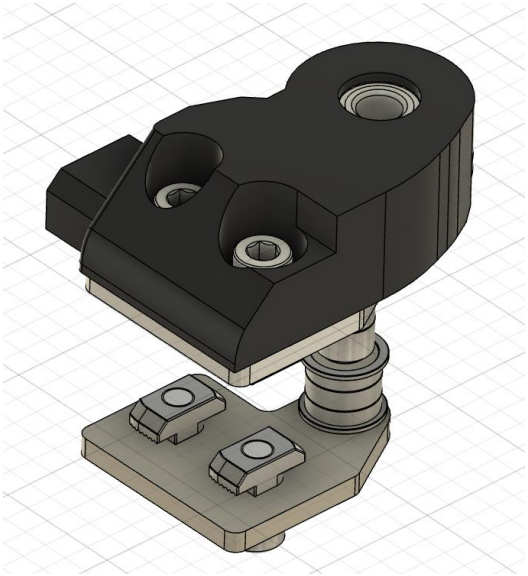
Insert 2x m2 and 1x m4 inserts here

!!! Do not insert 608ZZ Bearings now!!! (1204 iteration)

II/If you have those plates

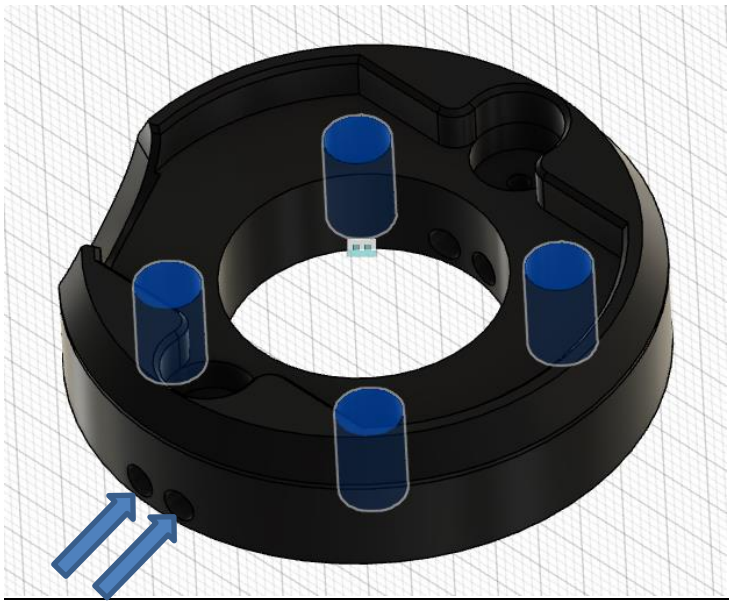
You will need to use thos module (1204 ballscrew has a specific block, an so the 1605):



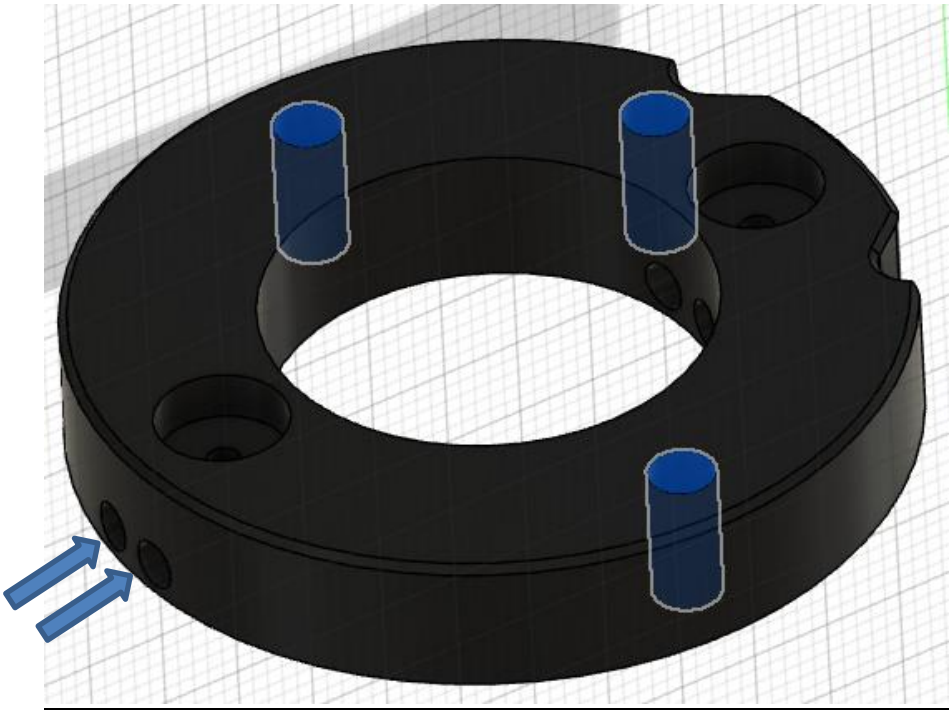


E/ OLDHAM-2.3 for SFU1205

Install all inserts and all the dowel pins



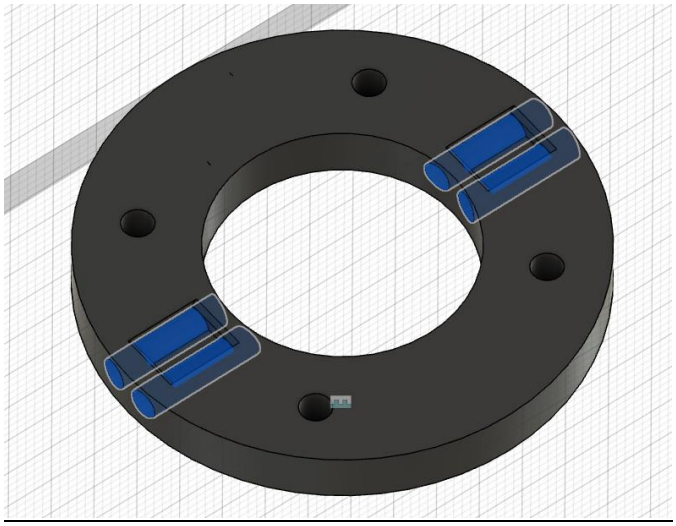
M4 inserts here on the lower ring



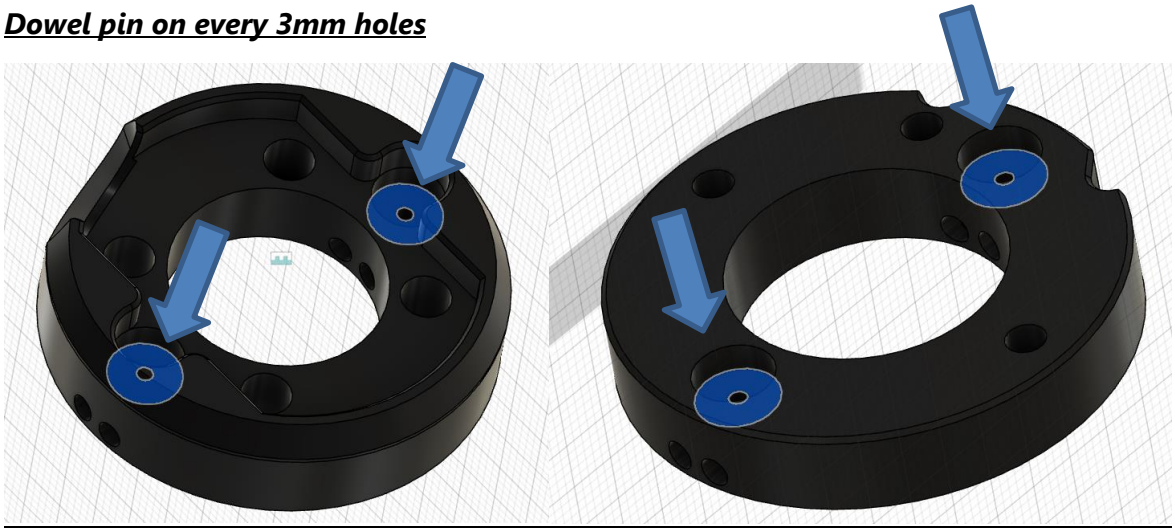
M3 inserts here

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.

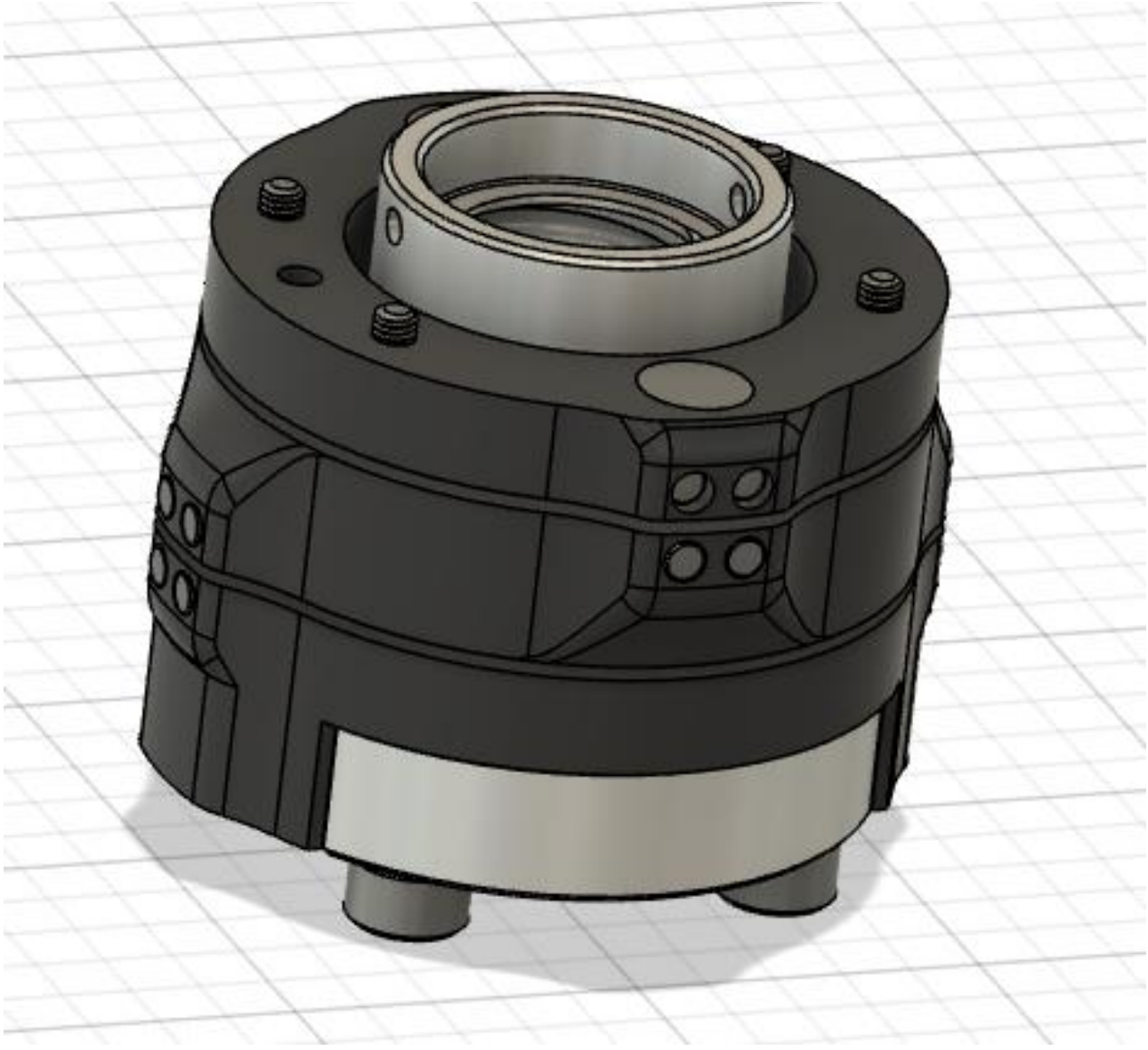
You can assemble the 2 middle parts / SINCE LAST REVISION THE CENTRAL RING IS UNIFIED

EPAHT can handle 25Kg on ech disc without issue

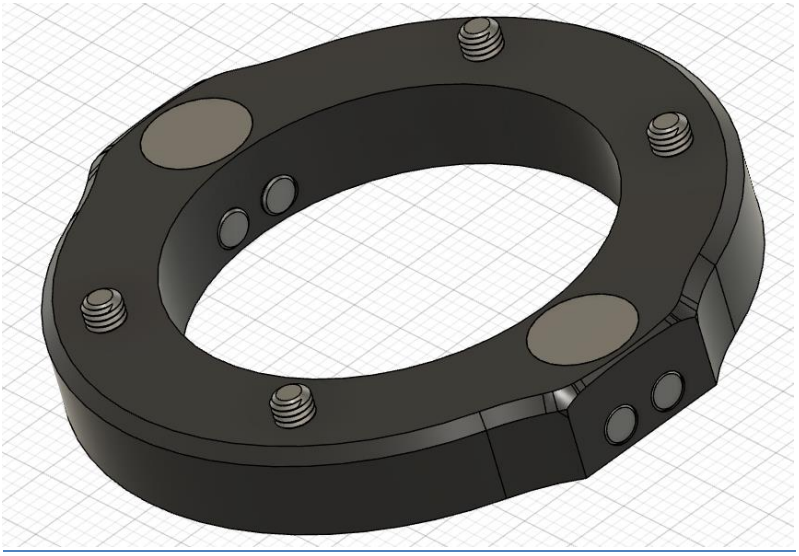
Other materials can see this number bellow, but we need less than a 2Kg resistance in a VC300. This design is made to last or be used in a very heavy solution, like 8-10-12mm bed for custom size VC 800+

F/ OLDHAM-2.3 for SFU1605

As the 1605 are way bigger than the 1204, a change is needed:



1 Top Ring:



Here only 2x 8x3mm magnets are needed plus the 4x m3x5mm

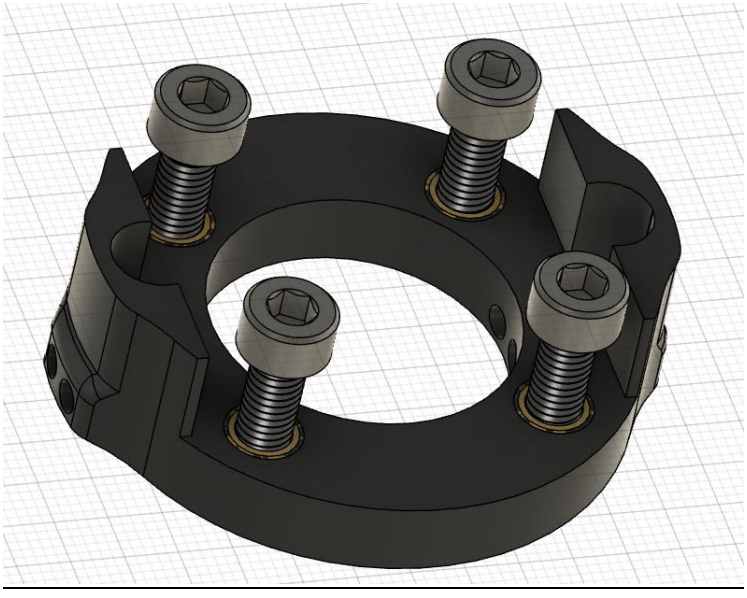
Install the 3x10mm dowel pins

2 Bottom ring:

Here only 2x 8x3mm magnets are needed. You need to install 4x m5 short inserts

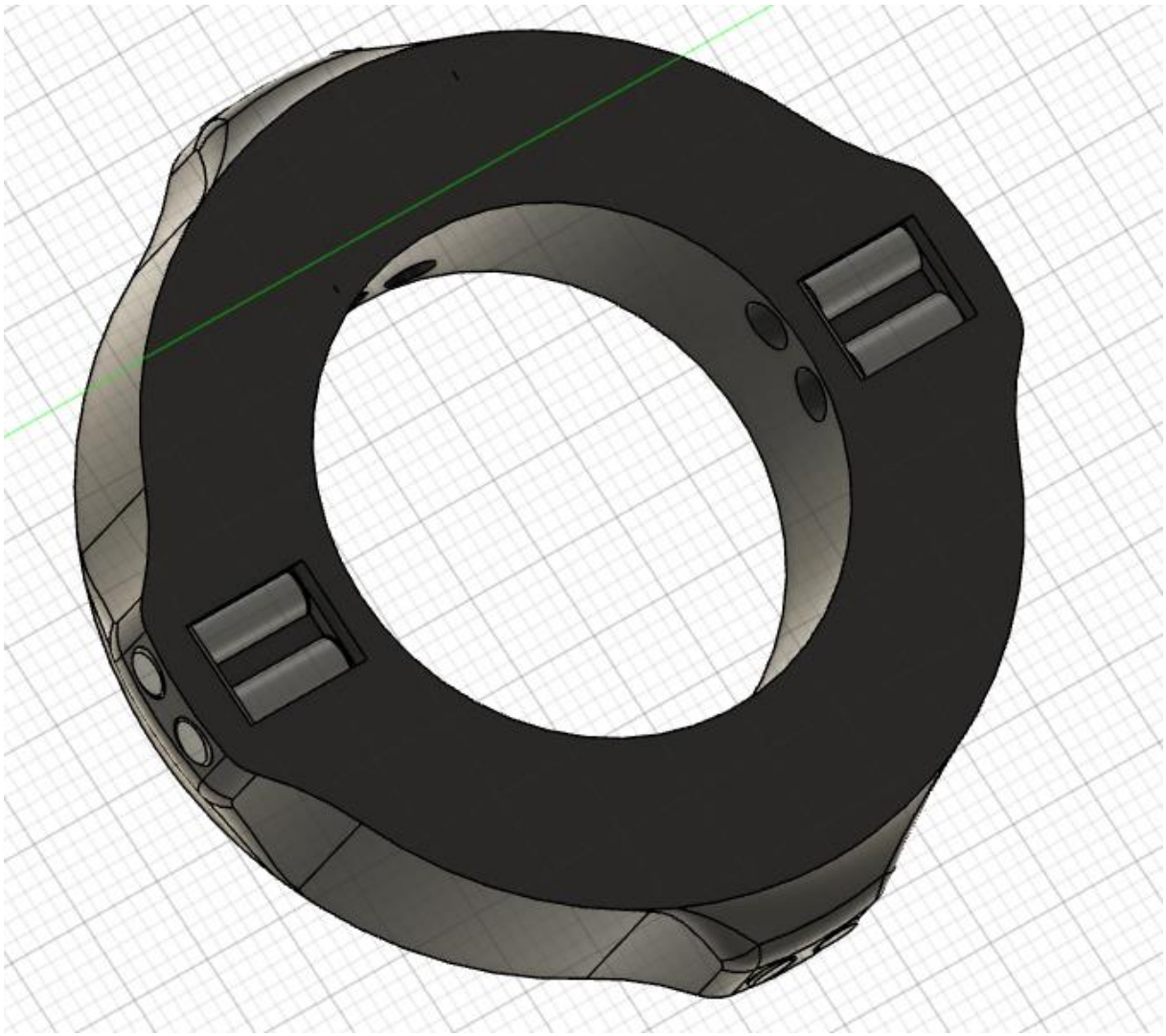
The M5x16mm displayed here are for the bigger nut holes

Install the 3x10mm dowel pins as well



3 Middle ring:

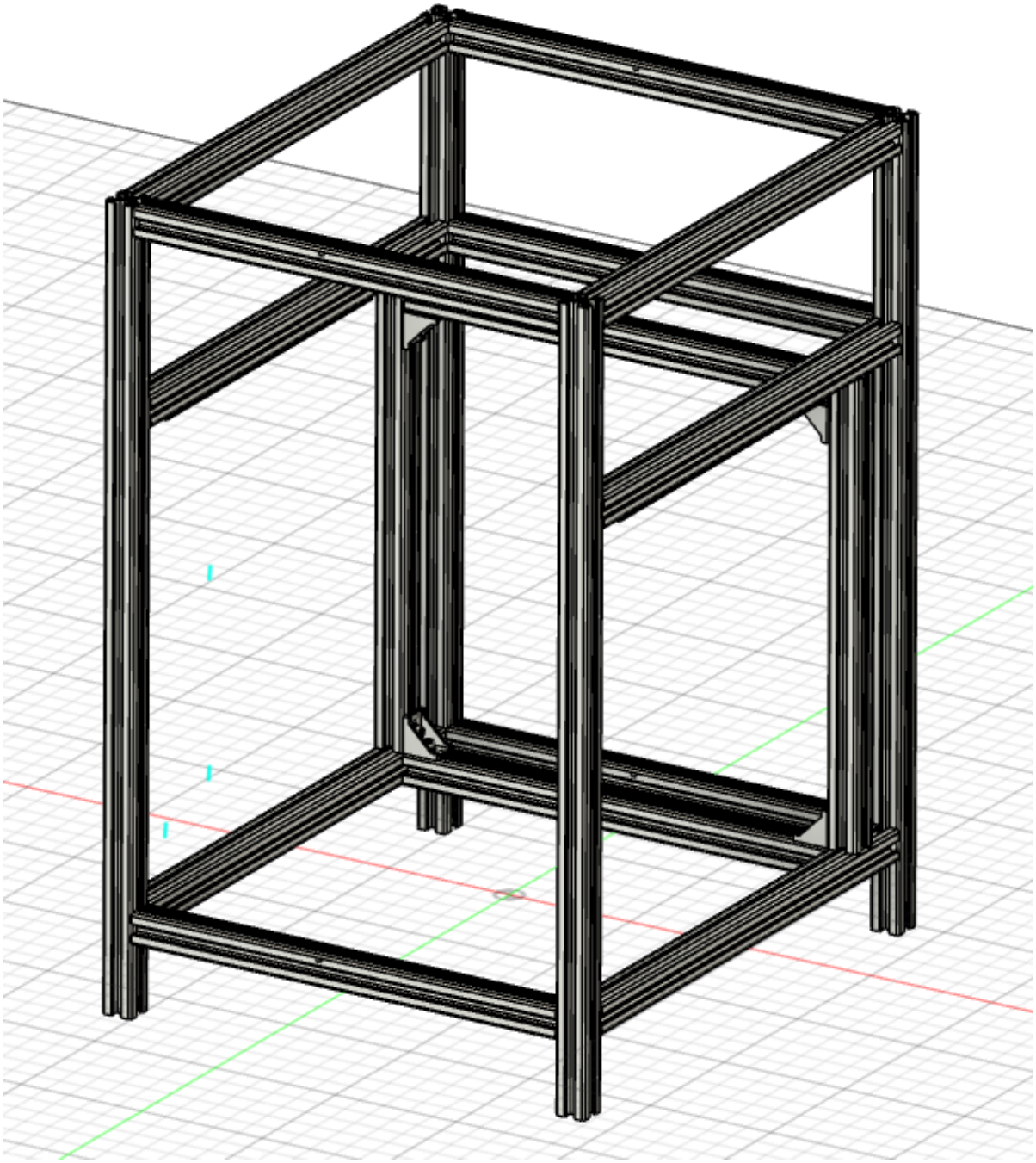
Here only dowel pins are needed



III Motor Blocks Assembly : 1605 and 1204

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

This section here concern the 1204 and the 1605 version, parts are slightly different but assembly is almost the same.



-The frame here got feet to accommodate the motor Block,. The CAD of this frame is available on my GIT if you want to deep look into it as the 3D printed Feet, you can buy theaded feets too.

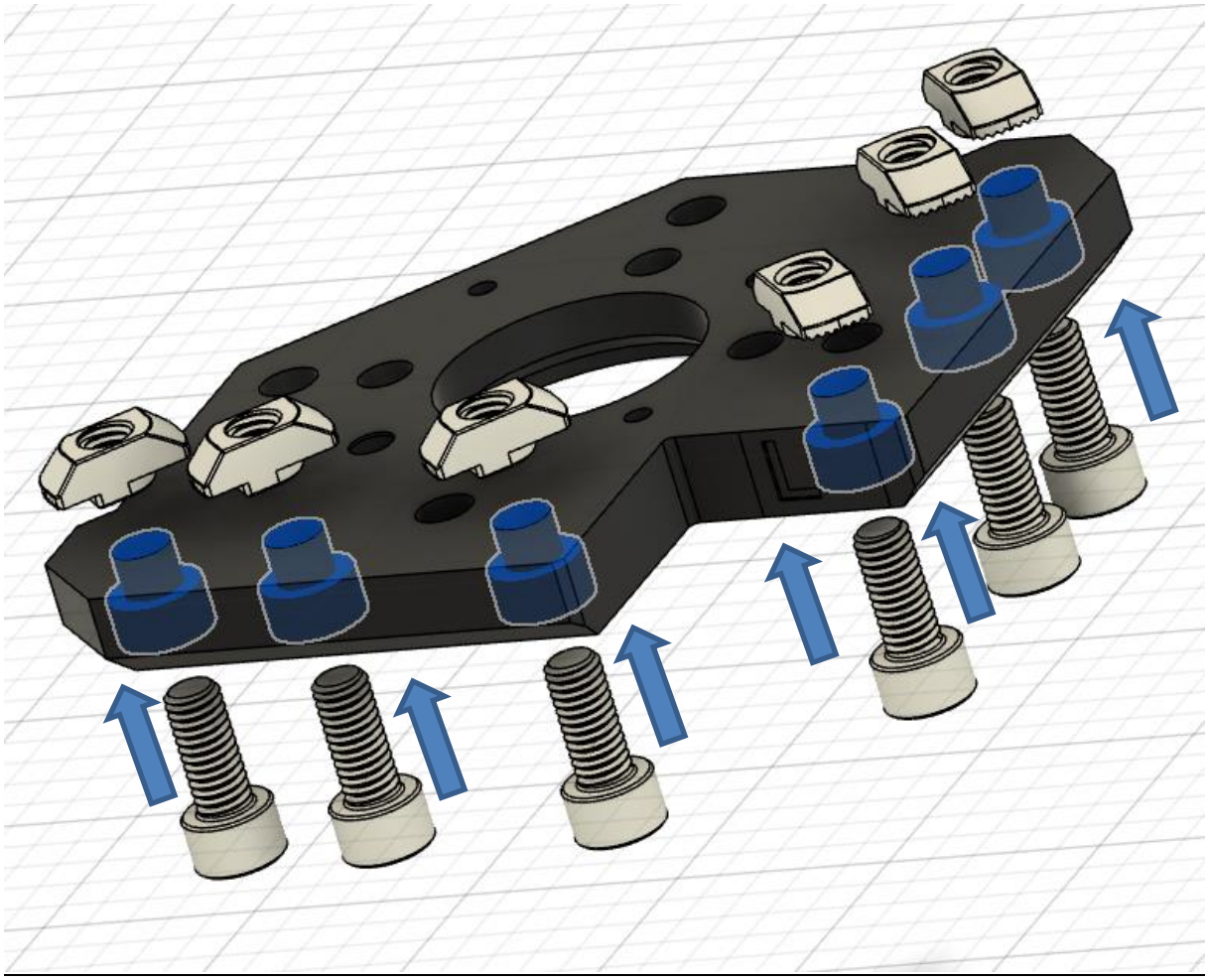
-If you want to use the RR 2.0 Enclosure kit, Use the according front arms

-The Z-Upgrade 2.0 use the Open Frame front idler 2.0 design with a new plate. For those who already have the Open front 2.0, work is already done. For the owners of a VC3.1 with the extended 2.0 frame enclosure, a modified Y bumper is available to retain the top of the ballscrews

A/ FRONT

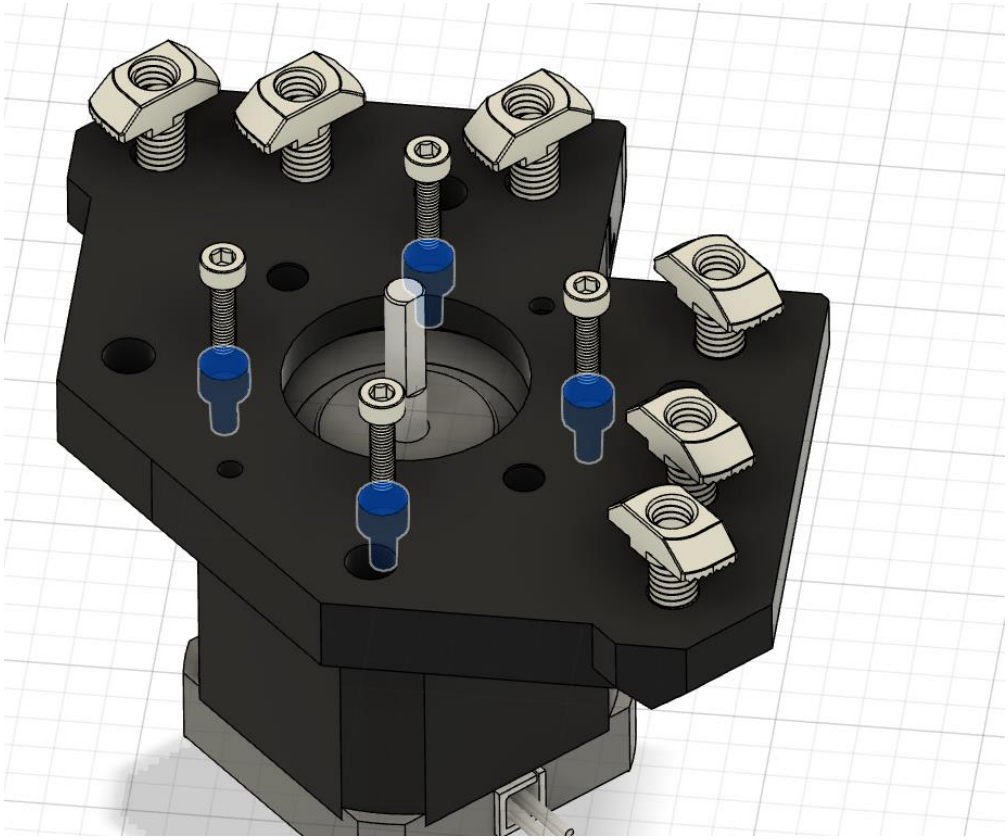
1a/ Lower plate SFU1204

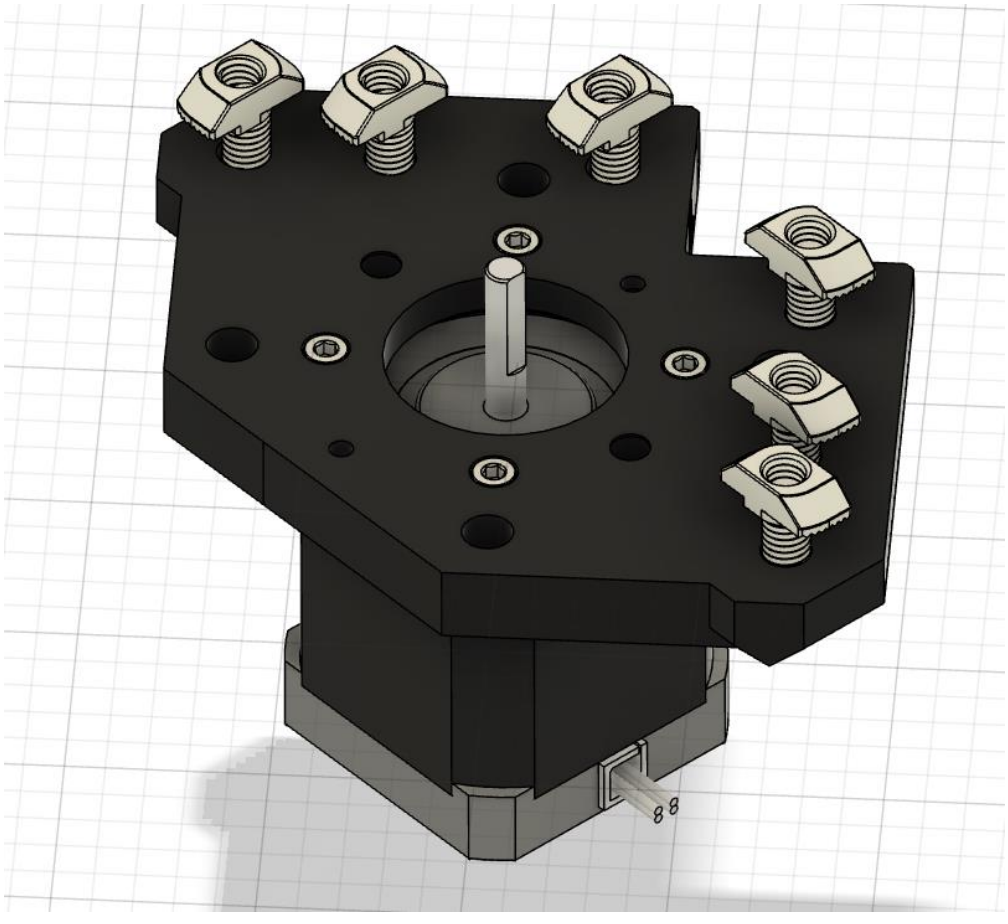
Install a M6 screw with a T nut for each 6x hols on both R and L underplate



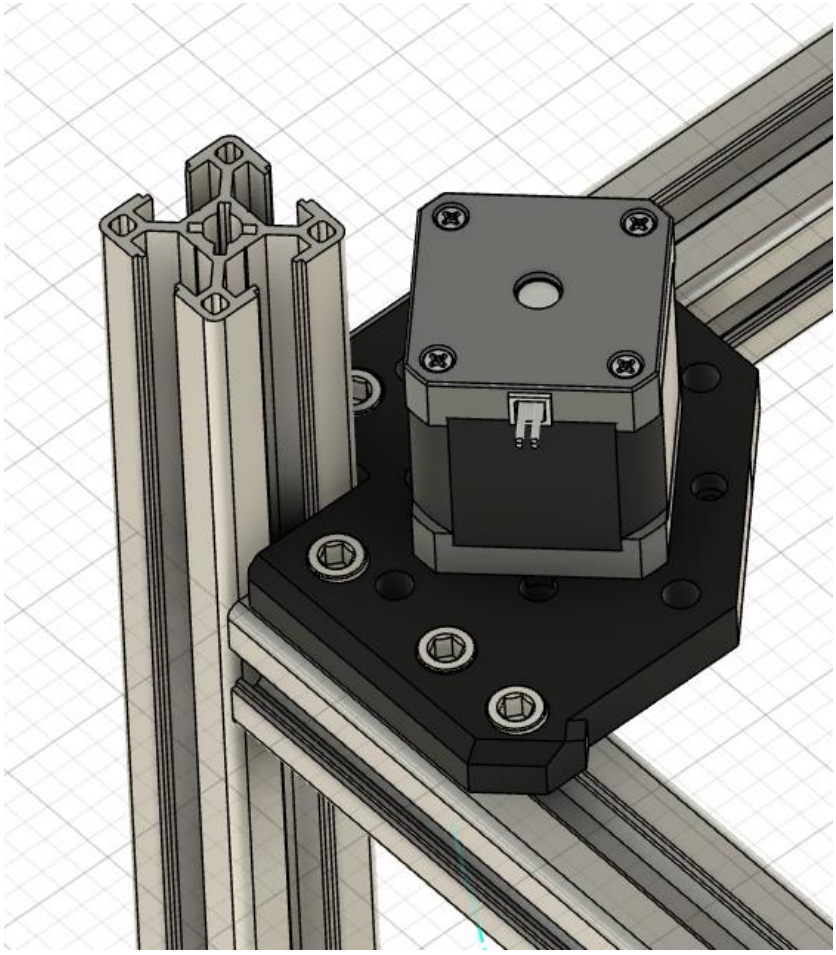
If you plan to use NEMA17, Install it now with the according M3x12 screws

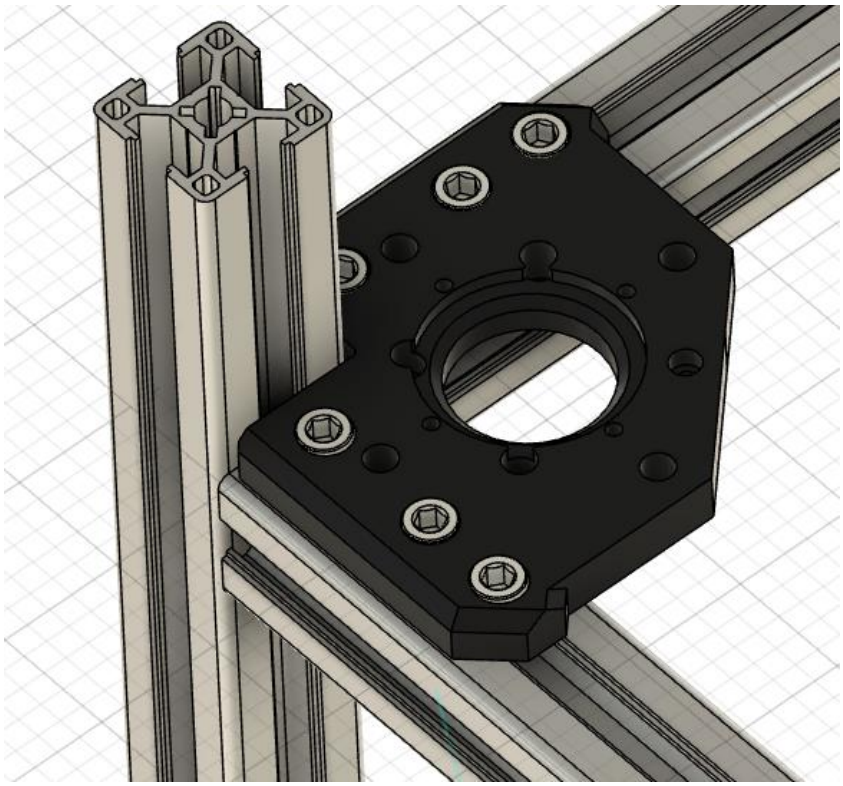
For NEMA23, we will install them a bit later





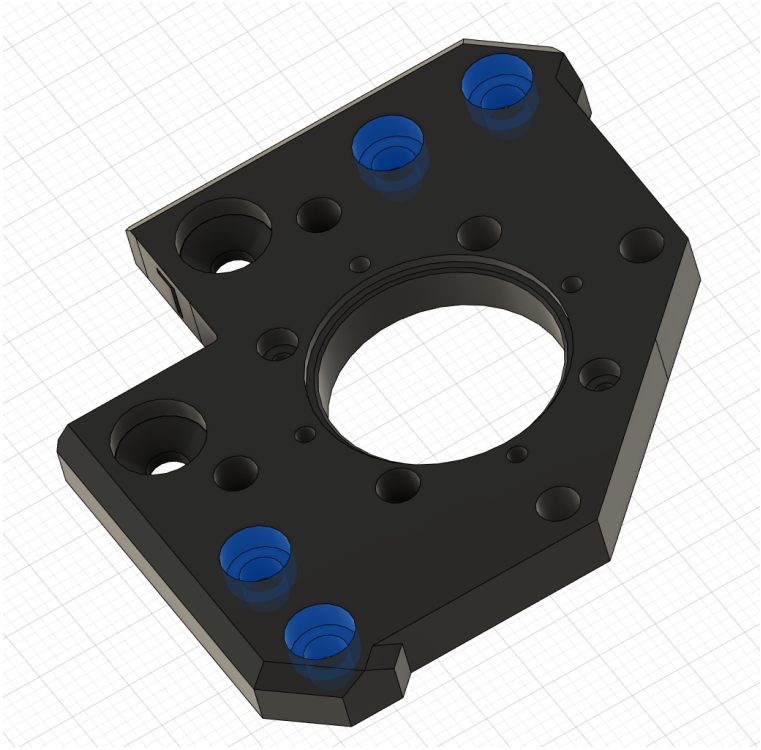
Then install the bottom unit to the front lower section



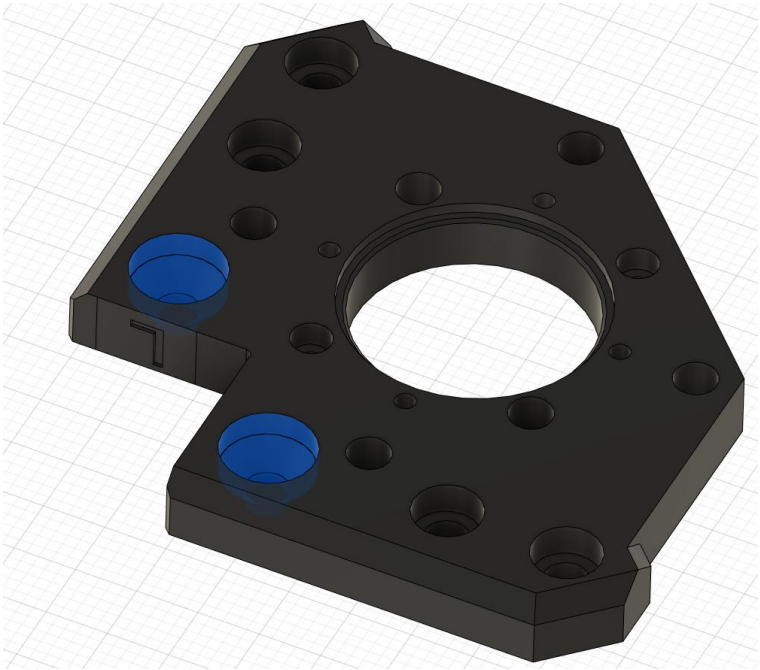


For NEMA23 you have the second figure

1a/ Lower plate SFU1605



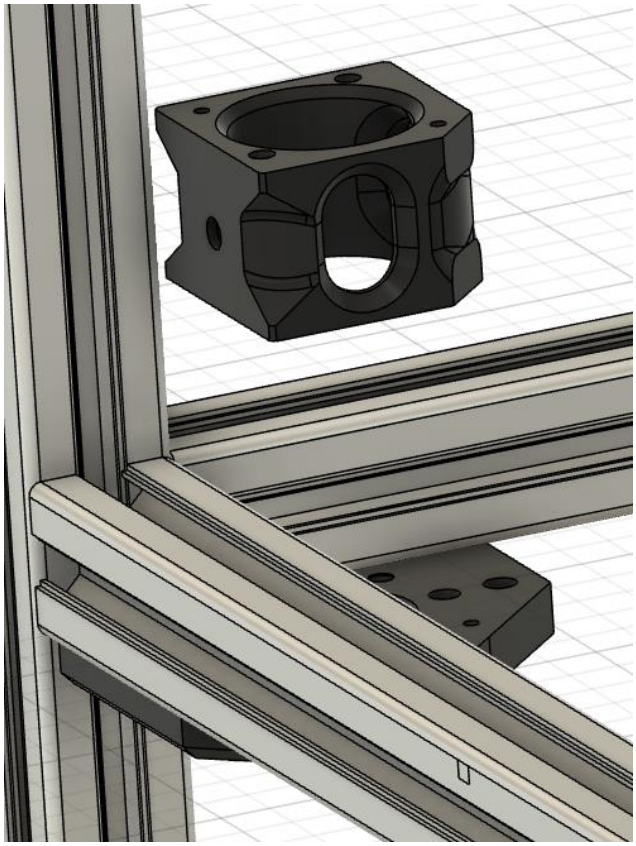
The 1605 lower plate is almost the same, only 4x M6 are needed

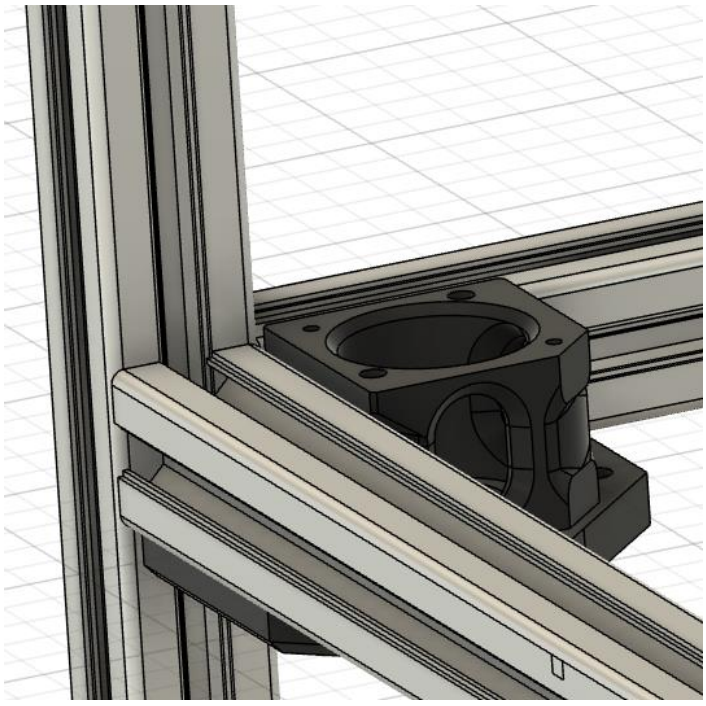


The 2 countersunks holes here are not meant to be used here (belong to another project and I kept the model for ease of productions)

2/ Middle Spacers

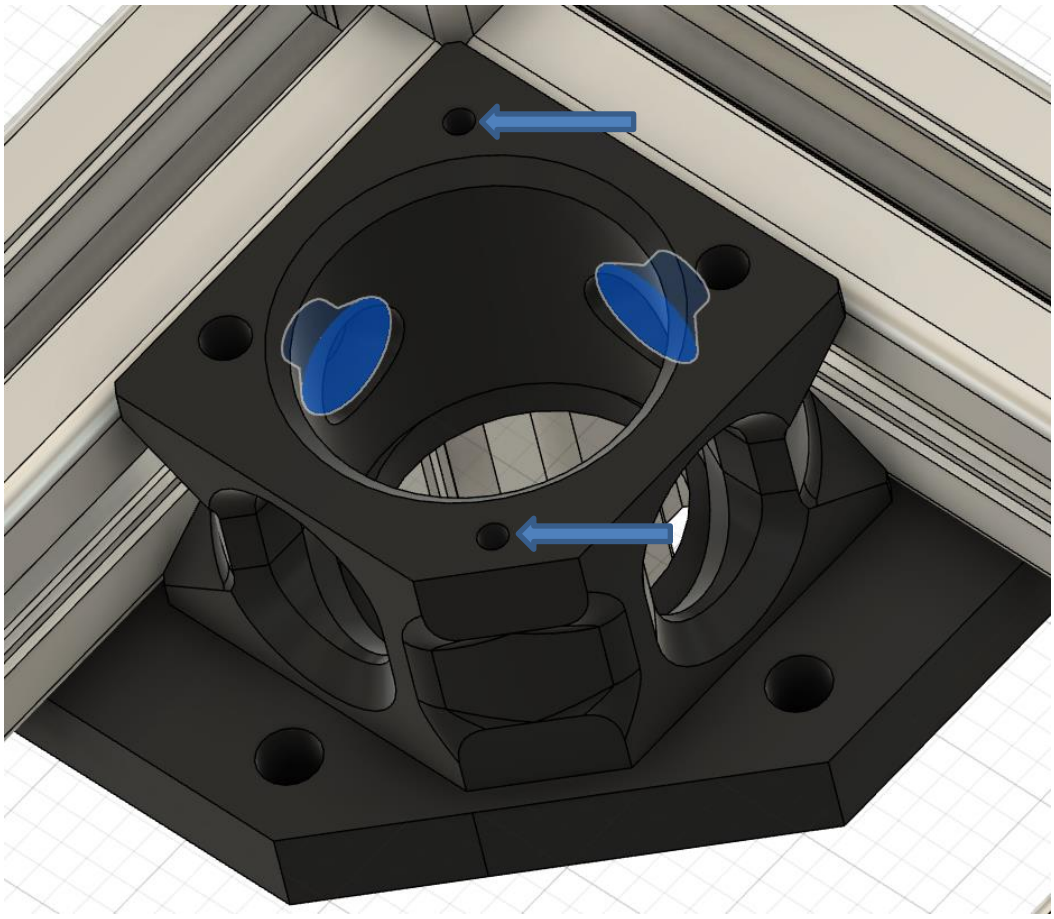
The middle spacer are used to fill the gap in the Block mechanism. It is here to accommodate the height id you are, or not using a bottom plate to close the machine. By default, the 3mm is used, you are free to modify this part by removing 3mm of it, to flush with a system without plate, or increase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

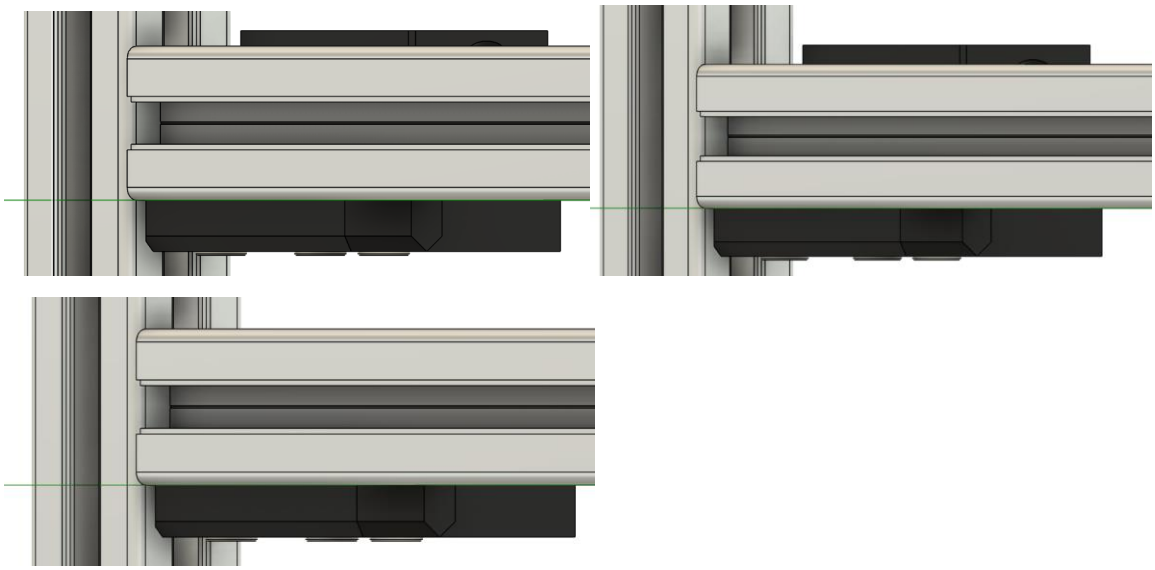




You can fix this part with a countersunk M6x12 and a Tnut here but that is not mandatory (still from another project)

The 3mm holes were from another revision, not needed here tu put any screw in it





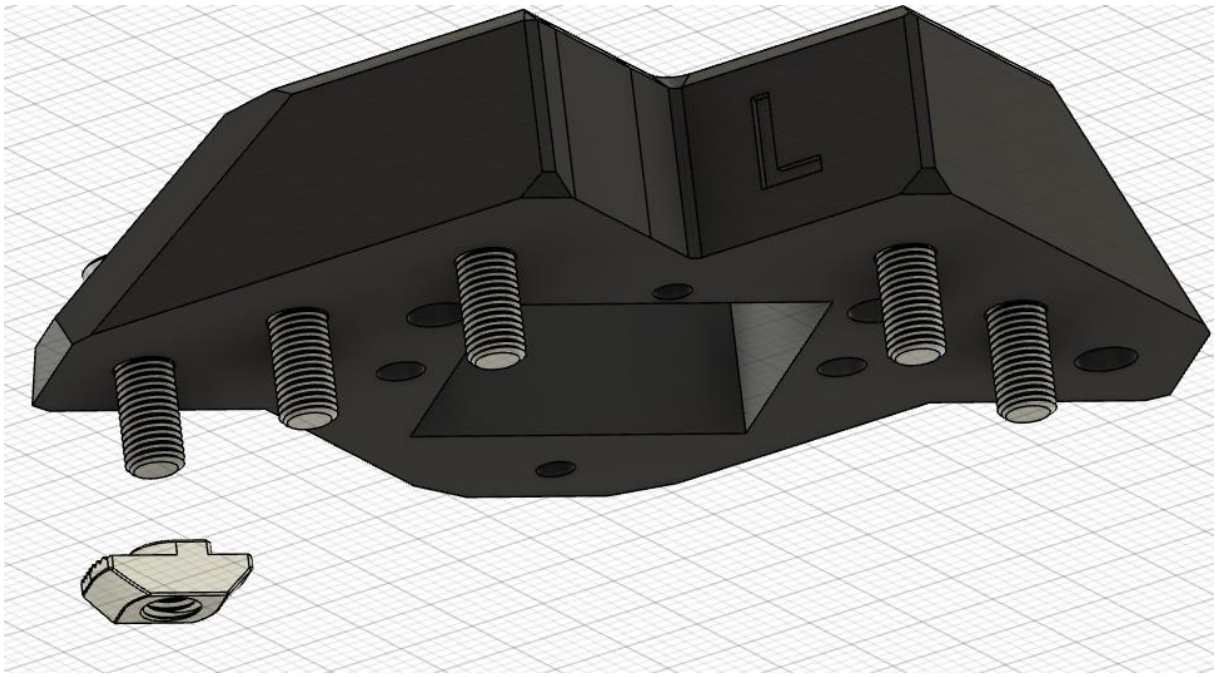
+3mm, +4mm,+0mm

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.

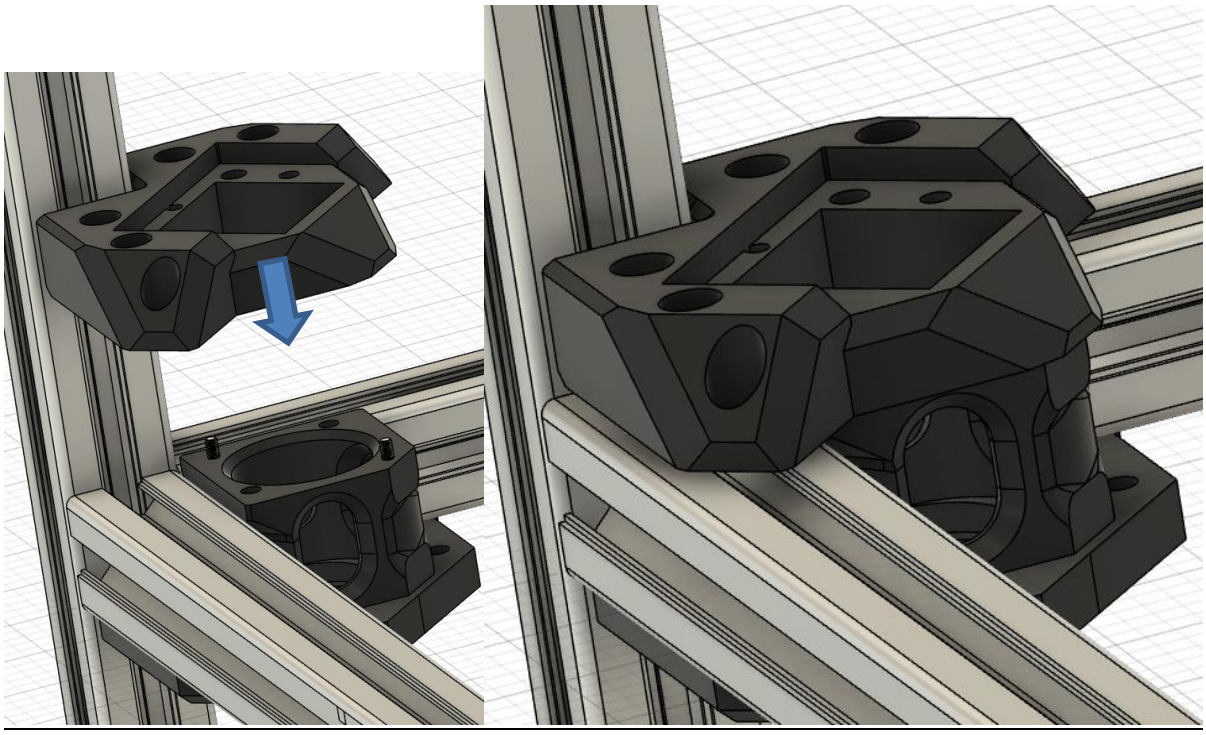
3/ TOP Plates (1205/1605)

Here what you should have to the top

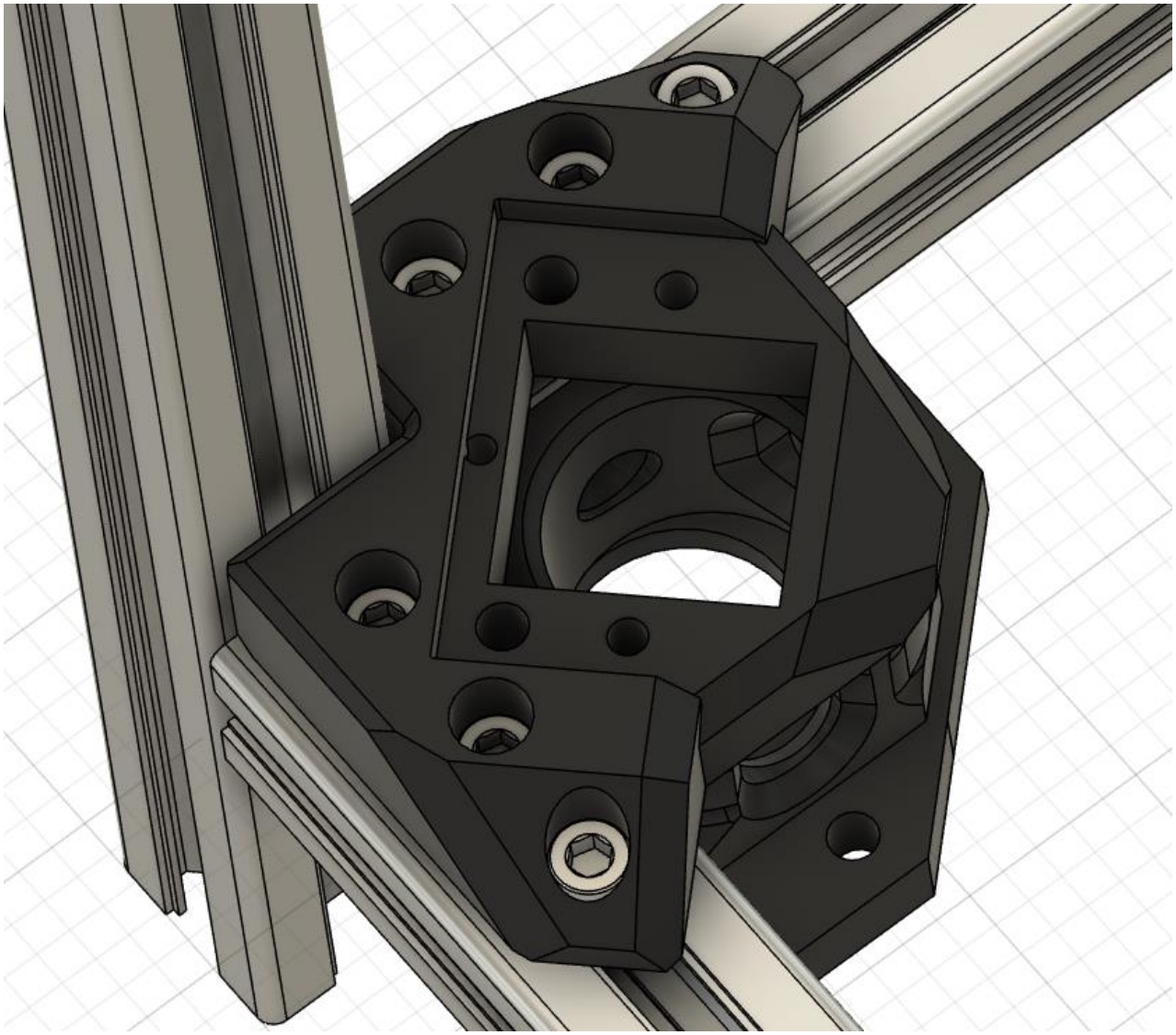
(In the NEMA 17 assembly, a hole is blocked, just ignore this screw)



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

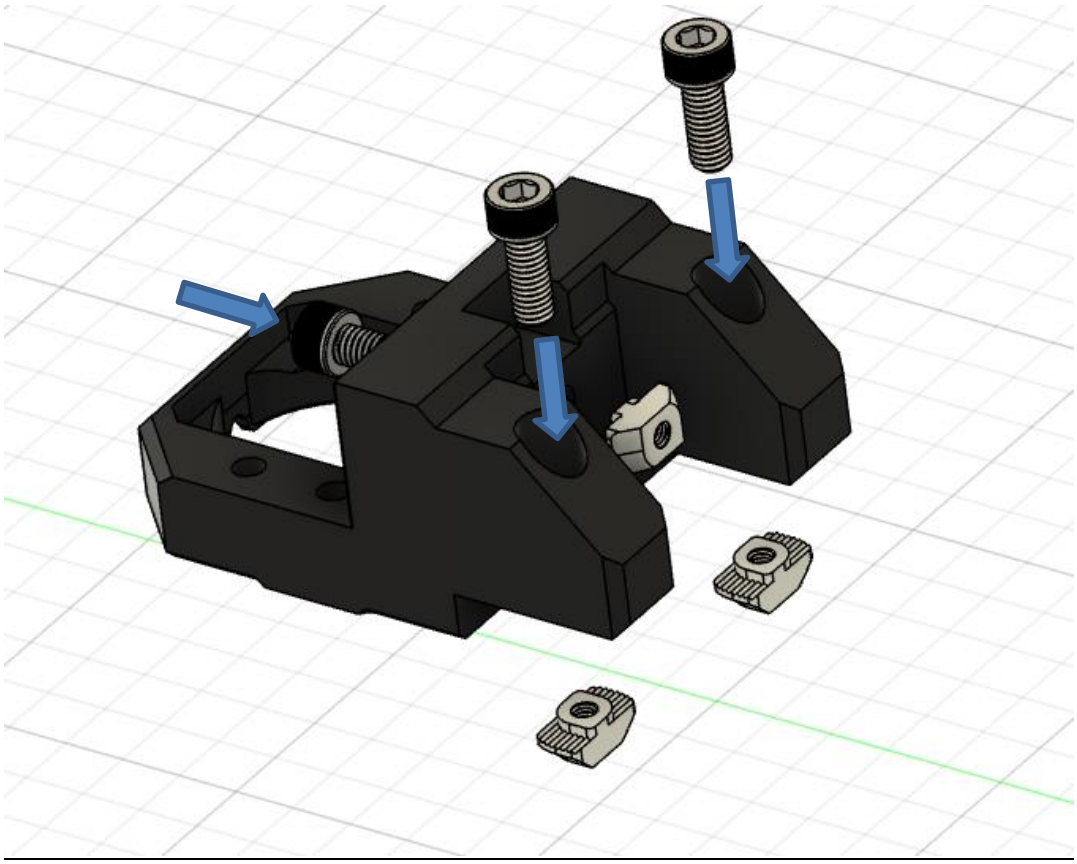
FOR NEMA17:

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

FOR NEMA23:

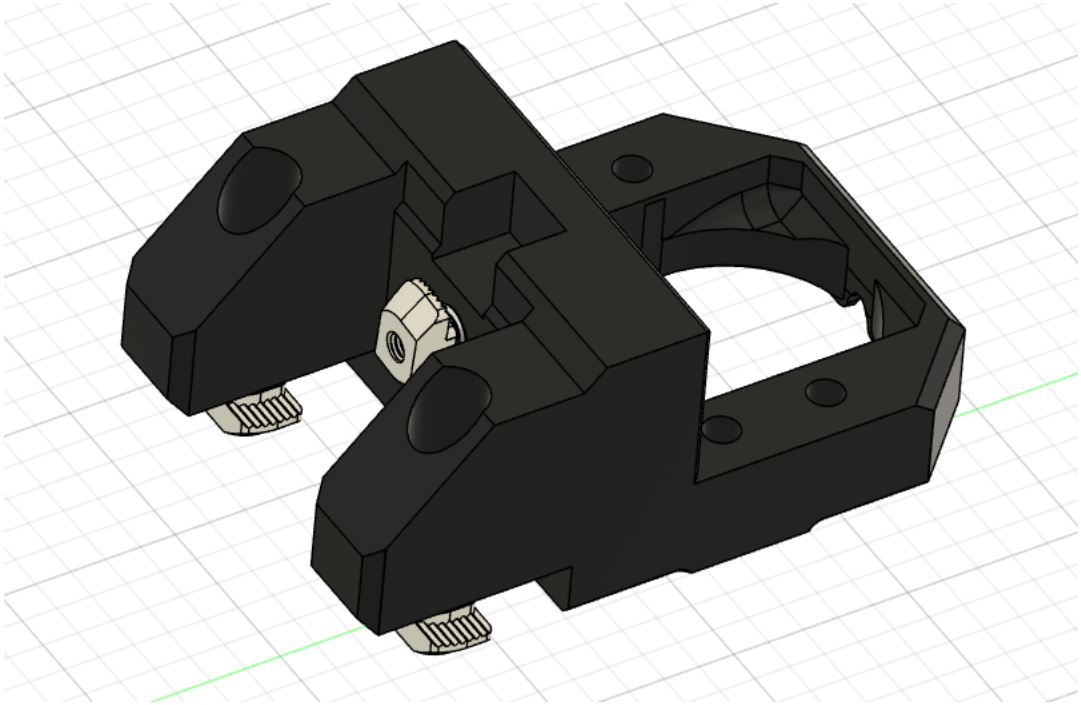
We will slide the coupler on the shaft of the NEMA from bellow at the end and secure it

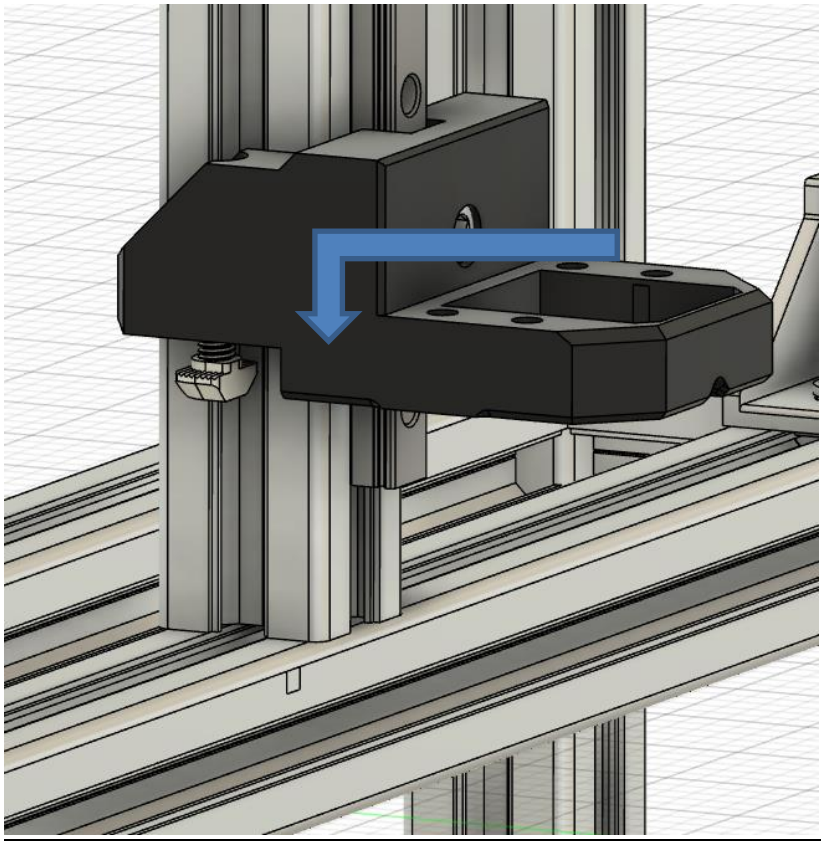
4/ REAR BLOCK (1205/1605)



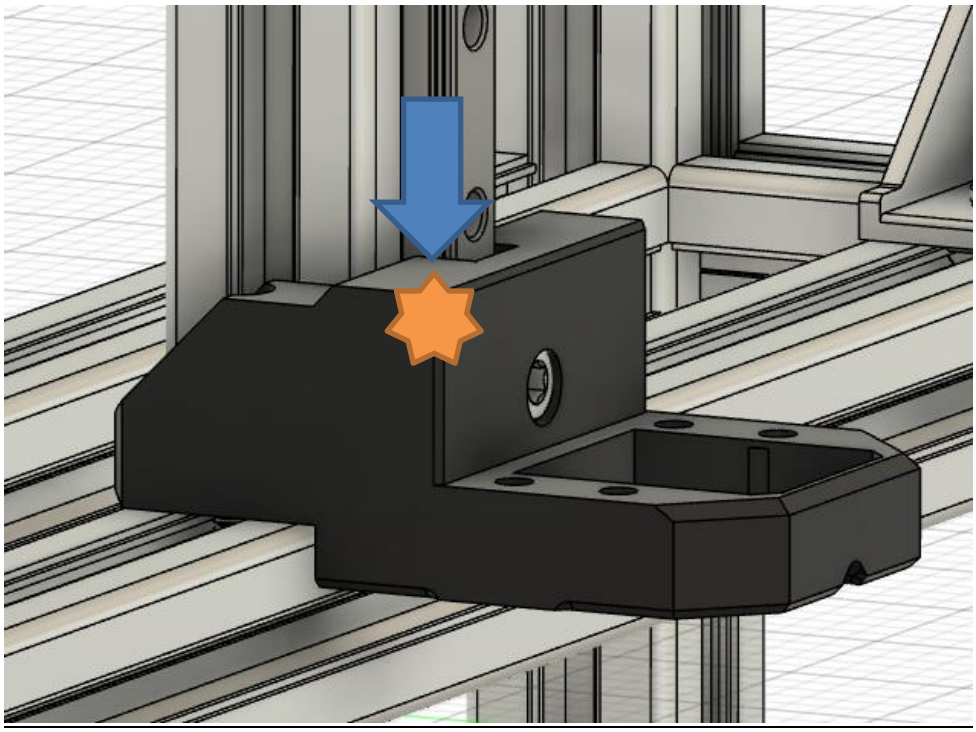
Install M6x14 screw with M6 Hammer T-Nuts

Note than some of you can get a slight different shape, with 2 laterals holes

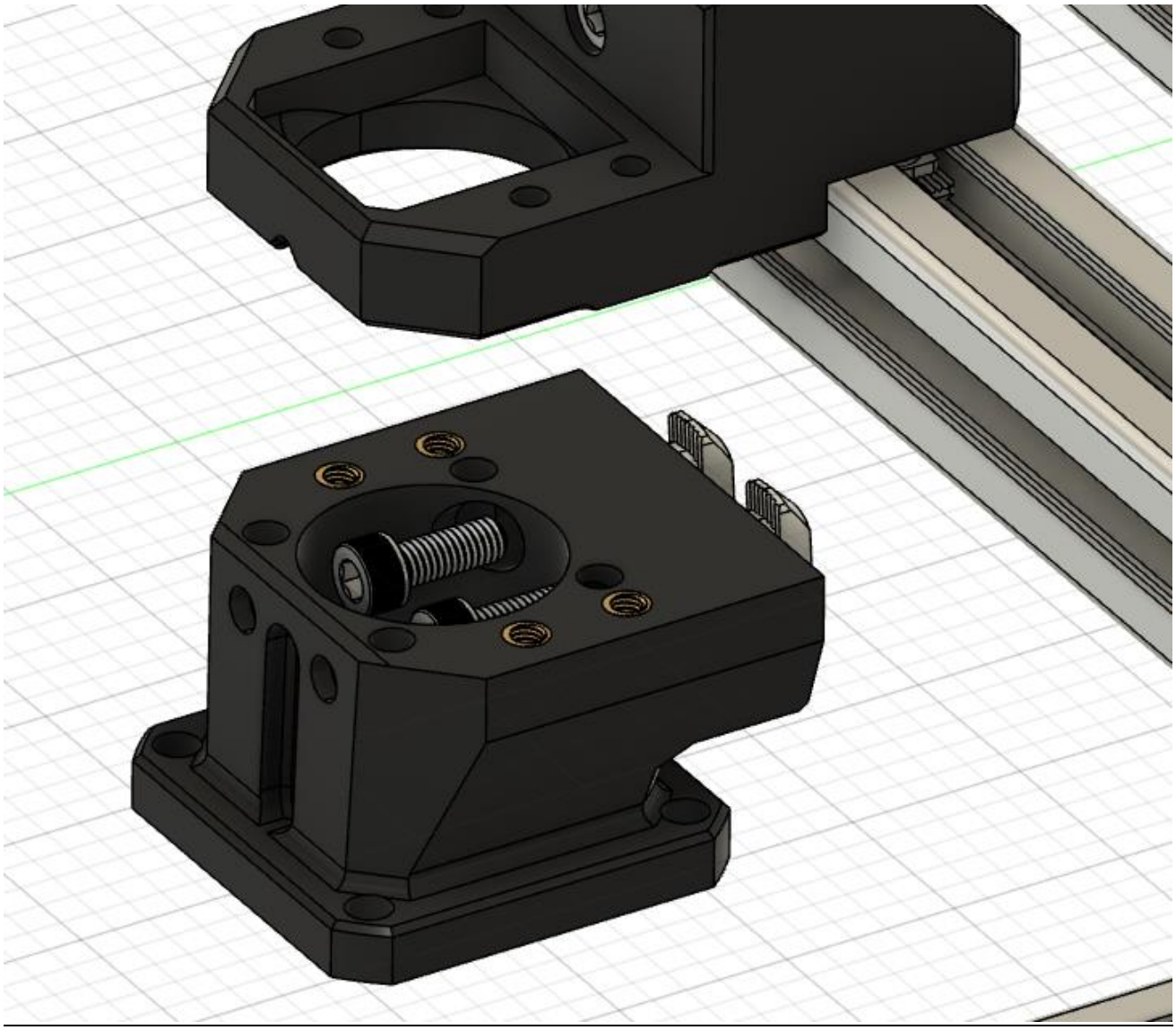




Position it for the center T-nut to go in the vertical 3030, then glide it to reach the bottom 3030, you can tighten everything up, this part is centered if the middle 3030 is centered.



5.1/ NEMA23 installation



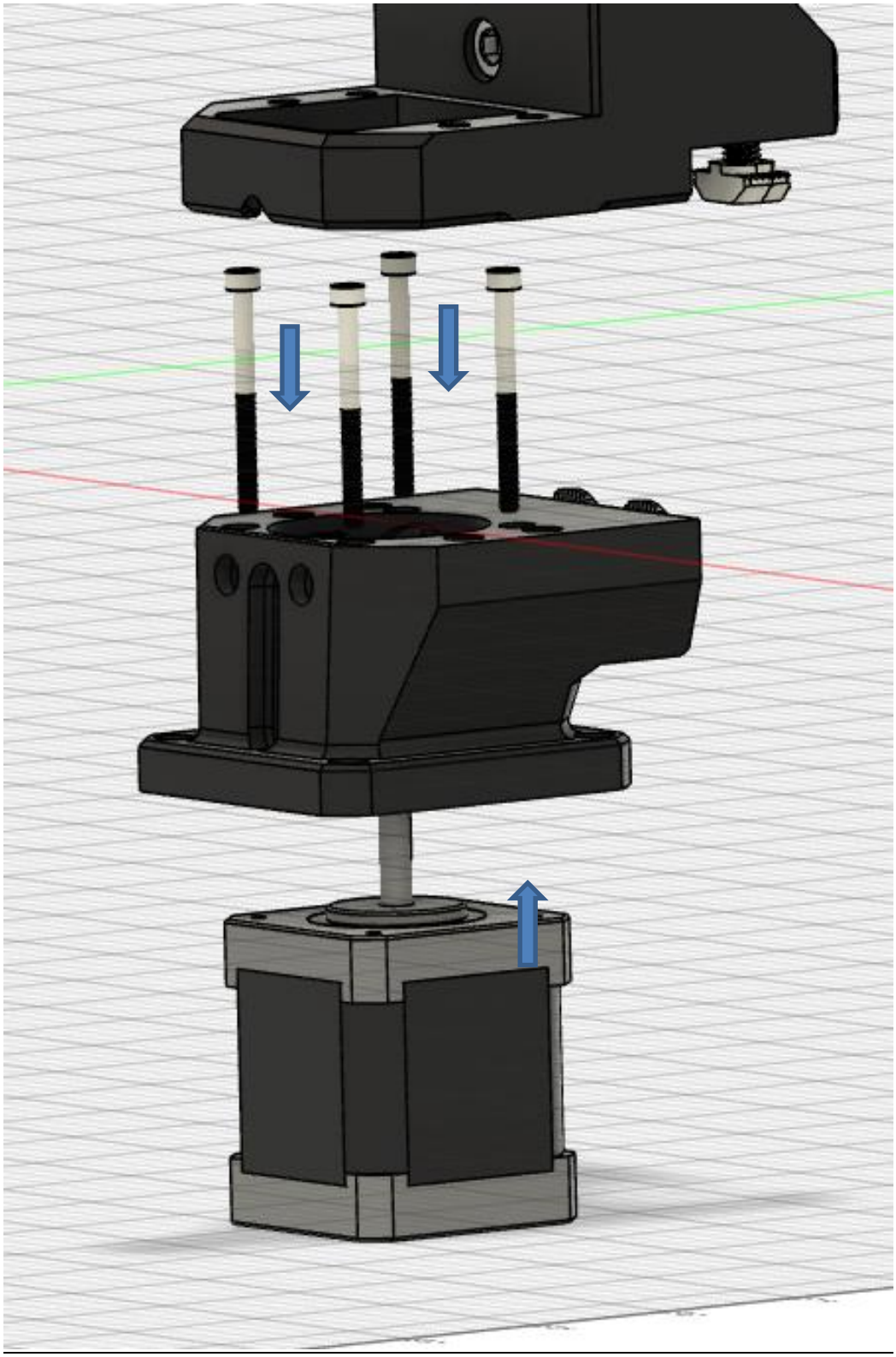
Preinstall 2x M6x14 screws with 2M6 T-Nut

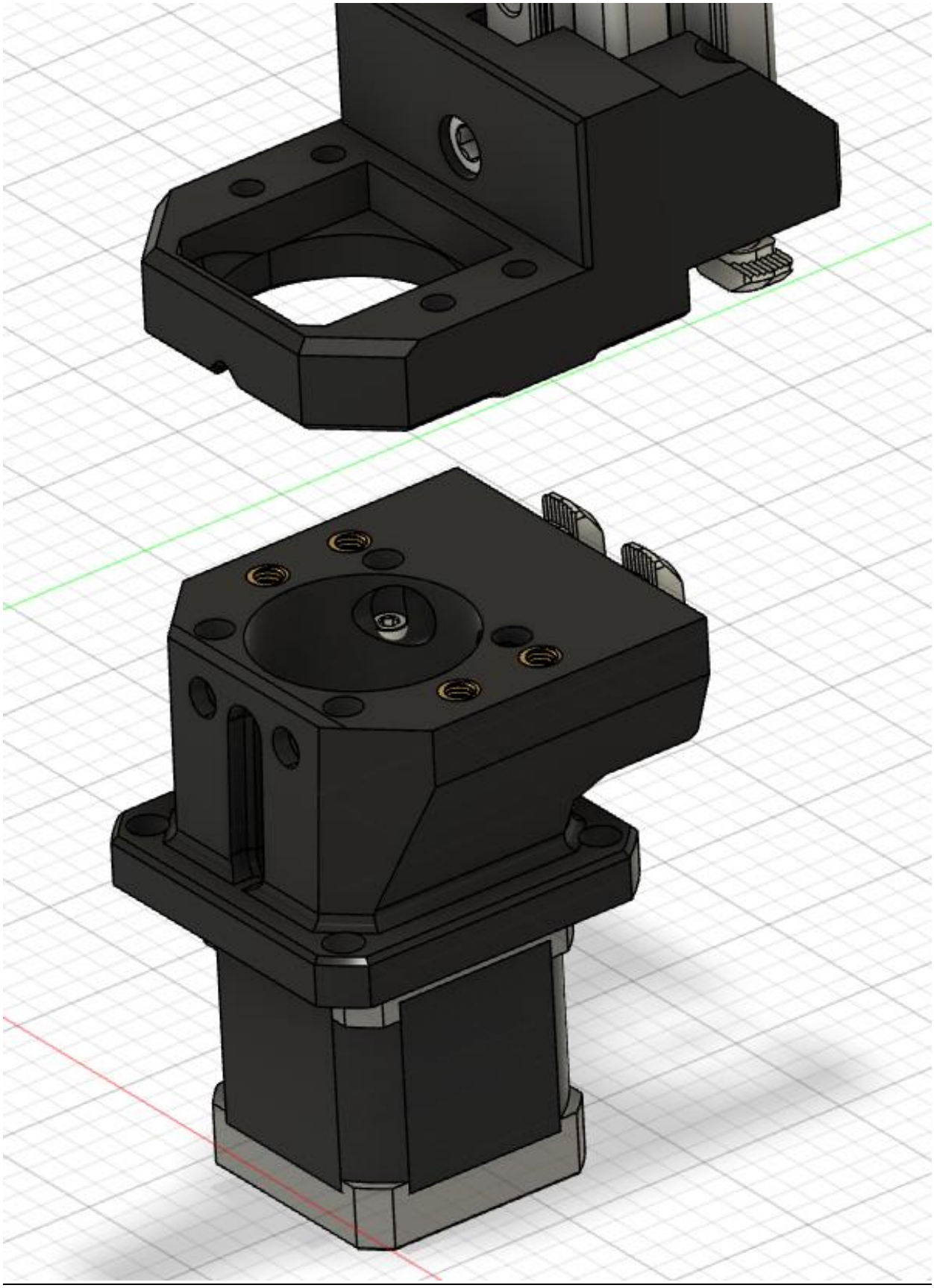
The rest will be done later

The Lower support is a Nema 17 / 23 combo, meaning it can fit either of those

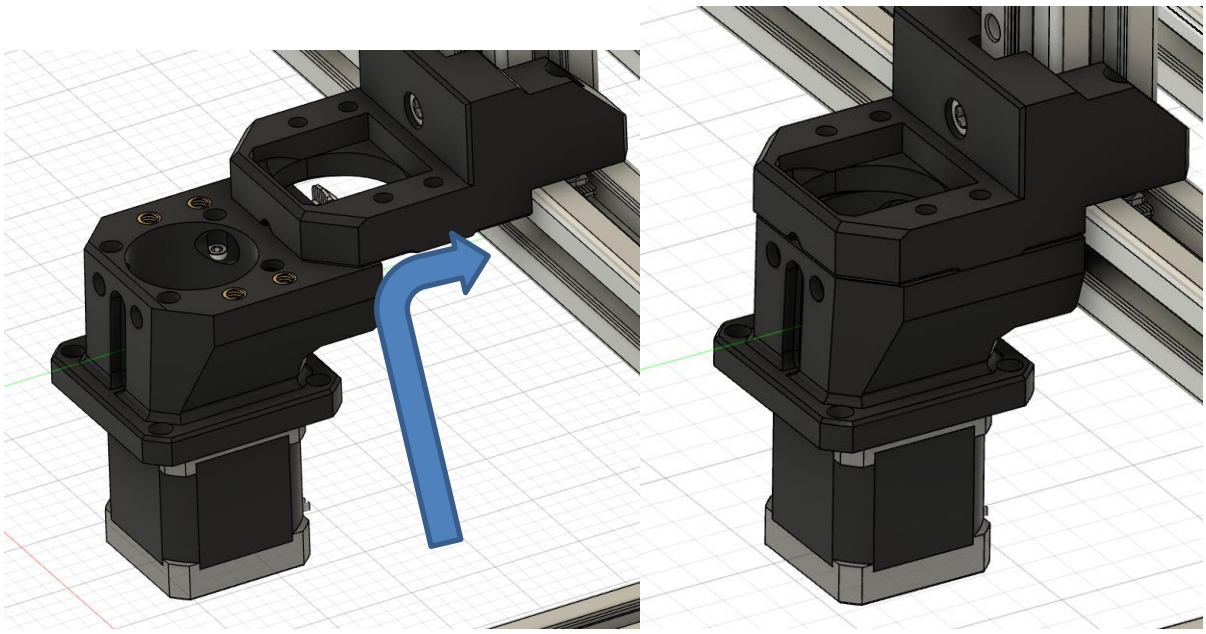
In some orders, a slightly different lower part can be found, with only Nema 17 compatibility, since N23 are rarely used

5.2/ NEMA17





Insert 4x M3x35mm to secure the NEMA17



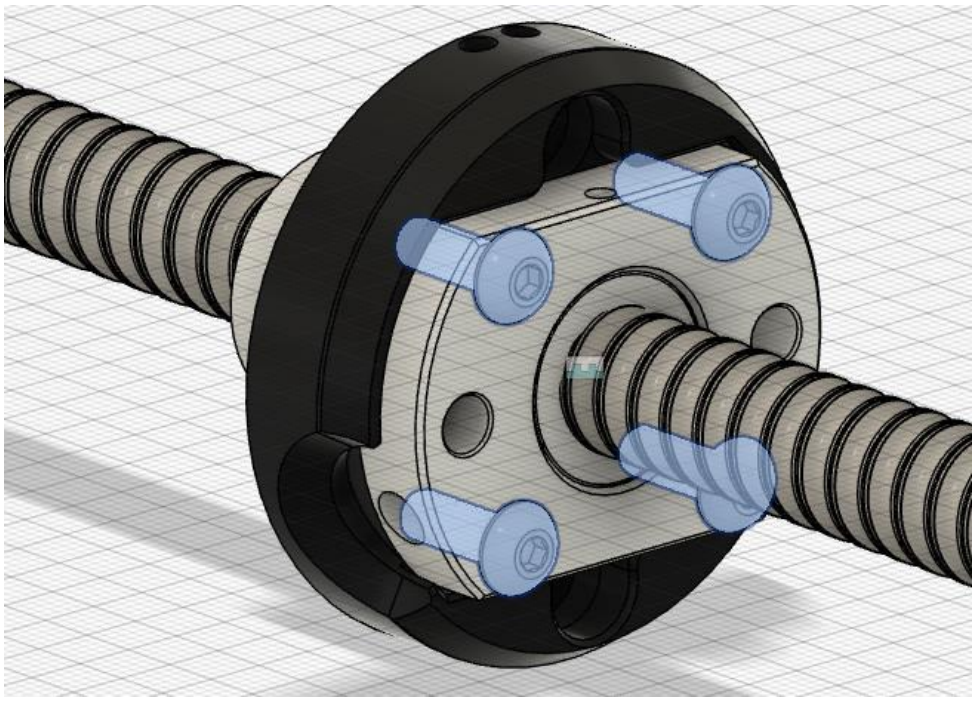
Insert the lower assembly on the top assembly, you can tighten the 2 back M6 to hold the structure for the next step

IV/ SFU/Oldham Assembly (1204/1605) :

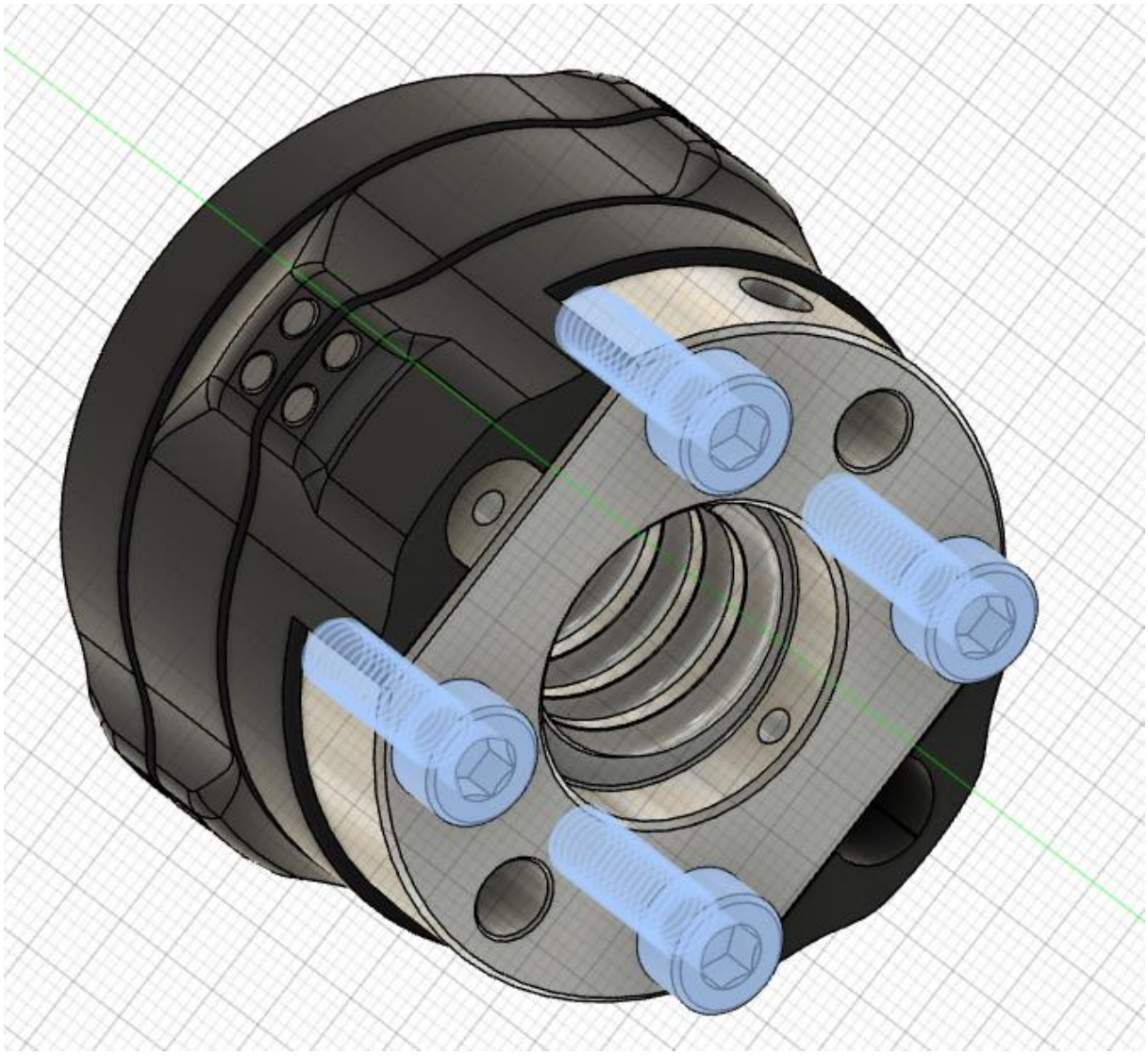
1/ Oldham

NOTE:

SFU 1204 version, we use the M4x12mm

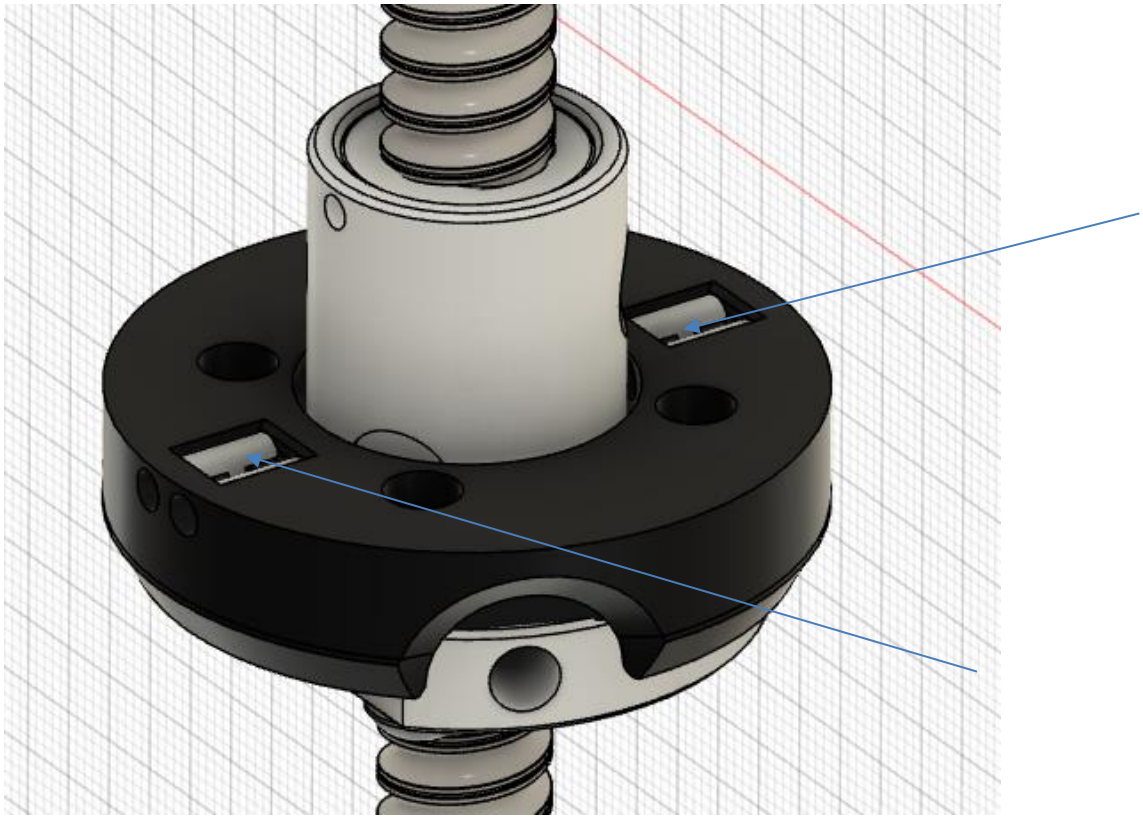


SFU 1605 version, we use the M5x16mm

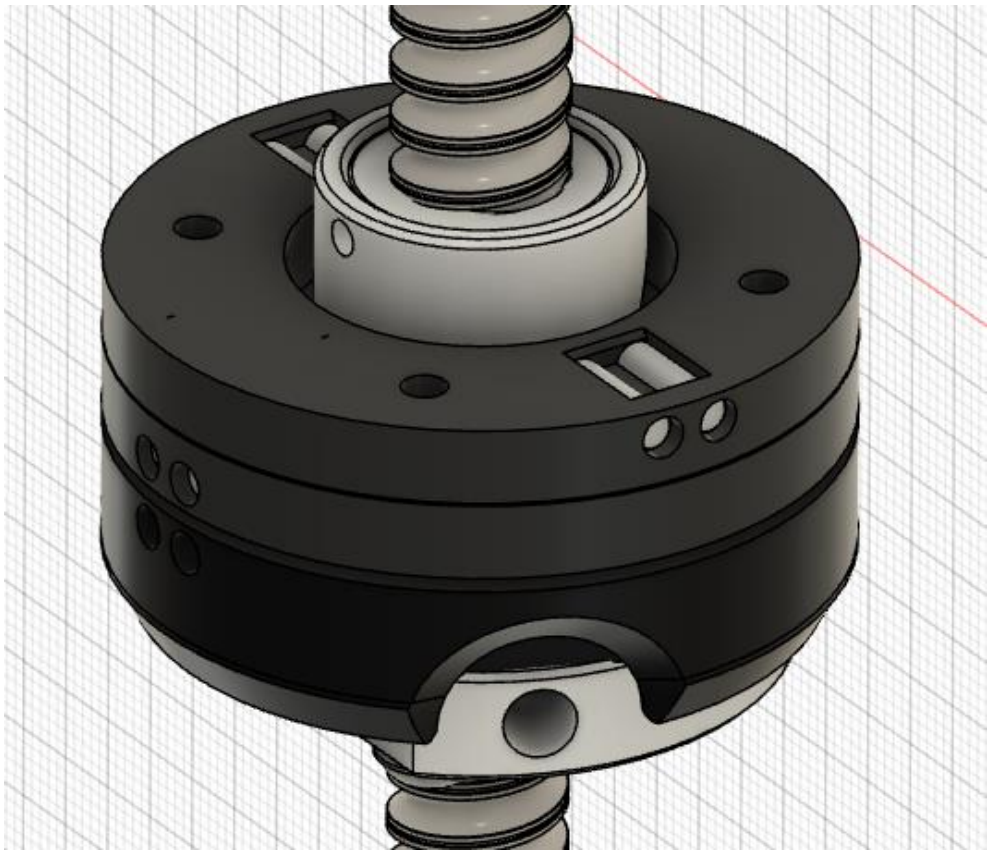


For the next steps, bearing balls are 4mm for either SFU1204 or SFU1605

That said you can use 6mm to allow a different behavior depending your needs



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



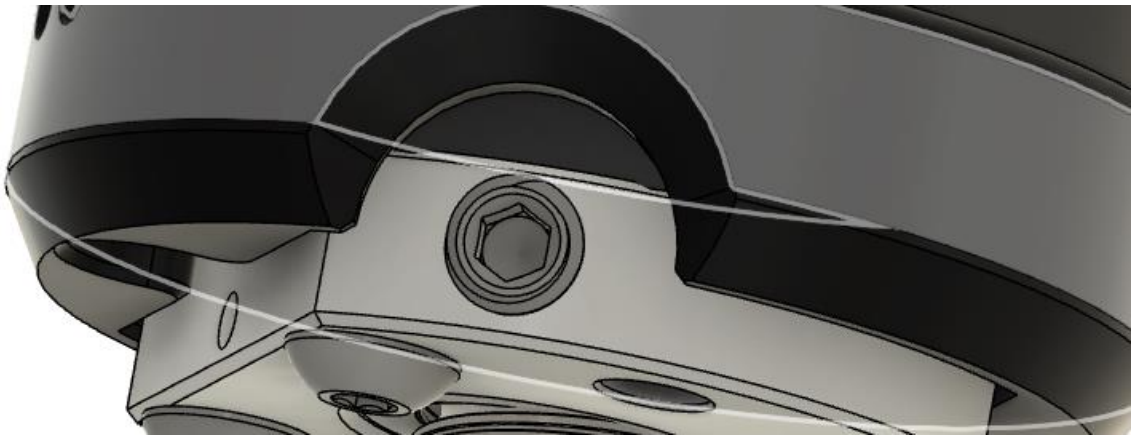
Stack the assemble central disks and install the 2 other balls bearing

Stack the upper disk

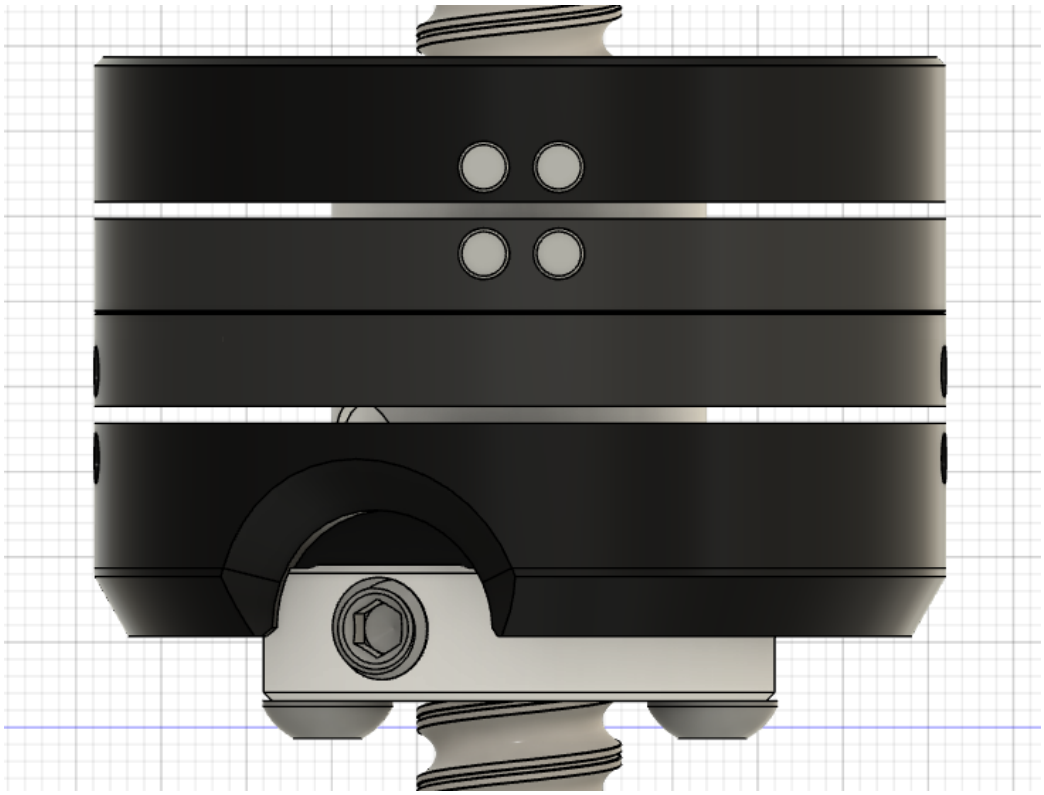
Before fixing the top to the Arm, make sure everything is in place and can wobble without any hard point. The ball bearings can be a bit unstable, the load of the bed will secure it in place.

-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

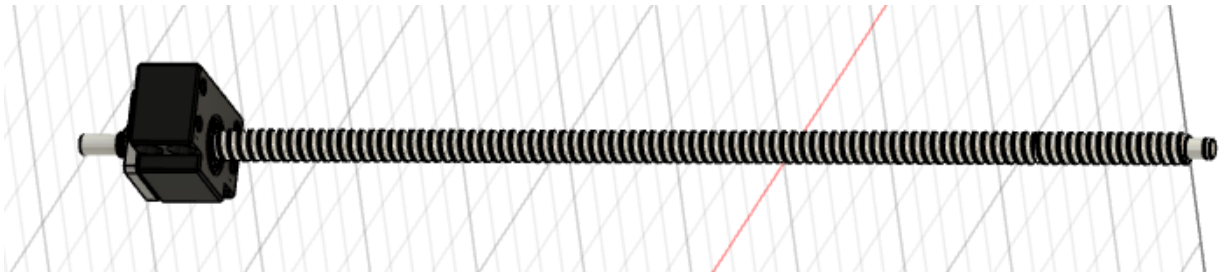
Check the balls bearing still in the dowel chanel

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

DON'T FORGET TO TUNE THE Z_MAX distance in Klipper

V/ Z Axis assembly on the Frame (1204/1605)

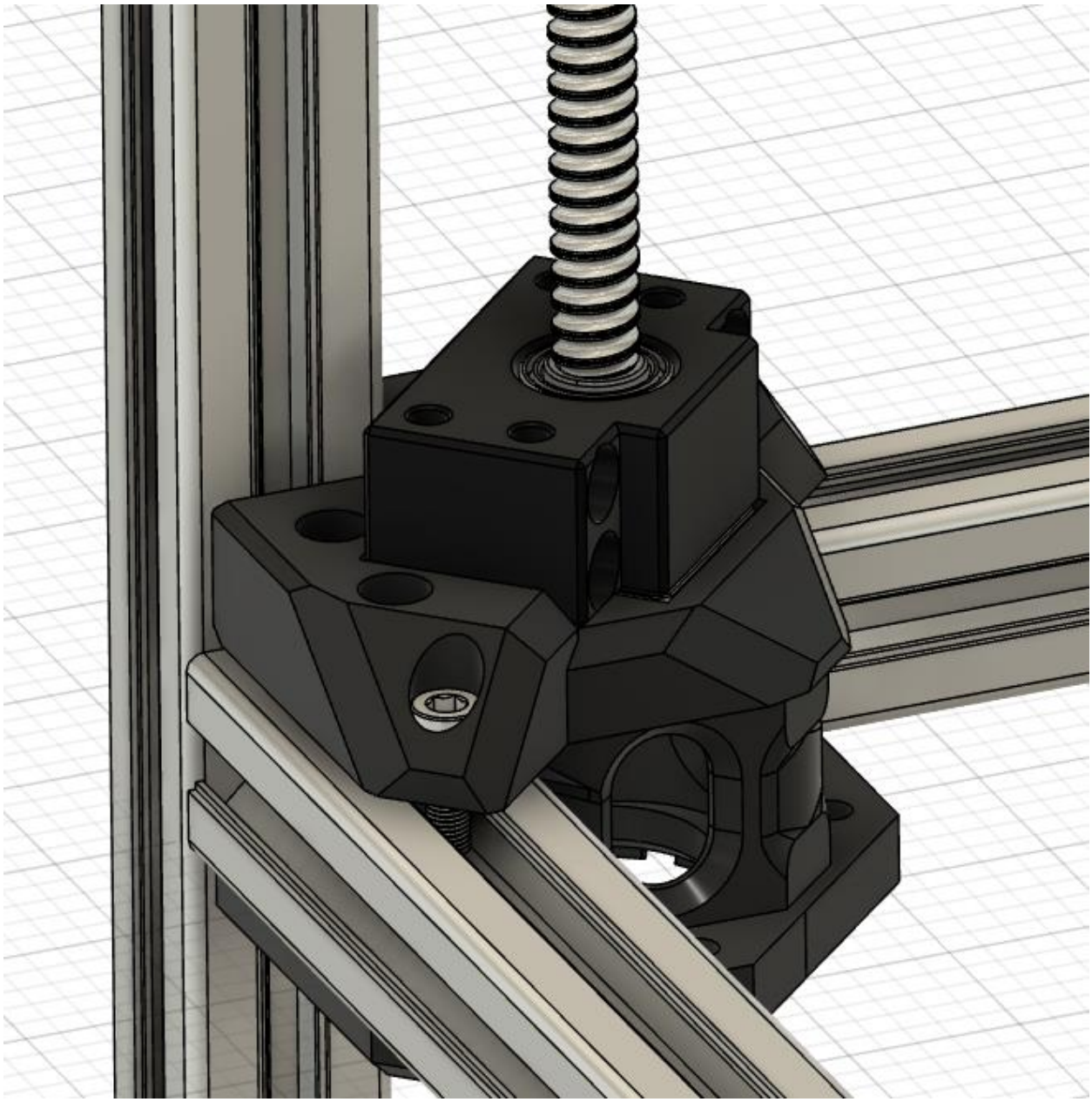
1/ Preparation

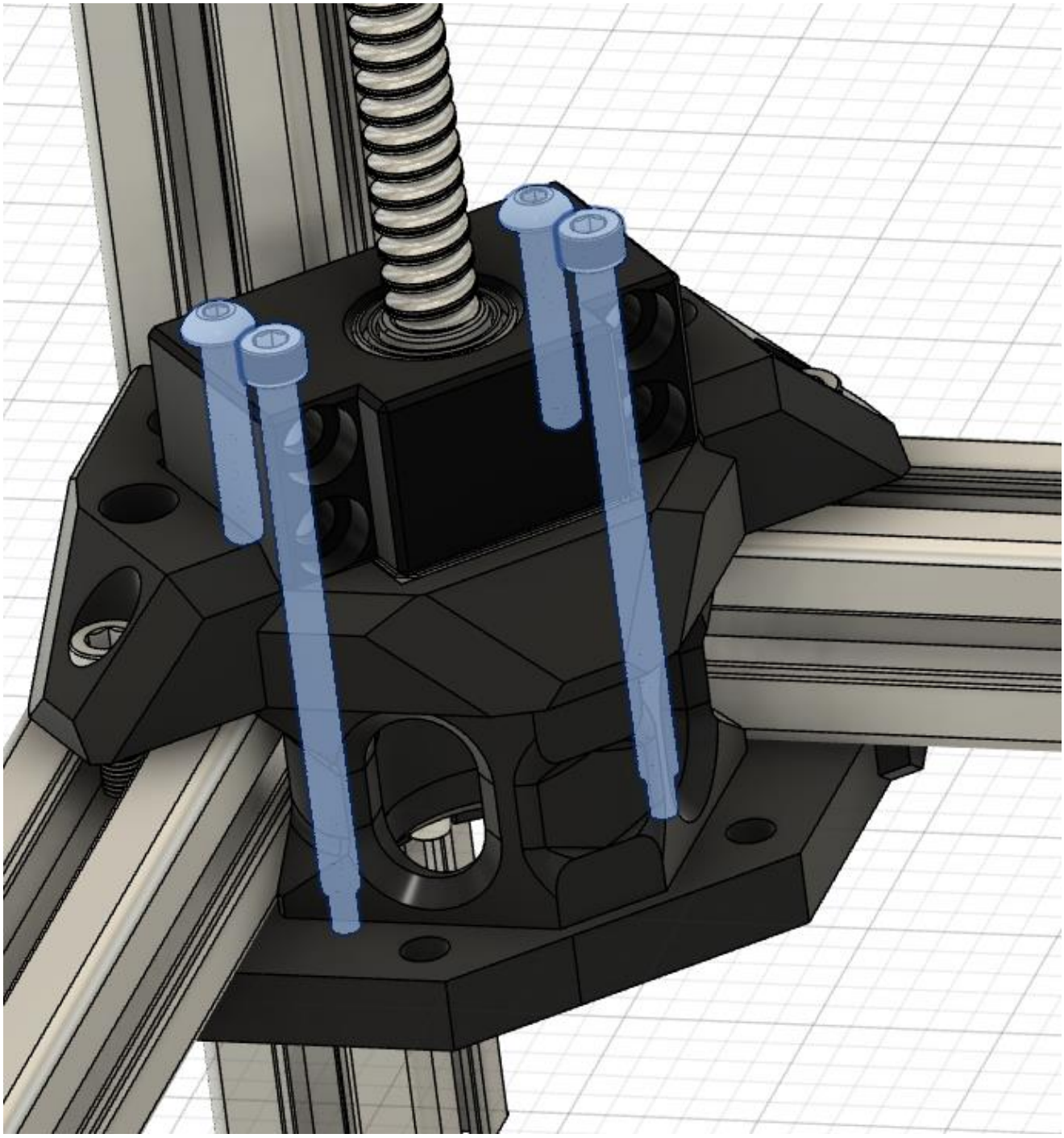


Install the BK10/12 on the Spindle, Add the nut locker, secure it half a mm below the block

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 BK10/12 on the motor block and secure it with 2 M5x80 throught the whole block, and two m5x30 on the rear holes:

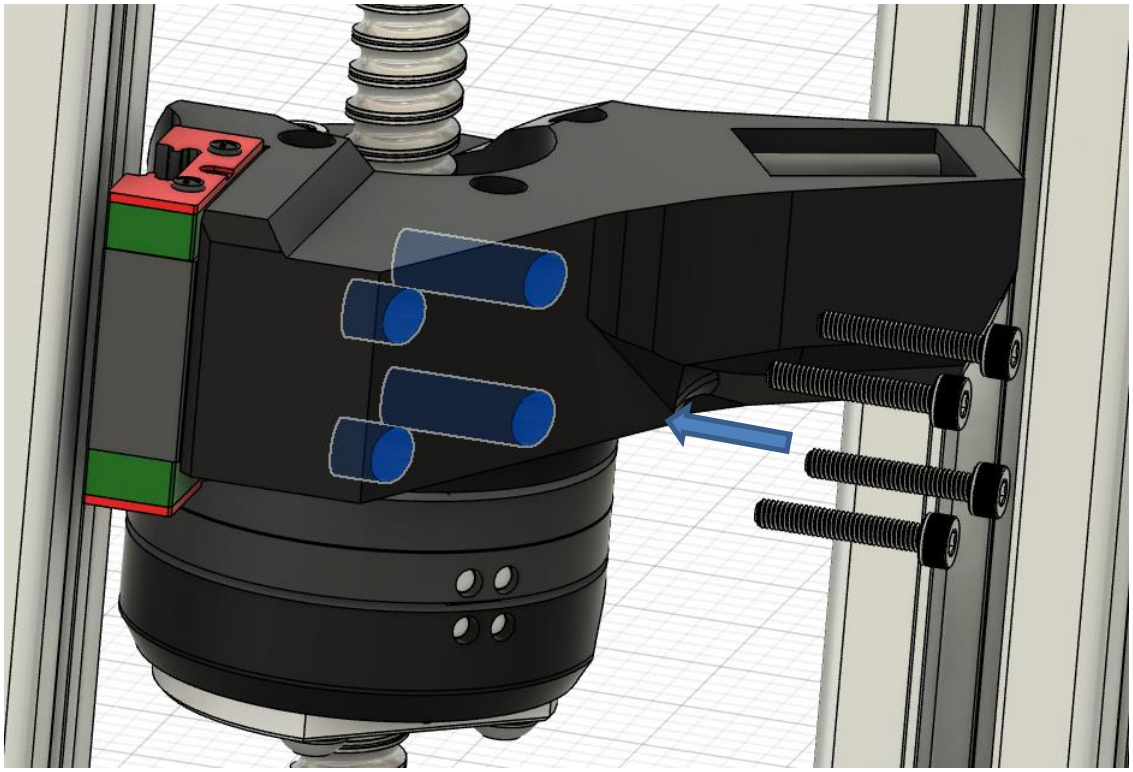




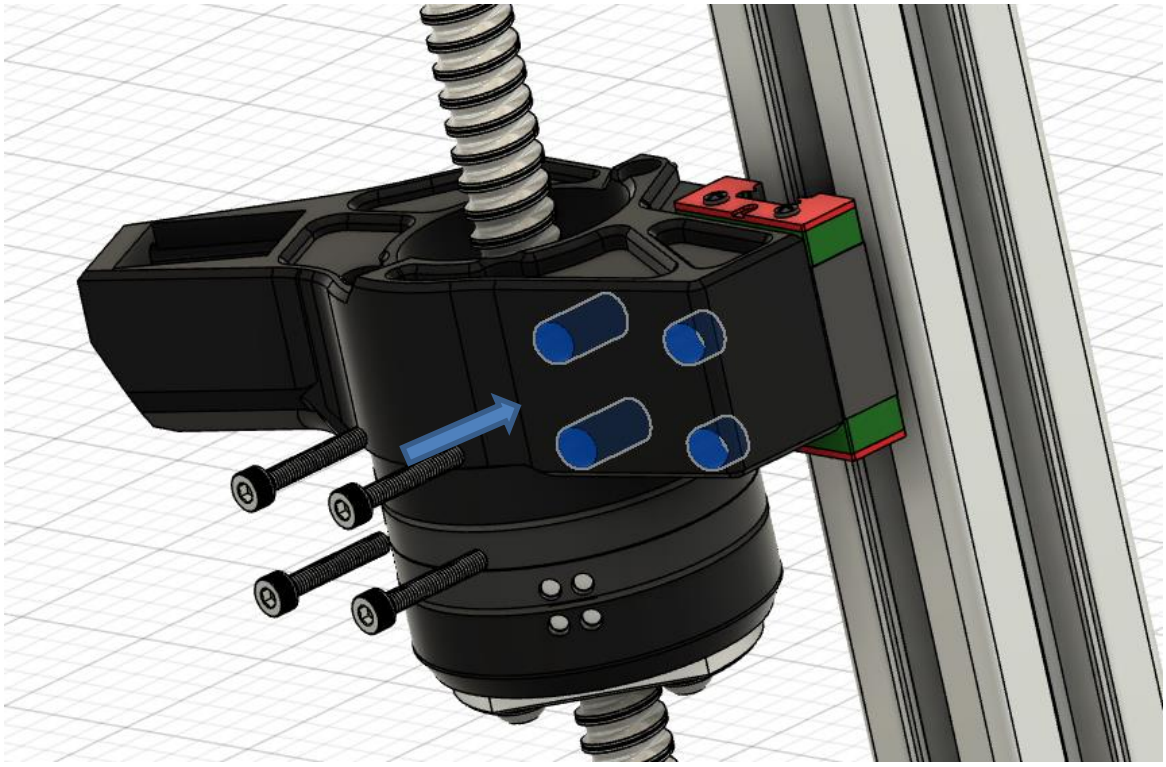
Don’t tighten it fully yet

2/ FRONT ARMS

A/ For SFU1204



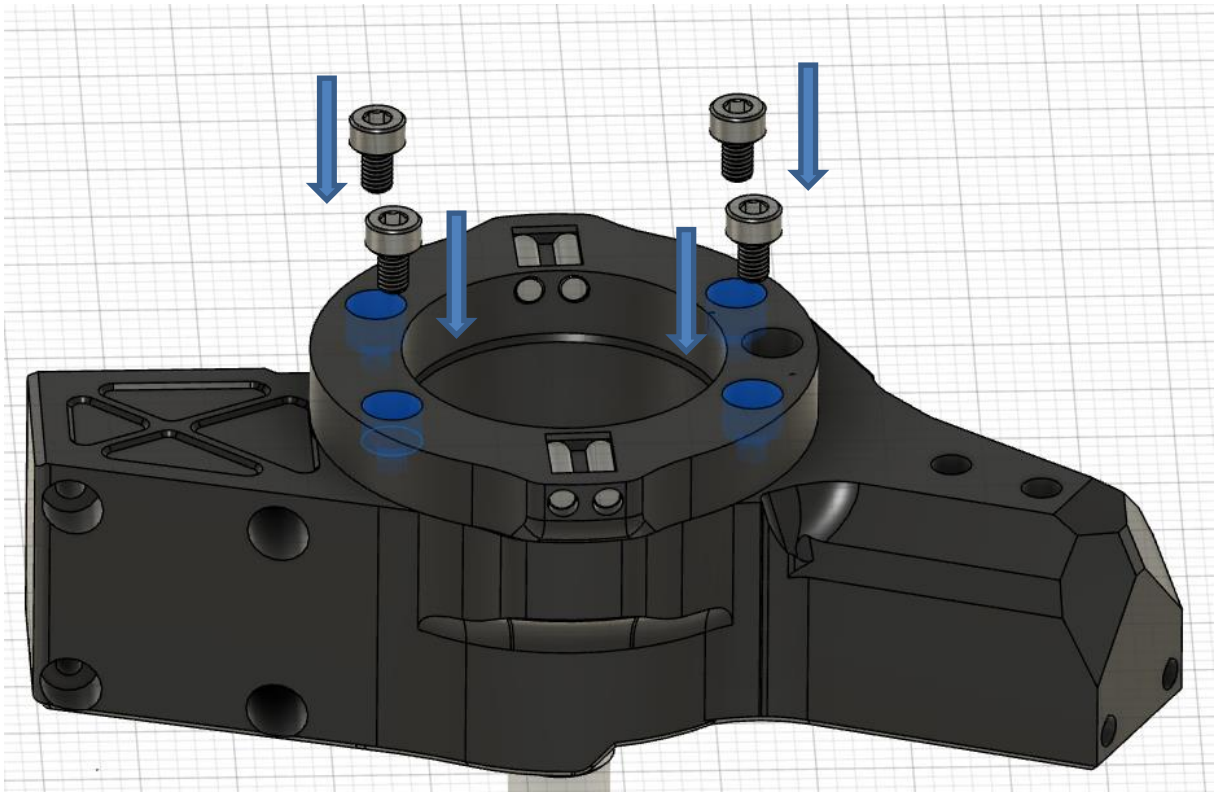
Install the front Arms sfu1204 (old 3.0 orientation here)



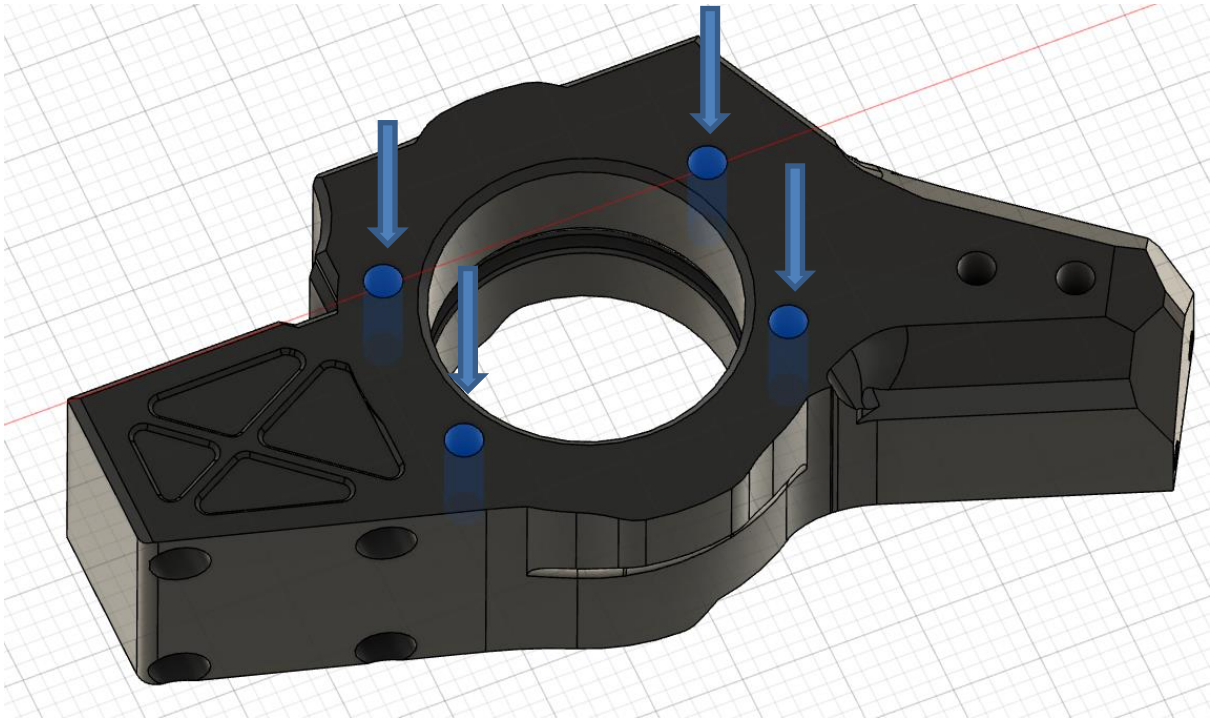
(3.1 orientation here)

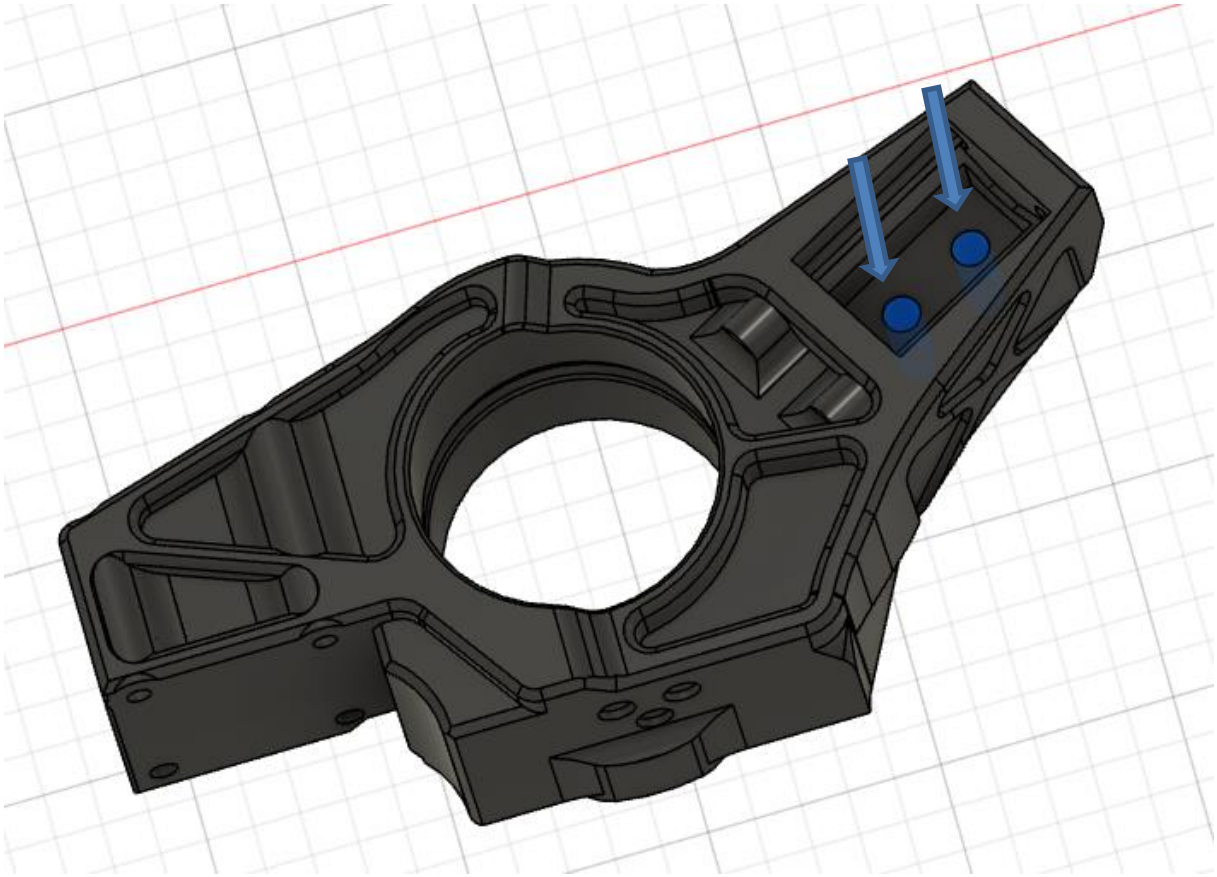
B/ For SFU1605

Same method, only the upper ring fixation change you must preinstalled it with 4x m3x5 on the 3 arms before putting it in place. (Same holes for the 3 arms)

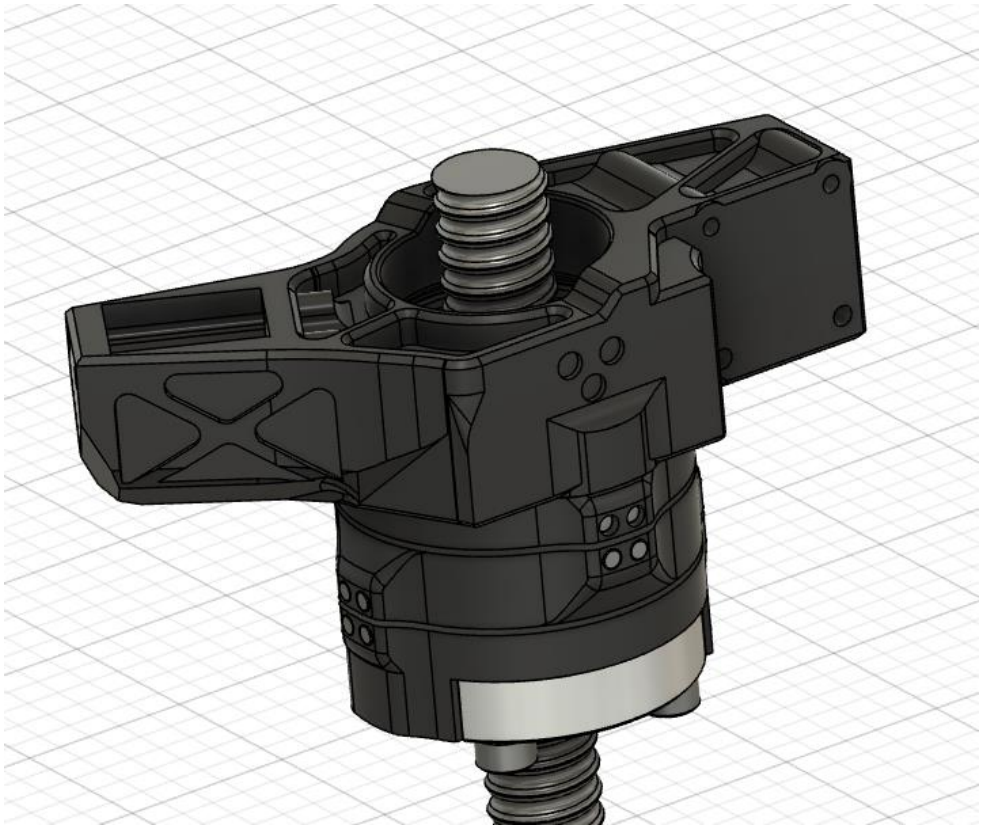


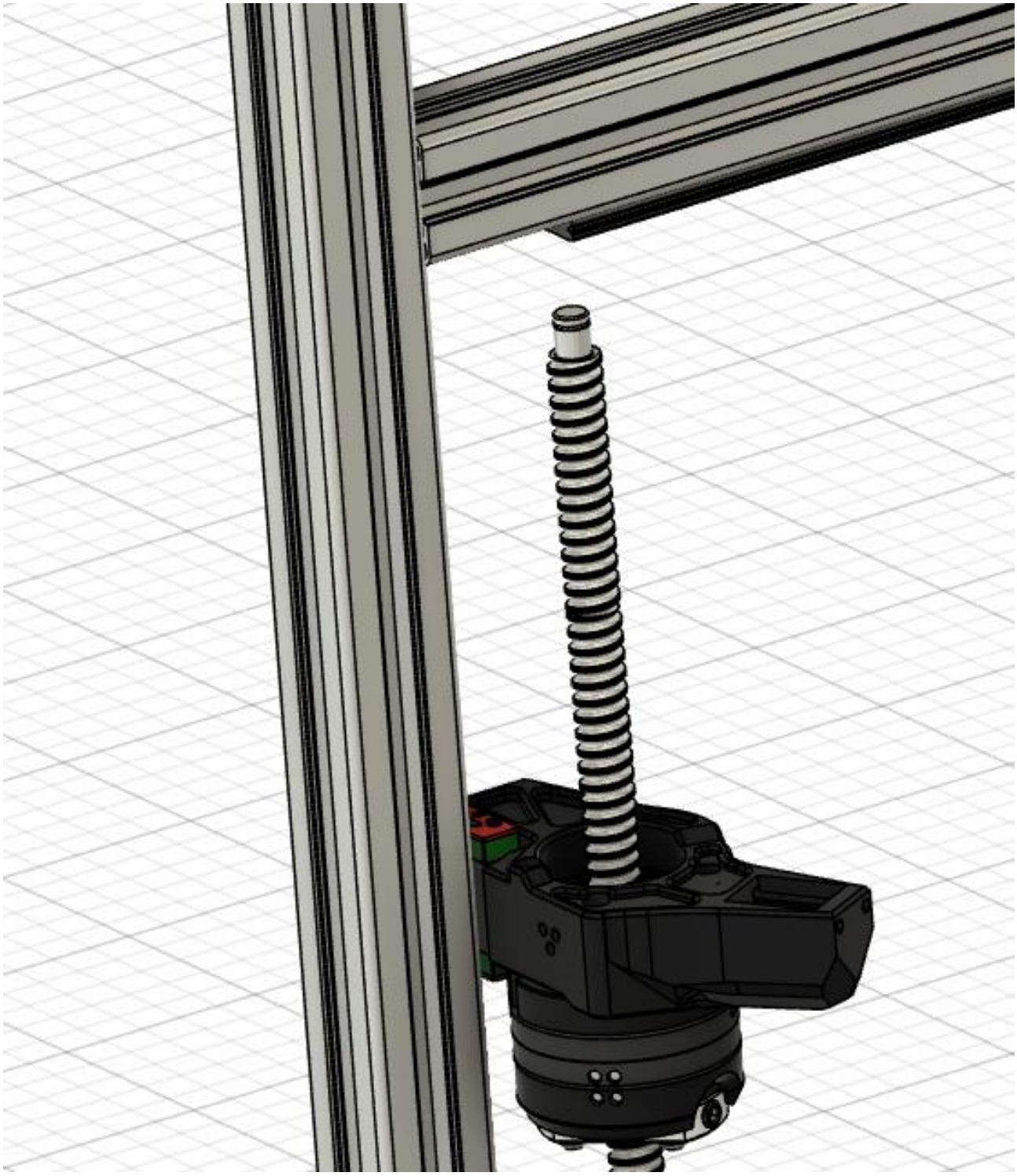
If you make the part yourself, don't forget to put m3x3mm inserts in those positions





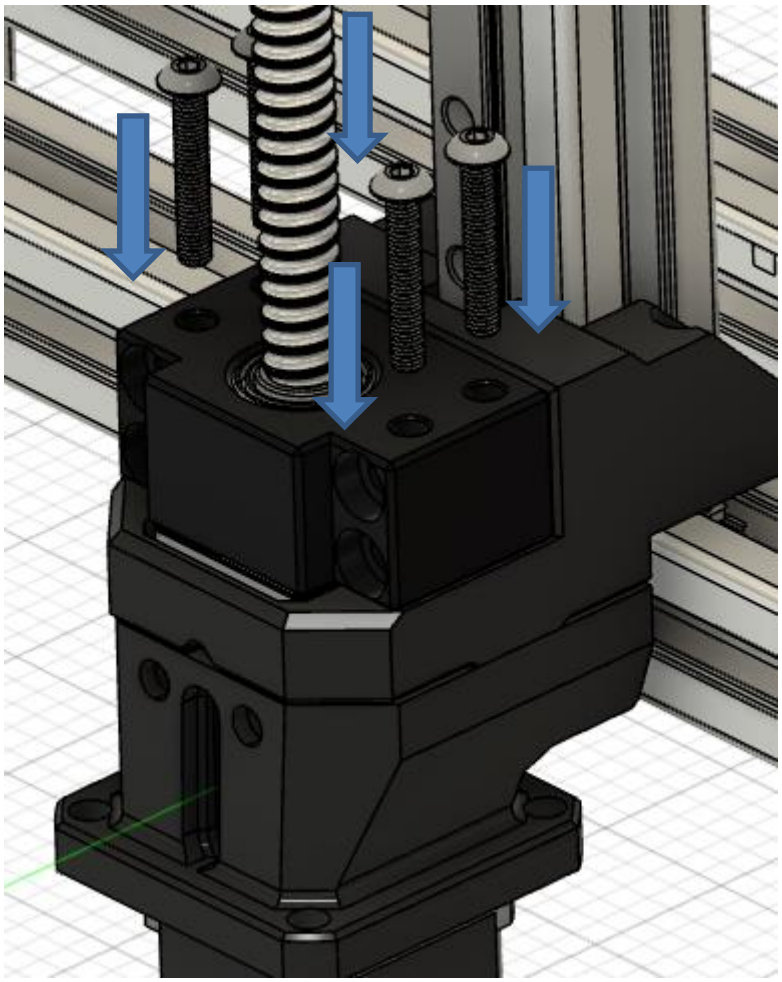
You should end with this results for 1605





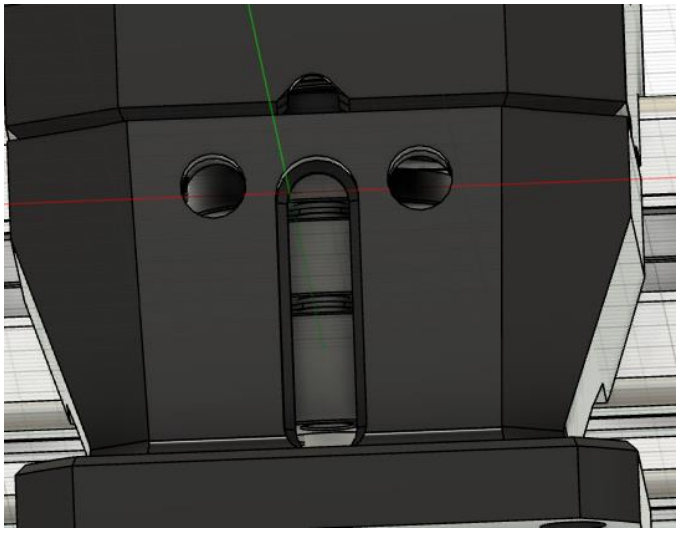
This should end like this for 1204; you can see some flexibility, and that will help for the next steps.

3/ REAR AXIS/Arm:



Insert the x4 M5x50 to secure the whole block

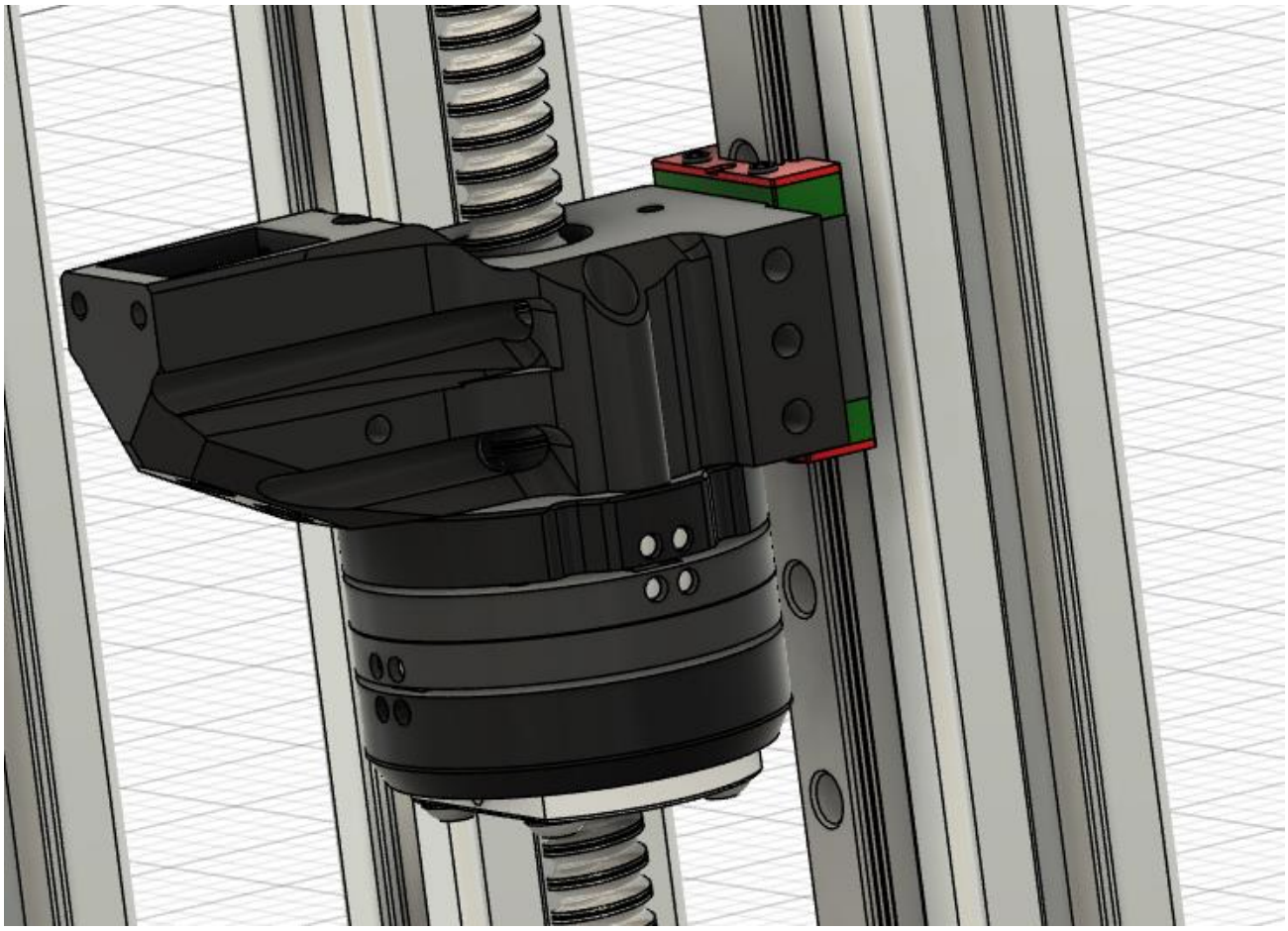
-For the NEMA17 installation, install the coupler on the nema17 shaft before assembling the BK10/12 /Spindle



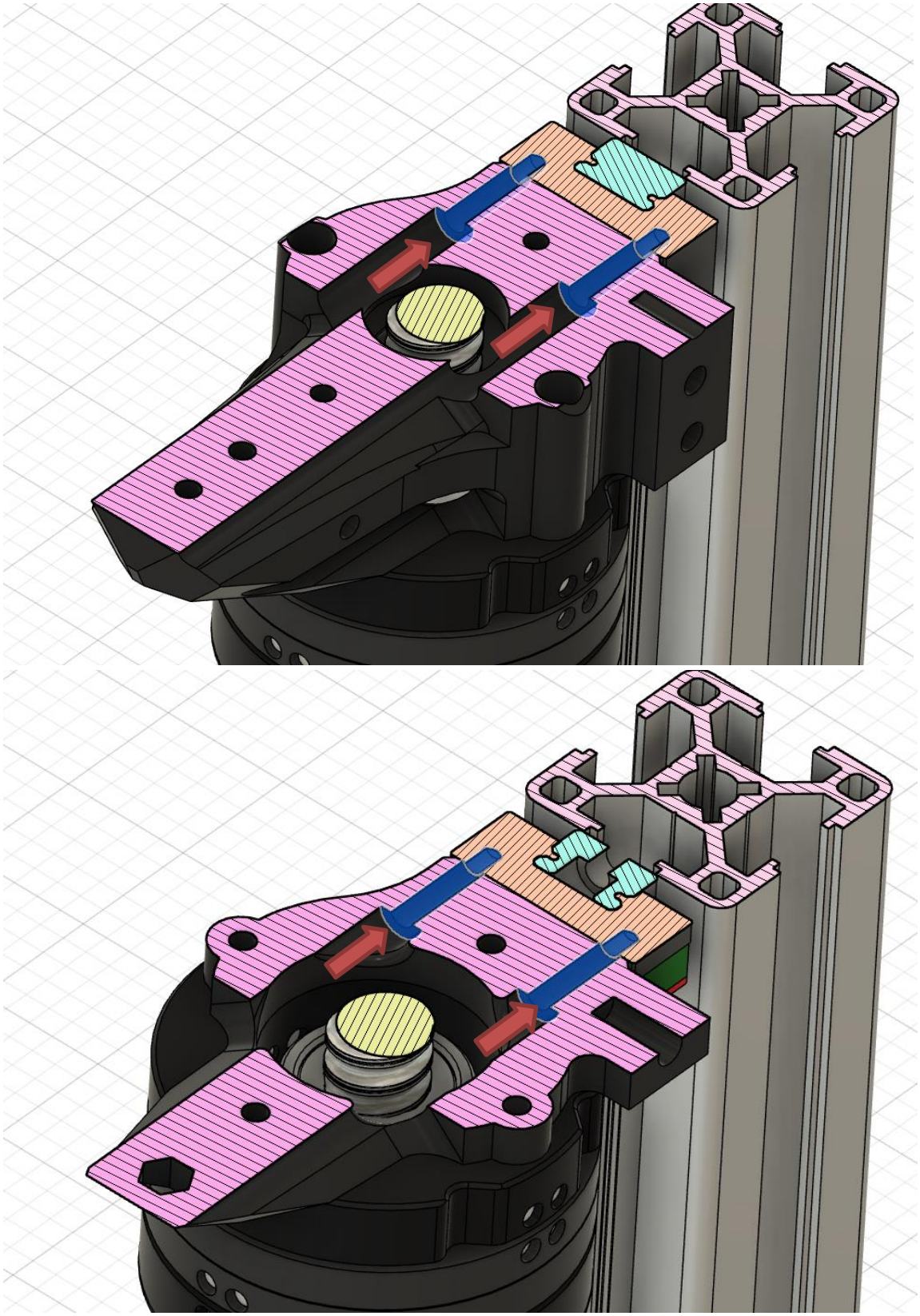
You can now tighten the coupler via the holes here, it can be a bit hard to access but it works fine at the end 😉

For NEMA23 the installation will be at the end!

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



For the 1605 variation simply reuse the same method that the 1605 front arms



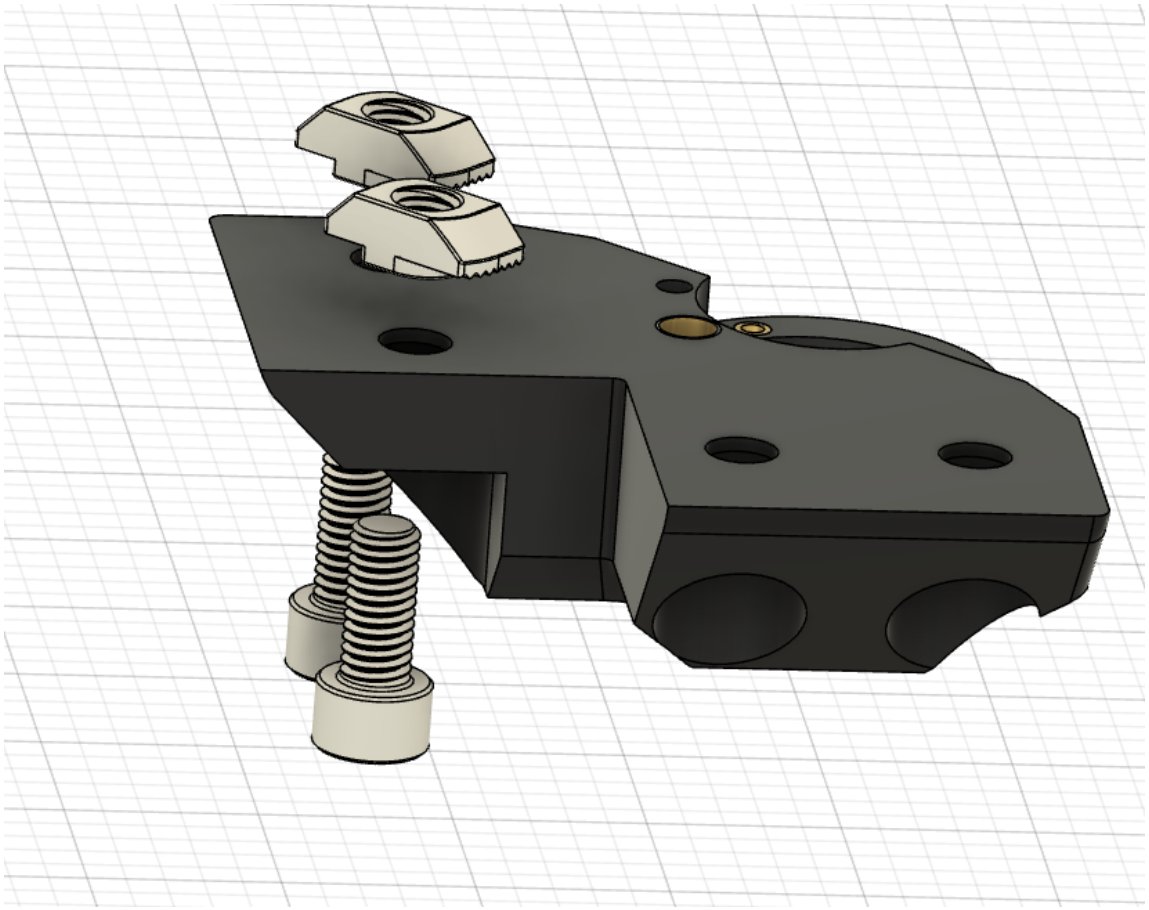
4x M3x15 via the 4 specific holes.

VI/ Top Retainers (1204/1605)

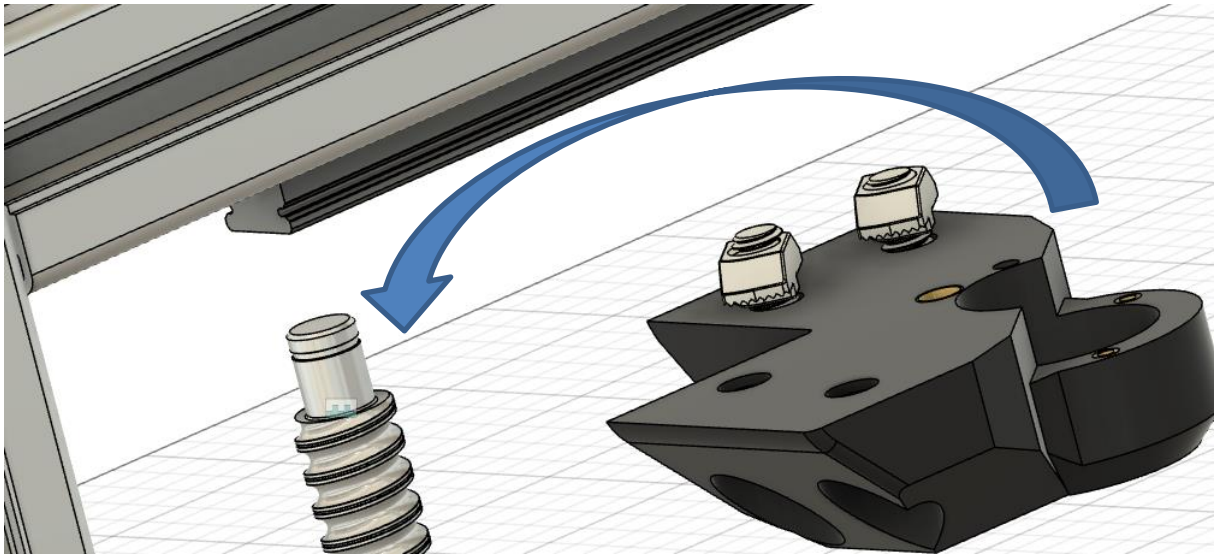
1/ FRONT RETAINERS

A/ Open front 2.0 (old)

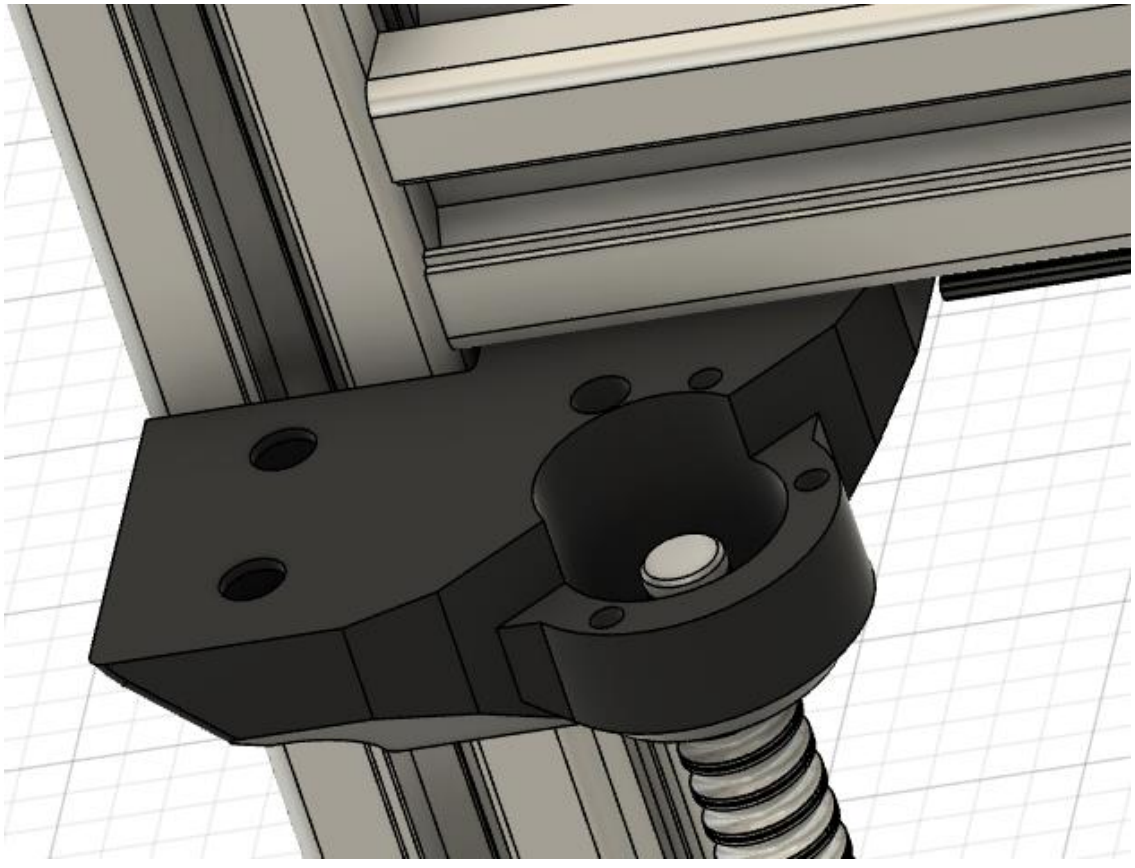
Those modules are specific to either 1204 or 1605 but it is build on the same methods, it assembles the same way.

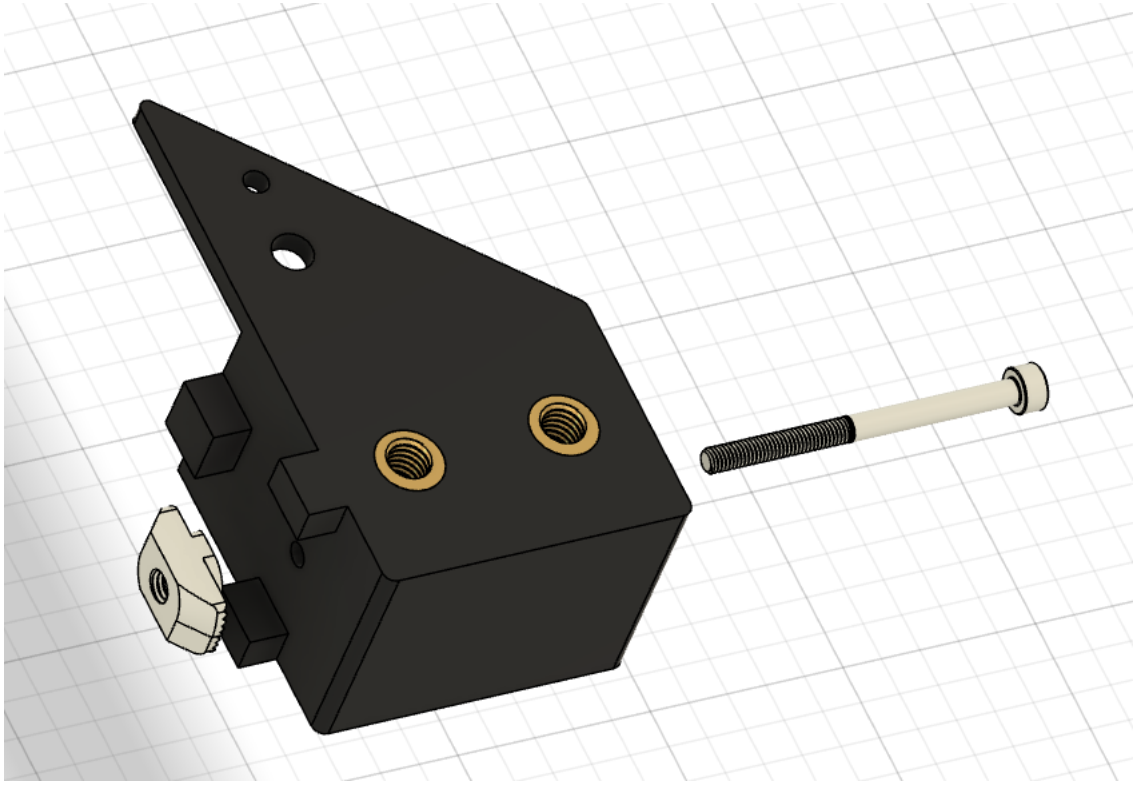


Install the M6x14 + the T-Nut

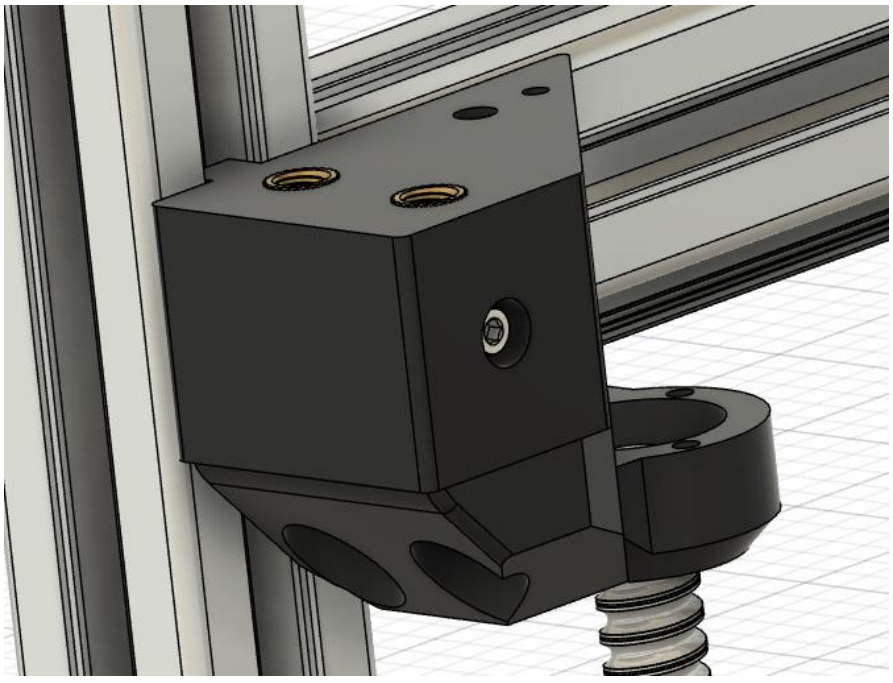


The objective will be to fix this retainer to the frame, since we have a bit of flex now, wiggle it a bit and this will take place. You can tighten the 2 M6to secure it in place

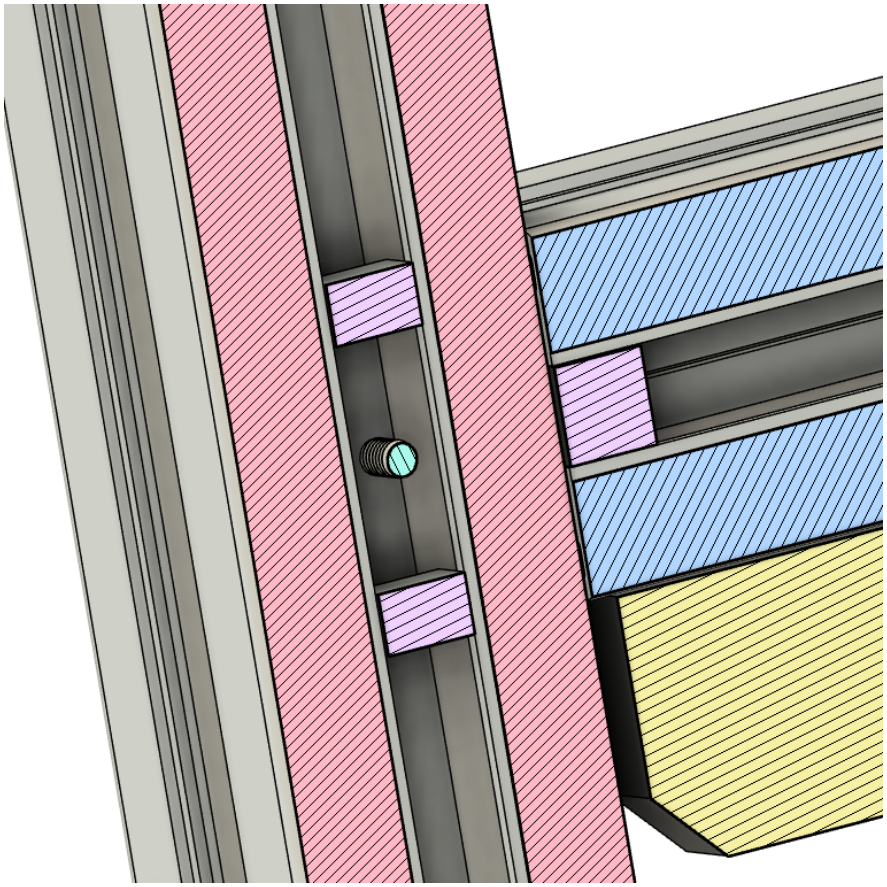




Prepare Middle front part, by placing an m3x40 with a M3 T-nut.

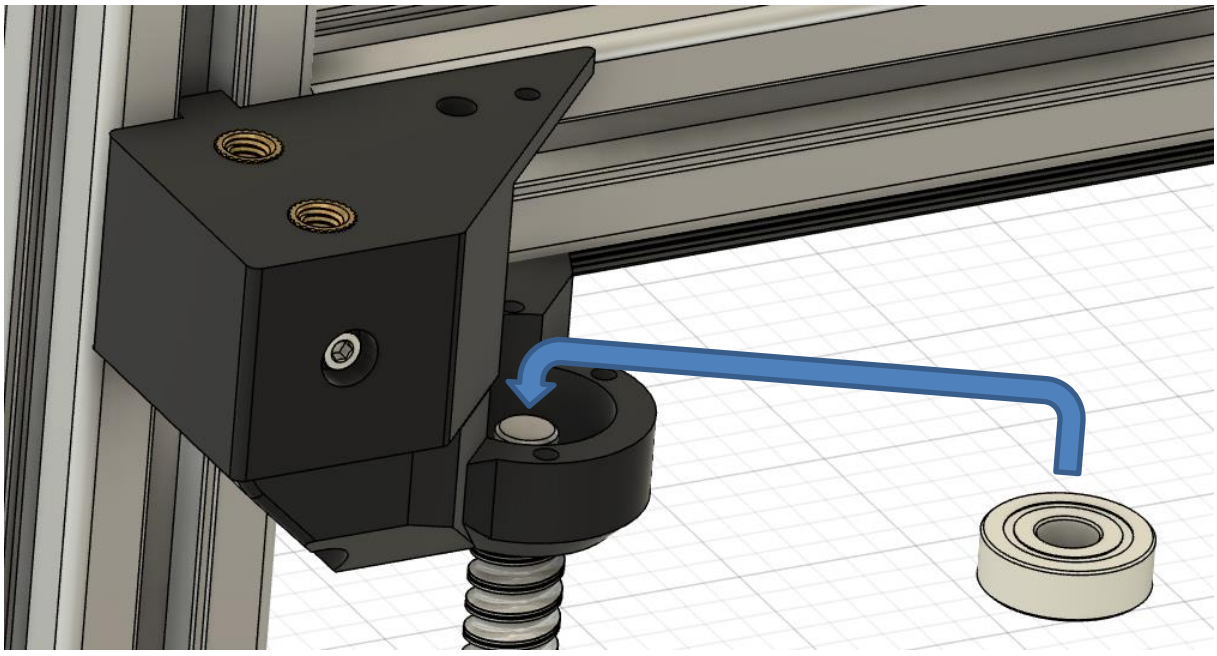


Slide it in the front junction

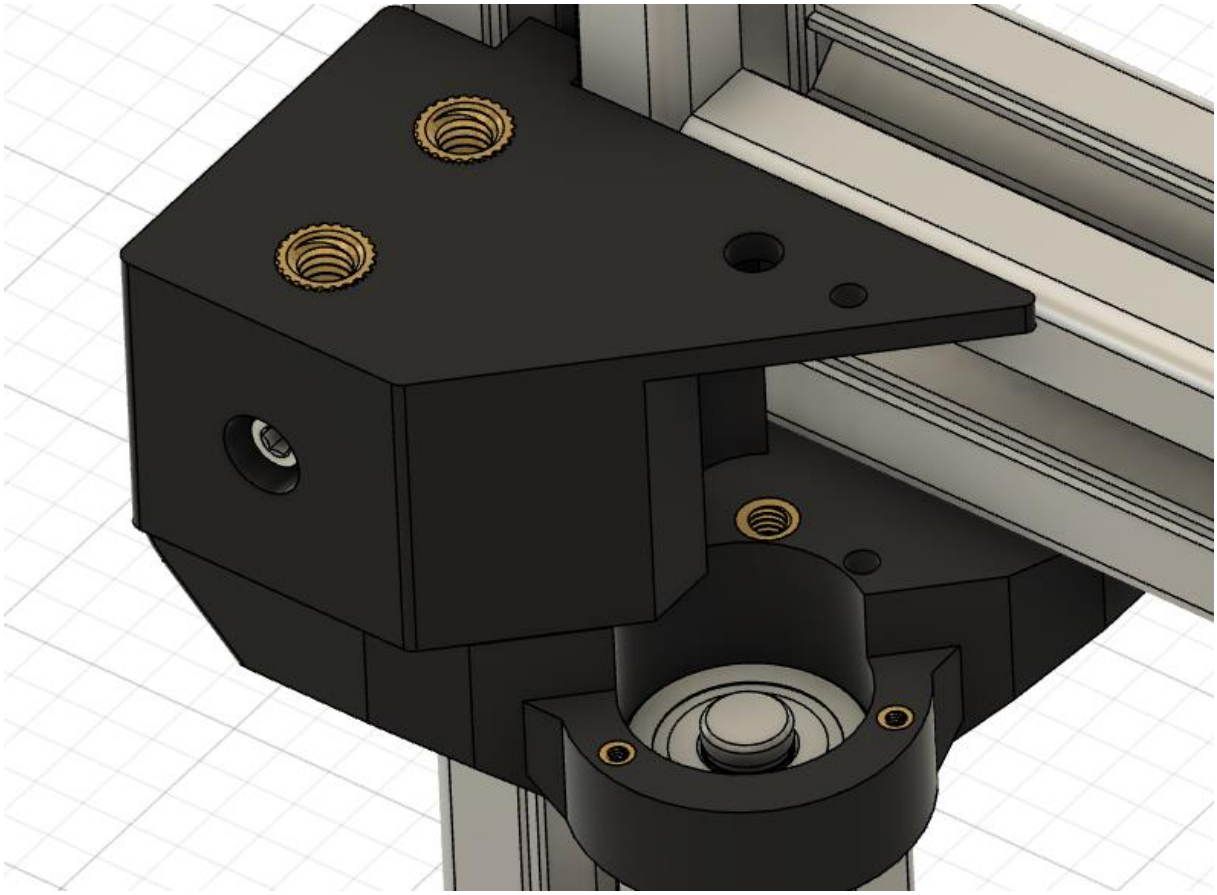


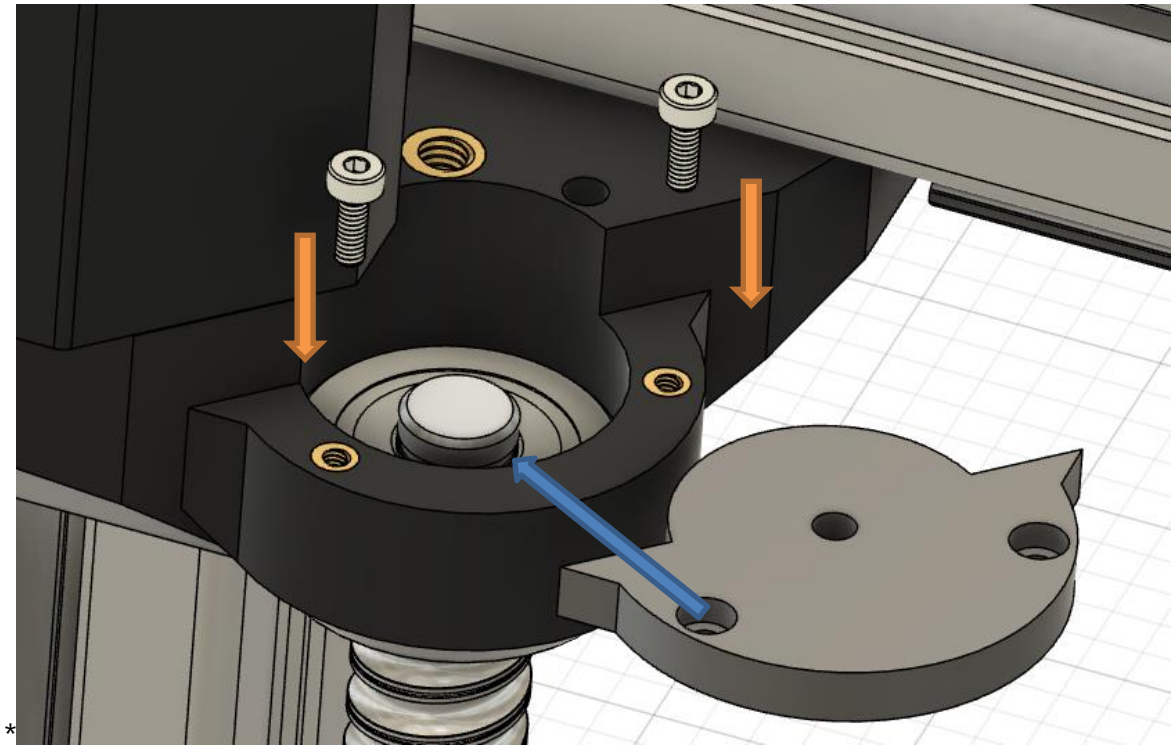
The 3 plots should auto-lock the part position, You can tighen the m3x40

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

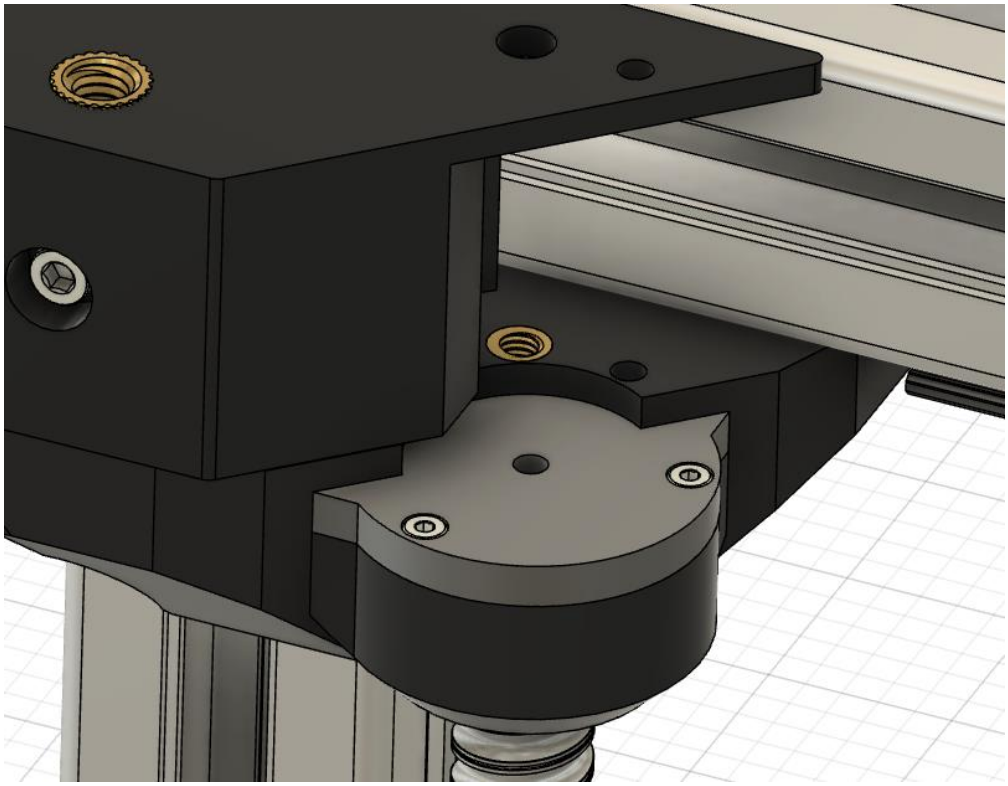


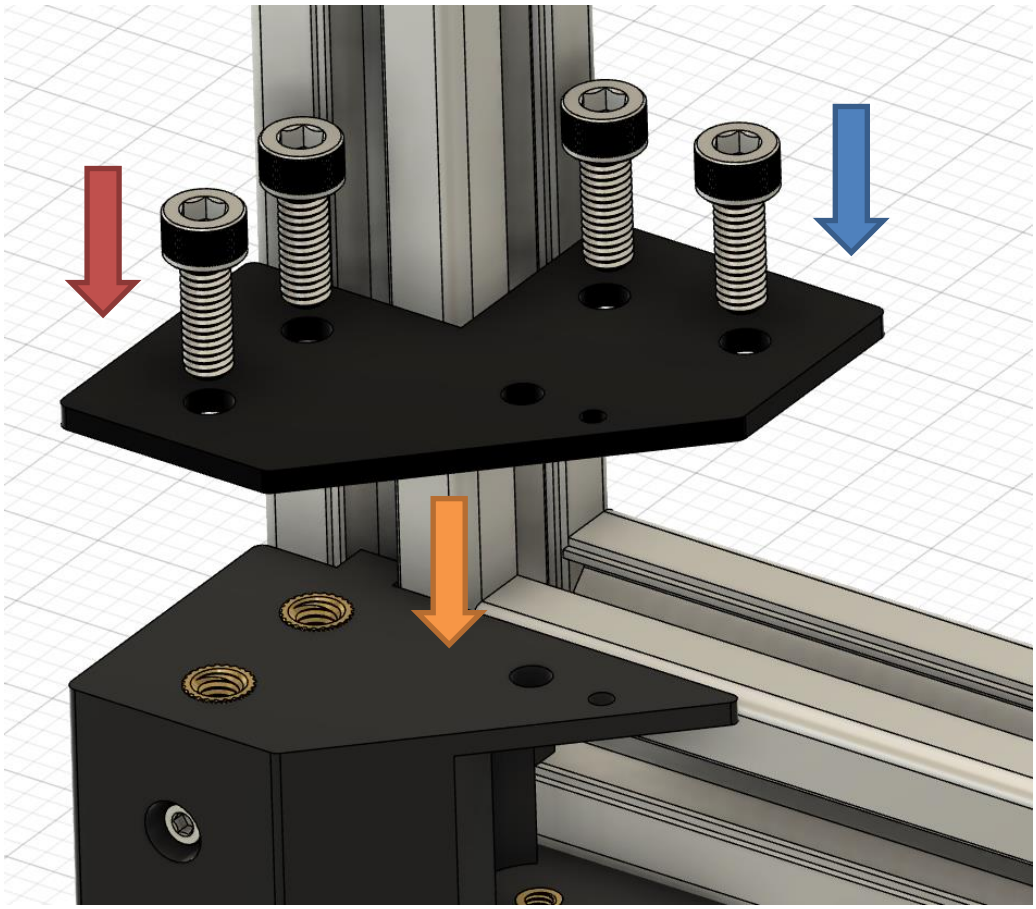
You can place the 608zz bearing in the SFU spindle to the flange of the part.



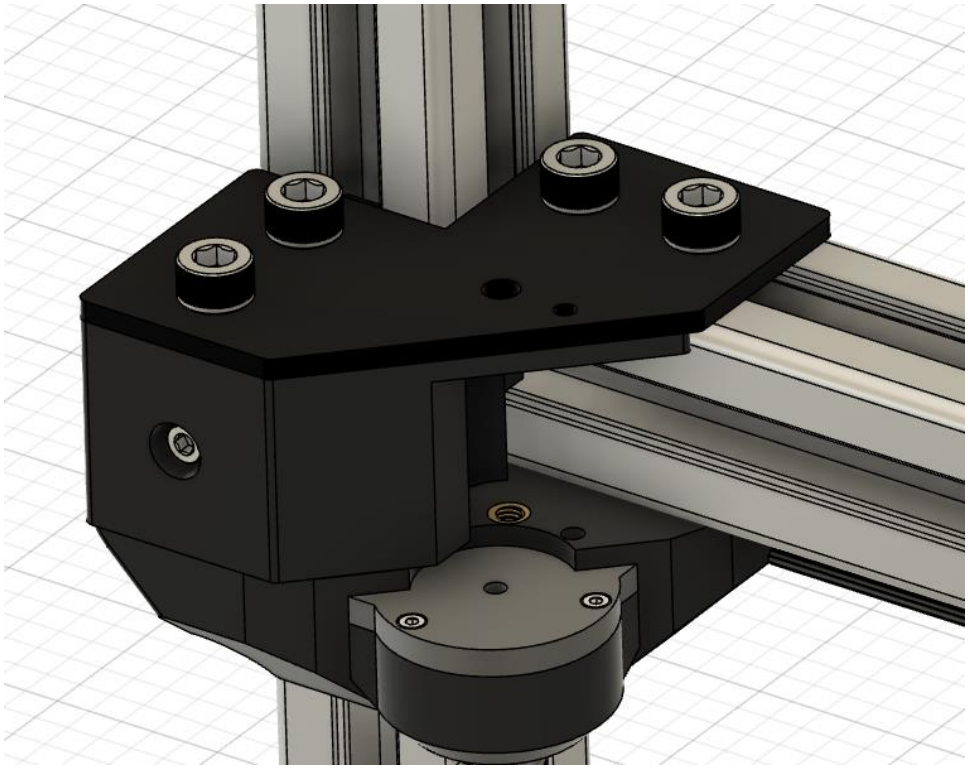


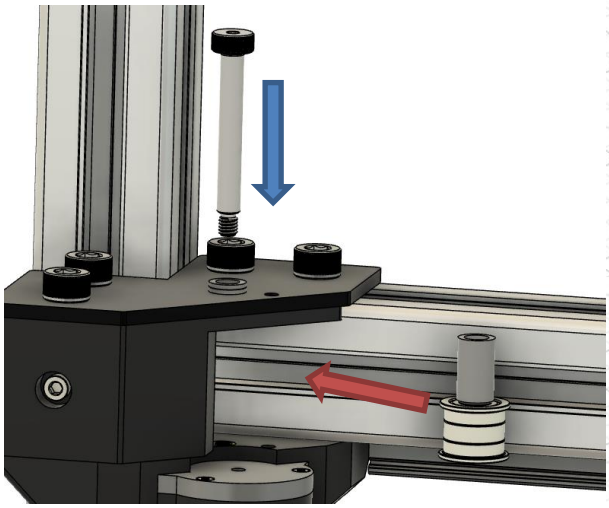
Place the protection top, then Secure it with the 2 M2x8

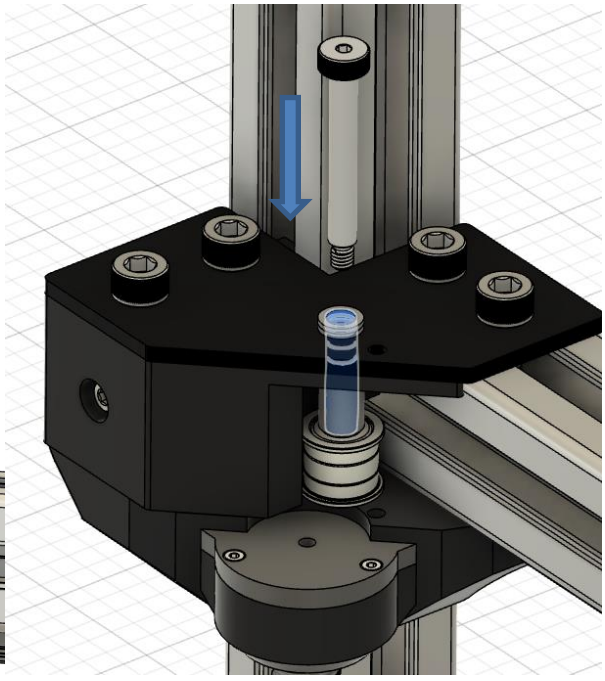




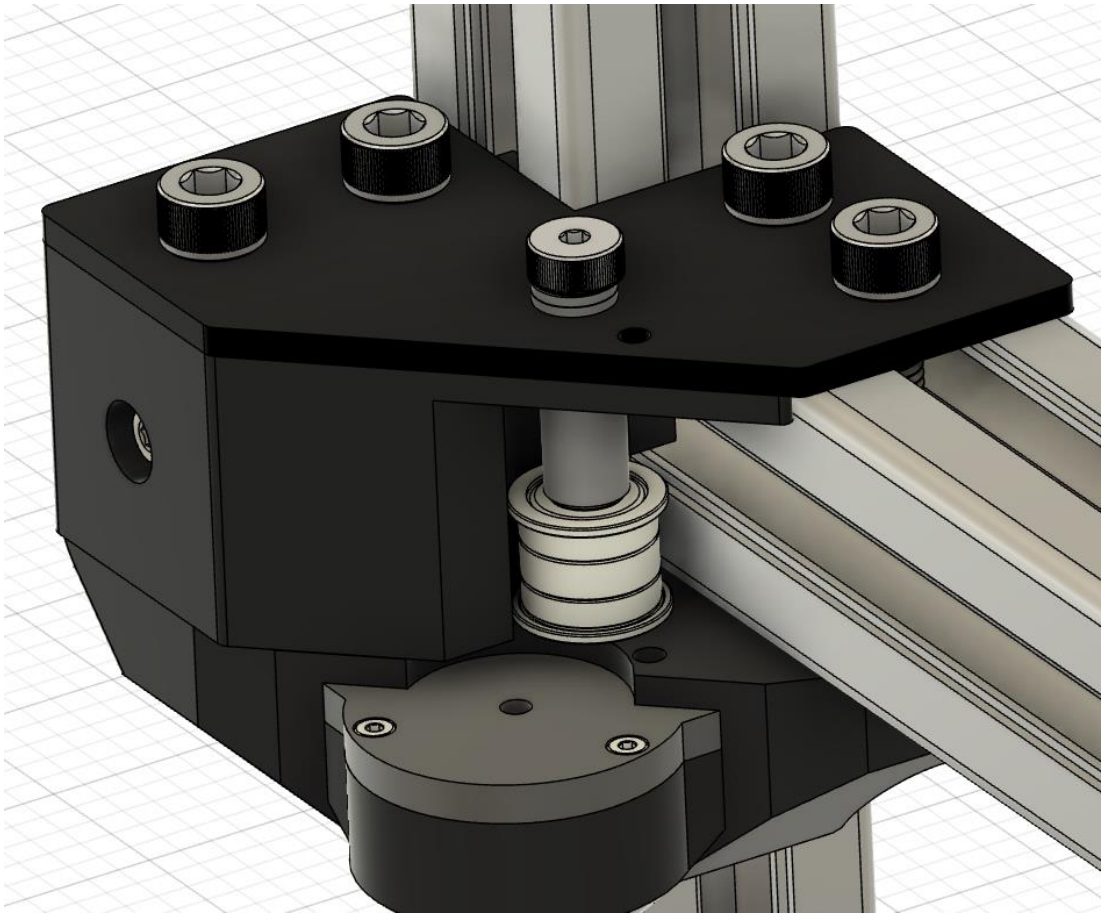
Place 2x M6x14 with 2x Tnuts, Position the plate on the top assembly, secure everything on the front side with 2x M6x14







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

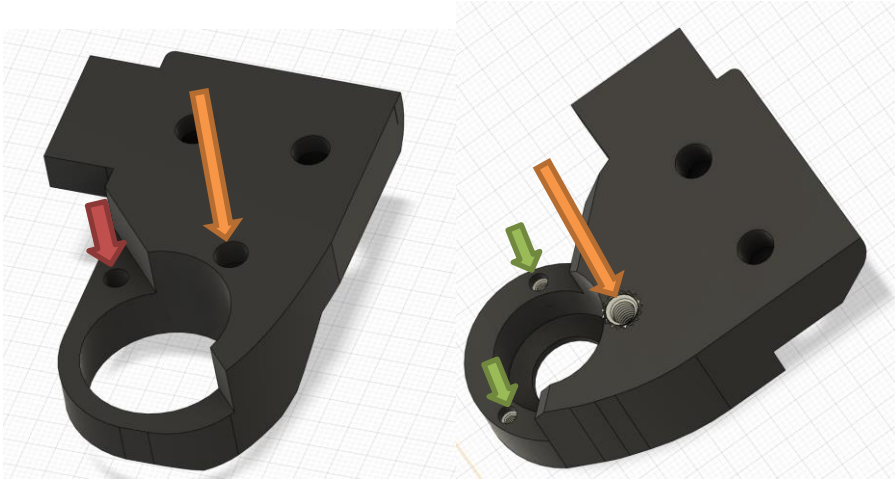


B/ Heavy duty retainer

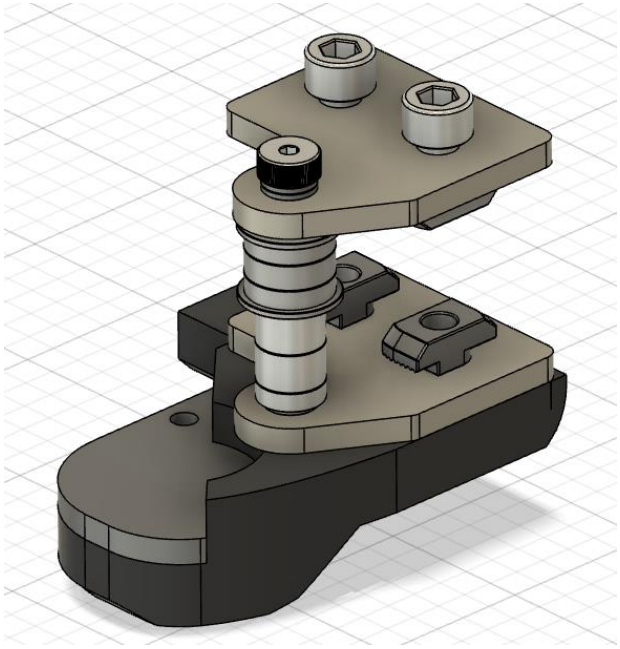
Those retainers has been designed to adapt directly on the VC3.1 new idlers plates

You can still use the other option to adapt directly on the 3.1 new front idlers plates

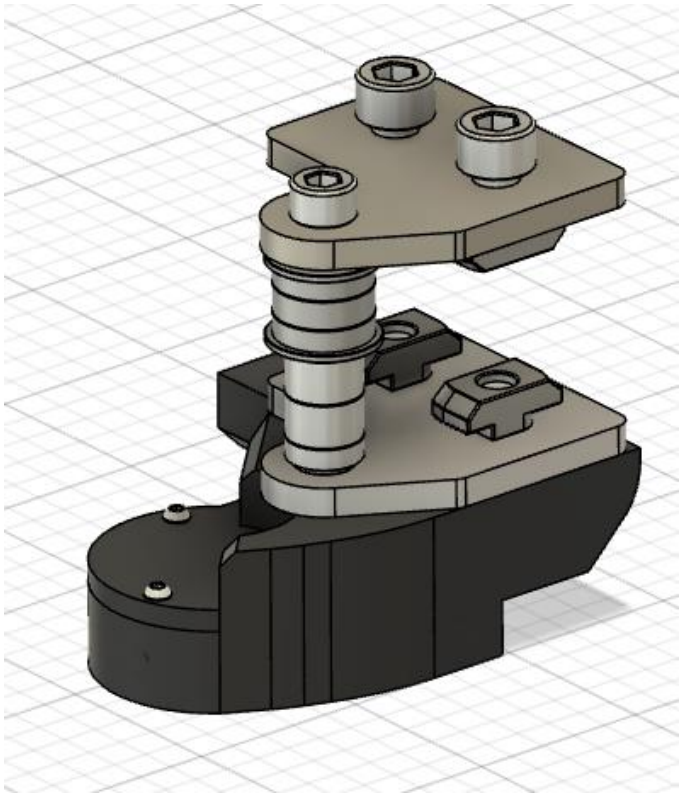
Apply an M3 and an M4 insert for the 1605 version, 2x M2 and an M4 for the 1204 version



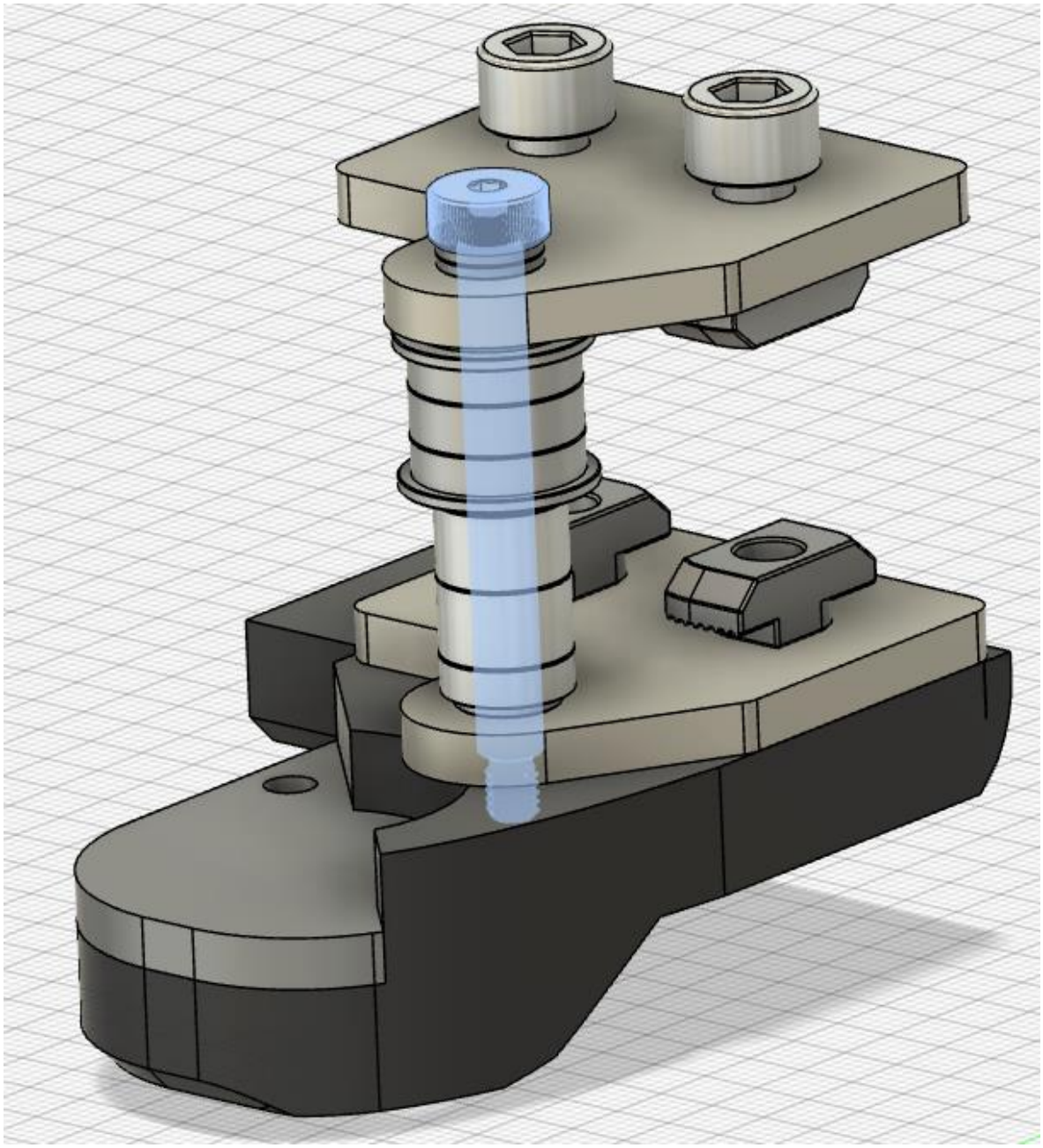
The 1605 version



The 1204 version



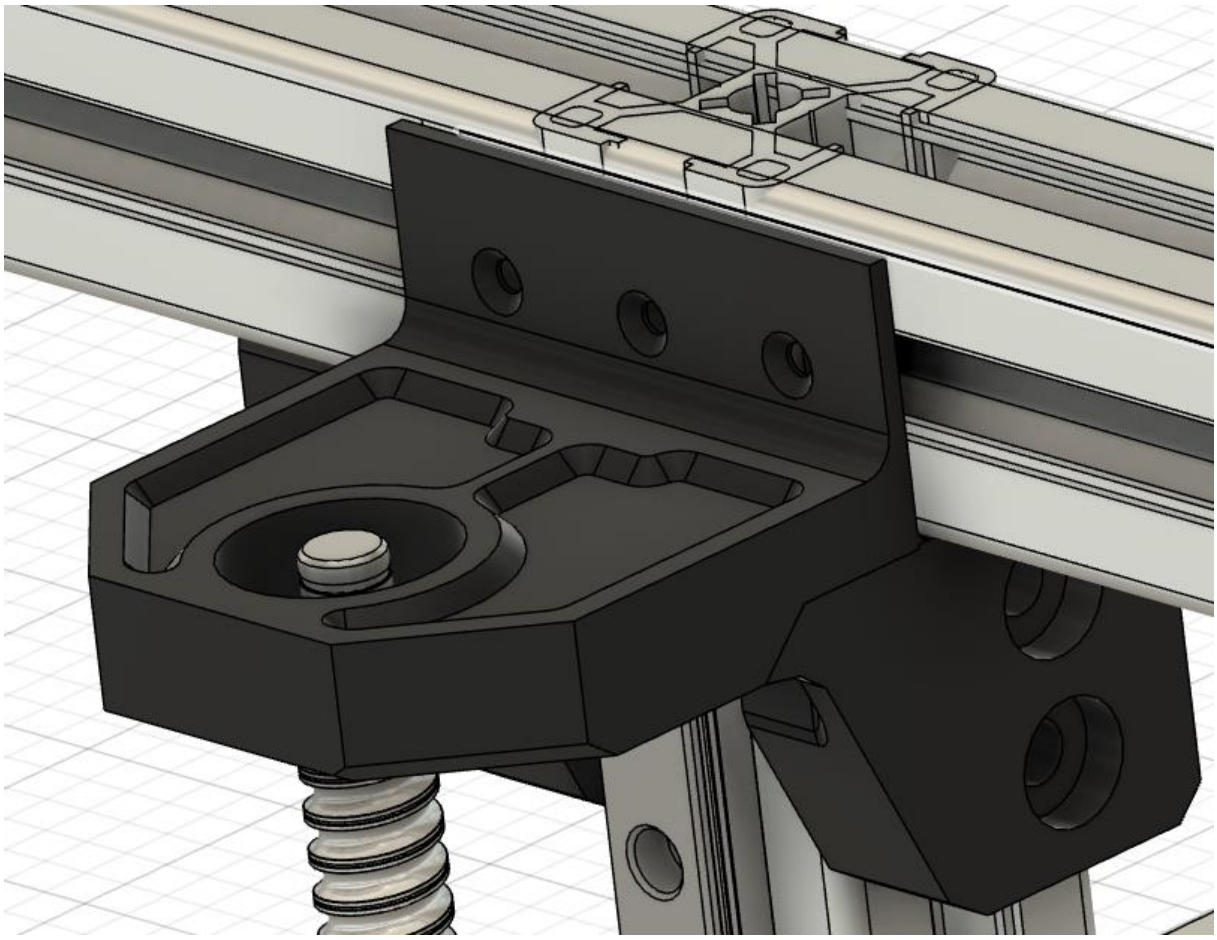
You need to substitute the “Y bumper” with this part to keep the Actual Idle Assembly



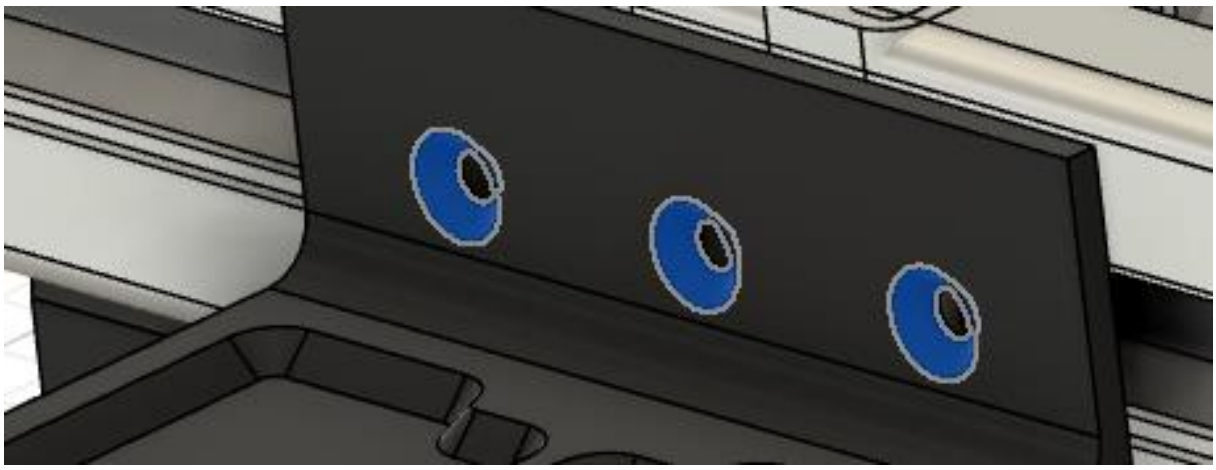
I strongly advise to swap the M5 to a D5m4 35mm shoulder bolt and accommodate the height with 2 microshim and grap the M4 insert in the bumper2

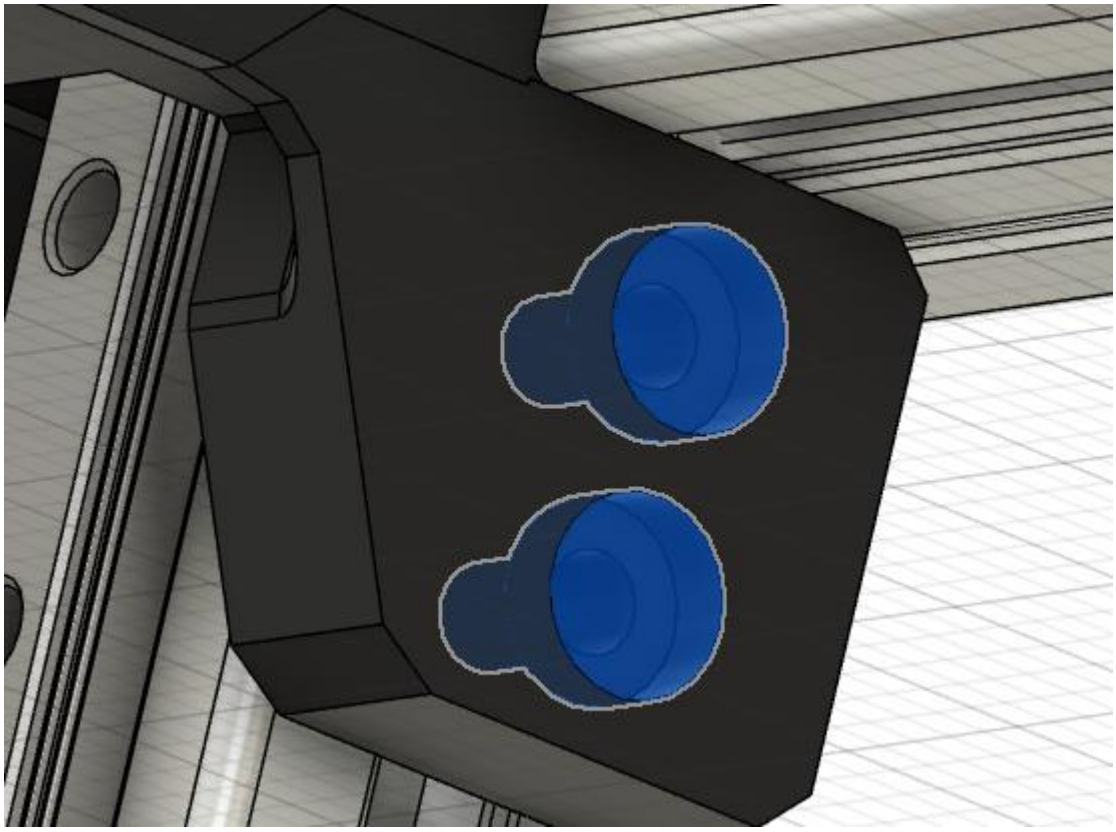
2/ Rear Retainer

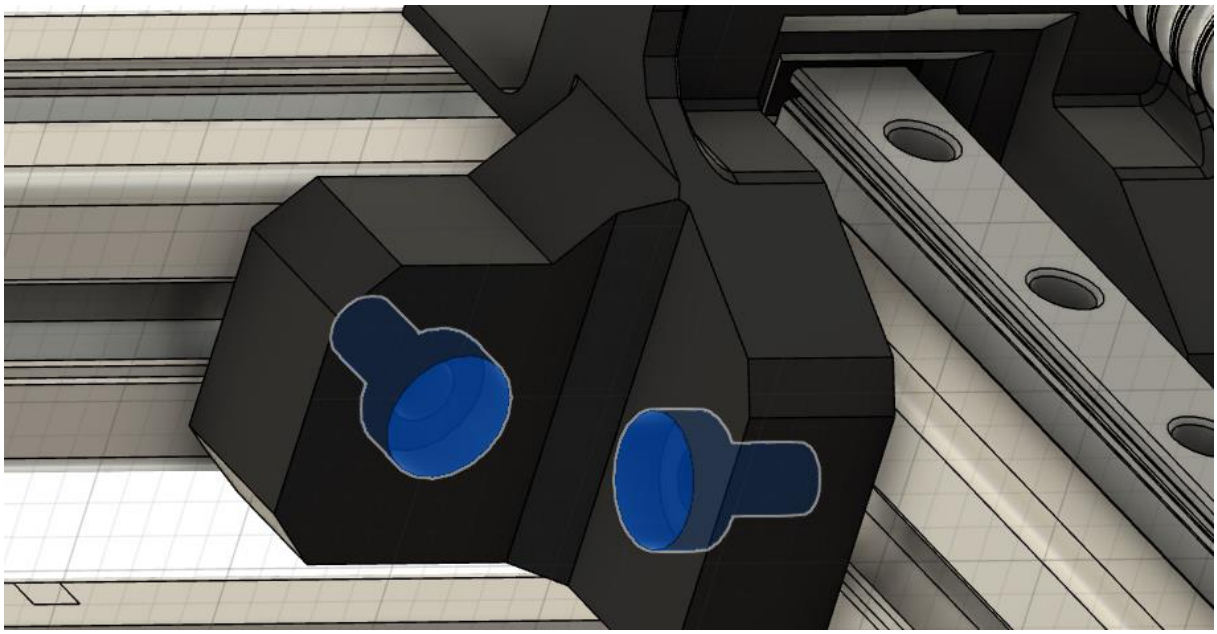
The last part is a bit of a pain, but with the help a a magnet it is completely possible



3 countersunk m3x8 with 3 M3 T-nut



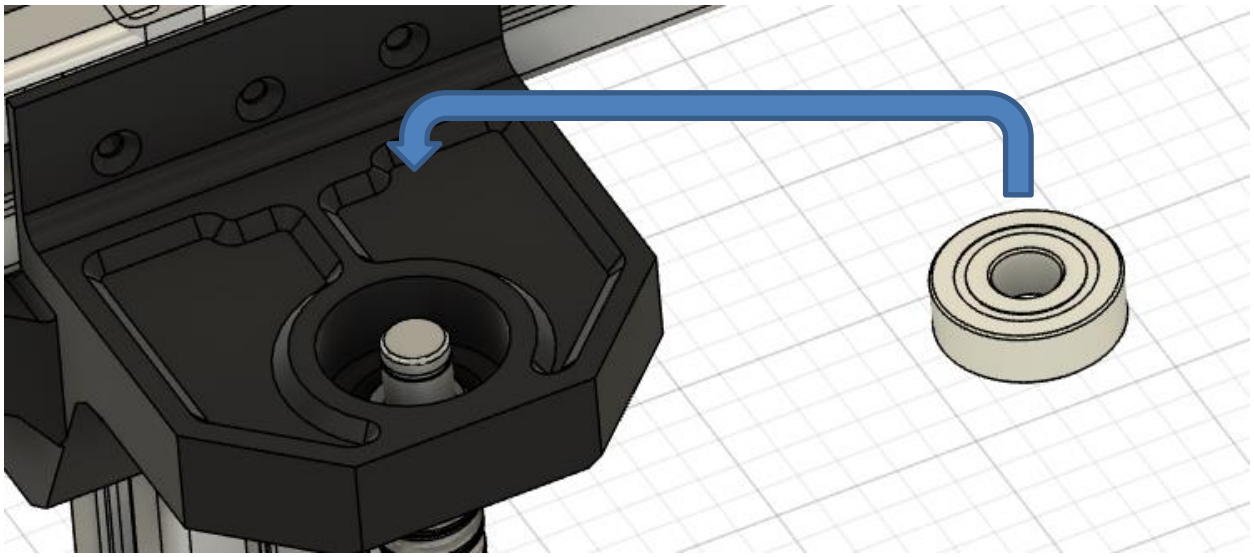


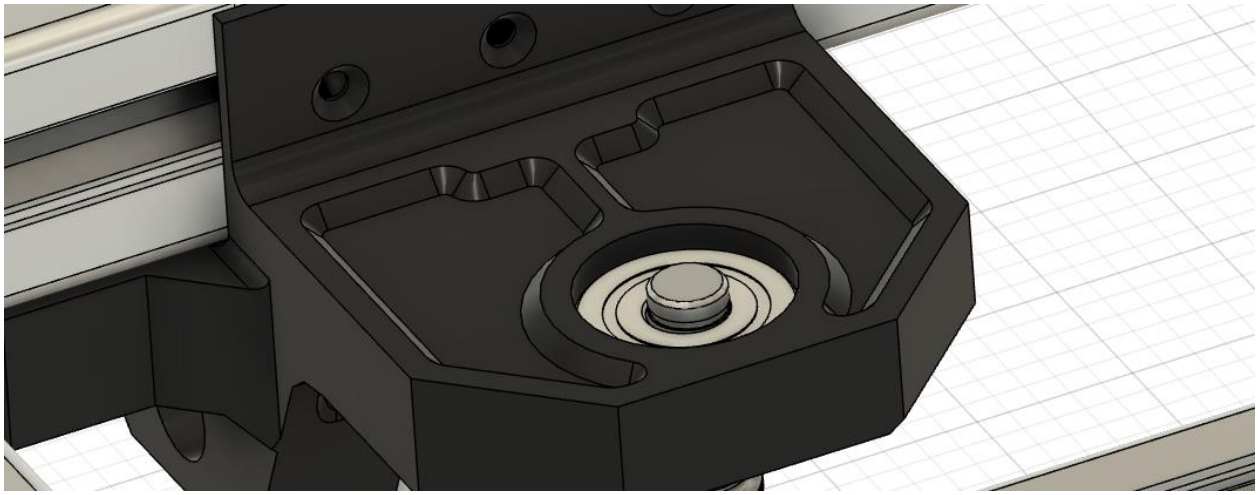


And 4 M6 with the according tnut

Once done, You can put the top 608zz bearing for the 1204, or a 6000-zz for the 1605

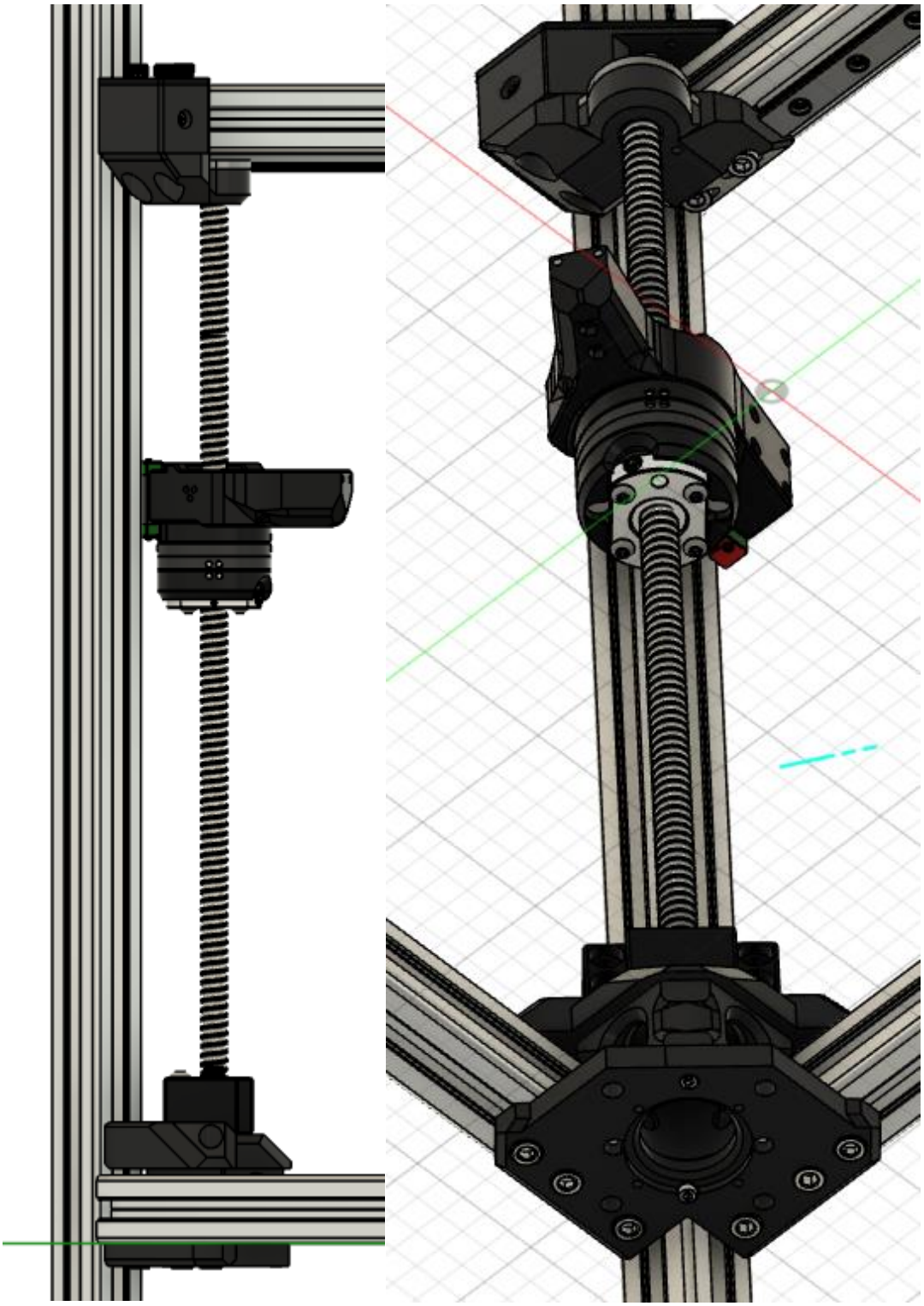
Can be recycle from the BF10 or BF12 of the SFU kit





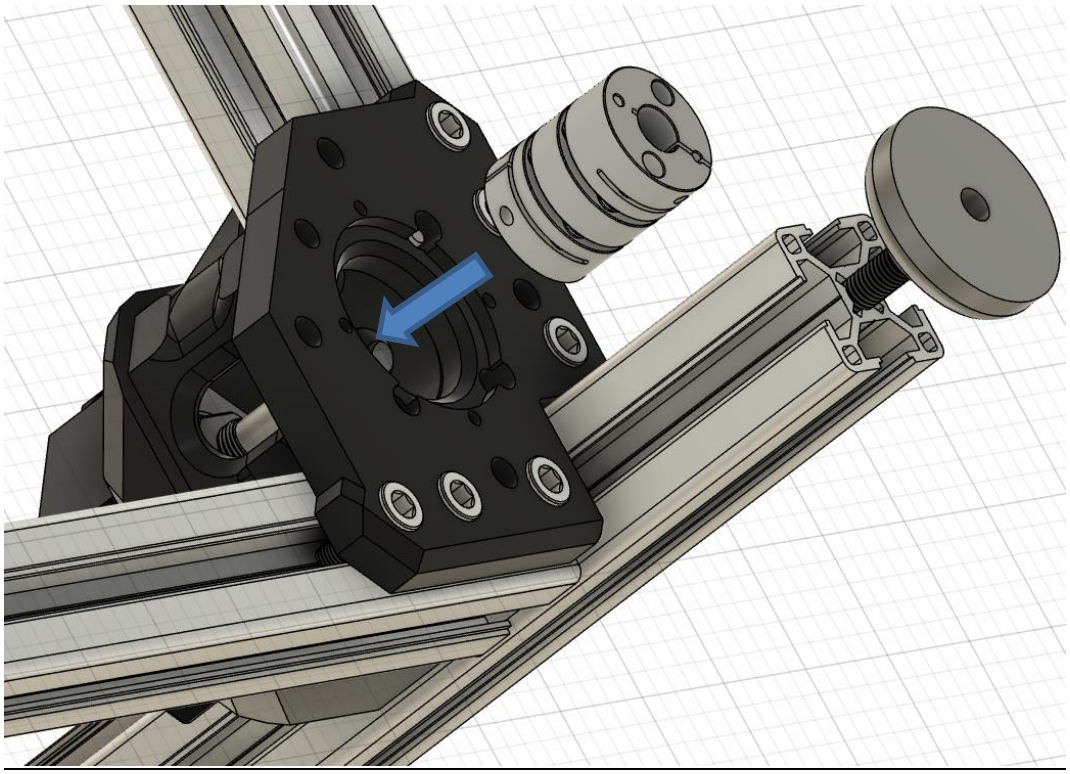
VII/ Final assembly (1204/1605)

Example: Here the 1204 iteration with the Open front V2 (old)4

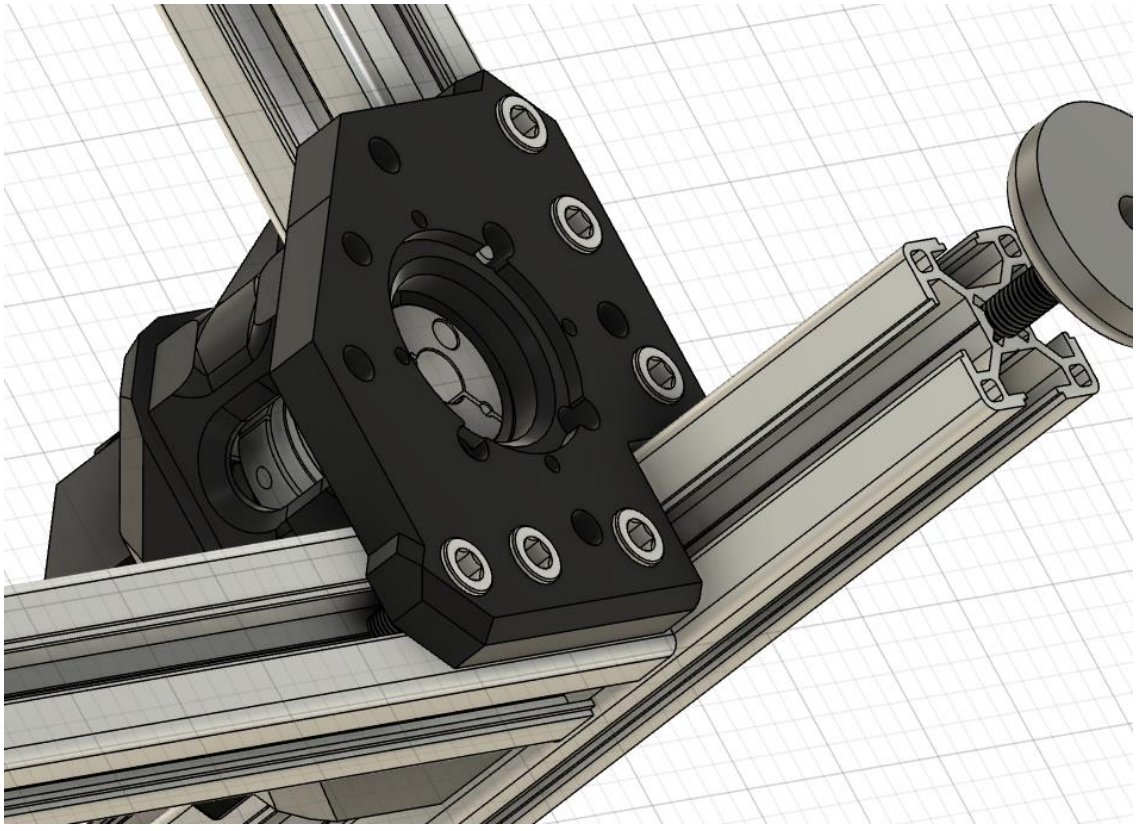


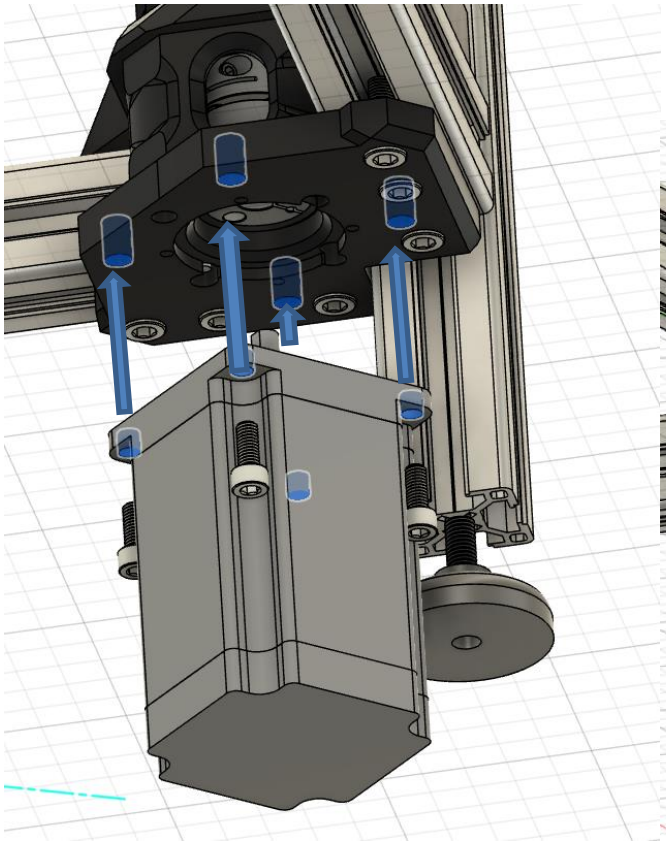
This process is the same across both front Z axis, only the idlers swapped place in the order of it.

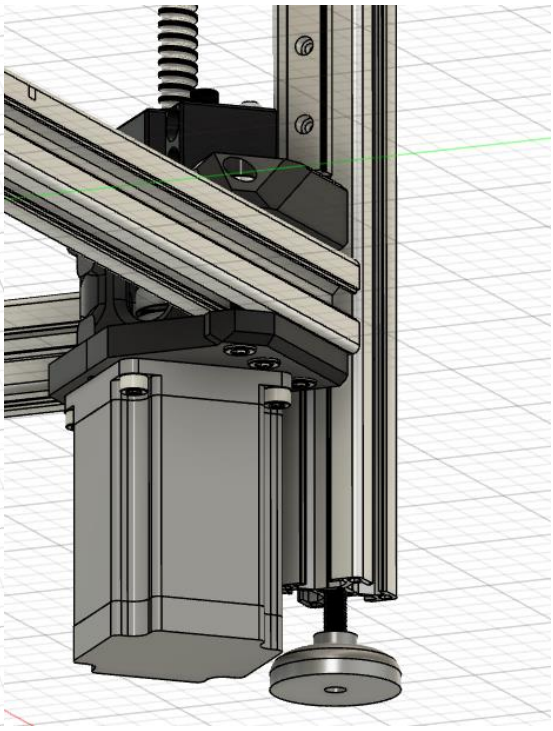
1/ Optionnal NEMA 23 Installation



Install the coupler from bellow





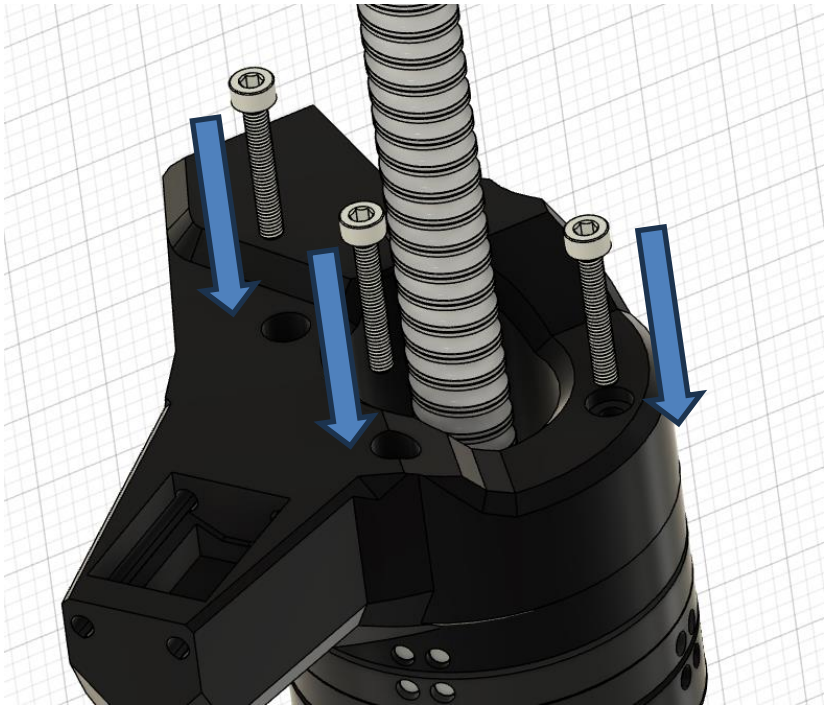


You can fix from bellow the NEMA23 (same logic for the rear pillar) with x4 M5x12 in the inserts.

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 😉

2/ ARM LOCK (1204 Only)

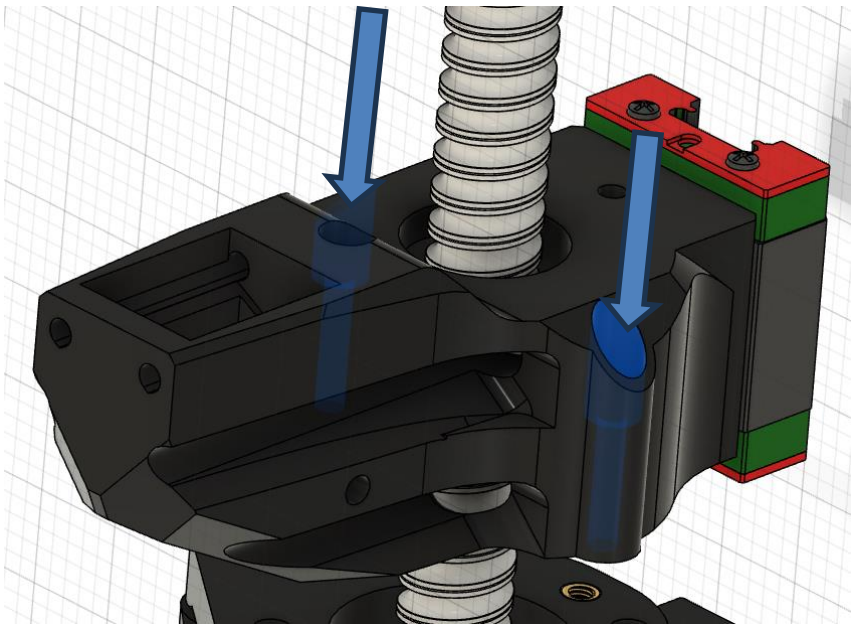
Now you can secure the 1204 Arms to the Upper ring; 3x M3x20mm for each front arm and only the 2 lateral for the rear.



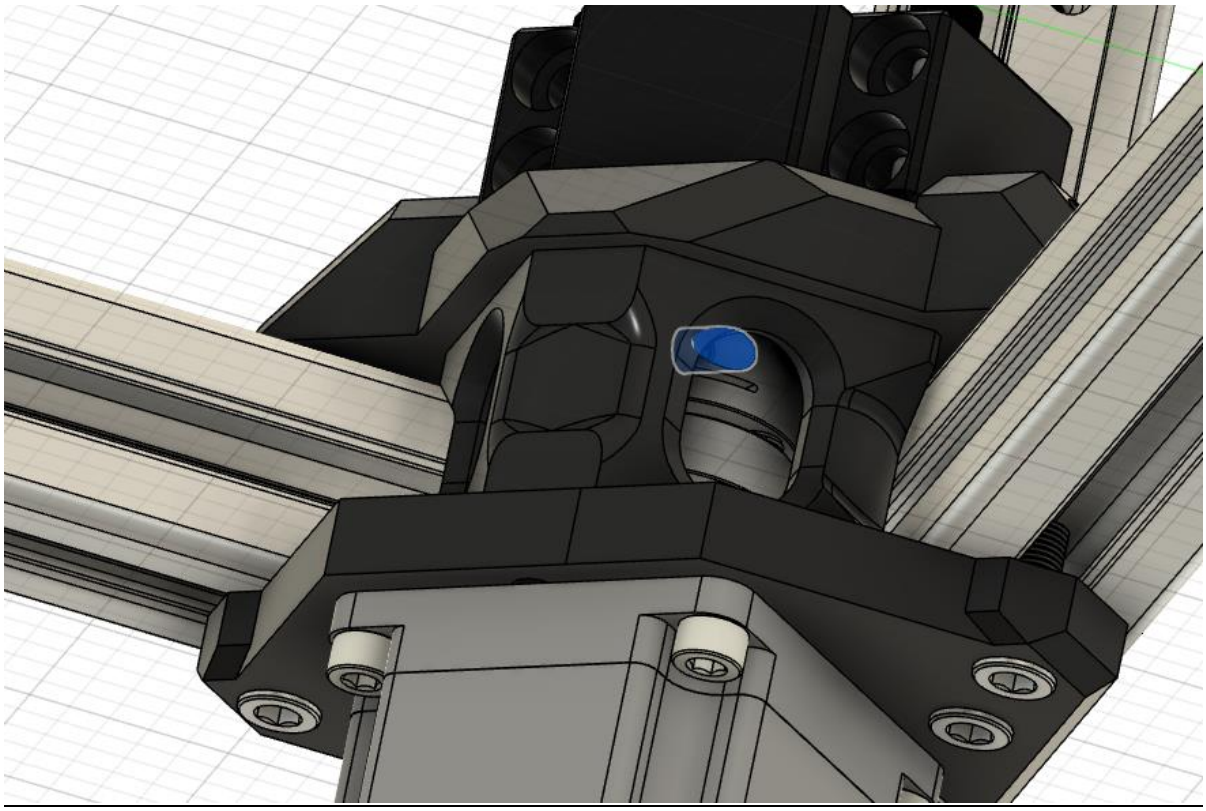
Don't forget then the upper Oldham rind have a specific layout for the front left and the front right

It comes with 2 upper ring, and a mirrored one

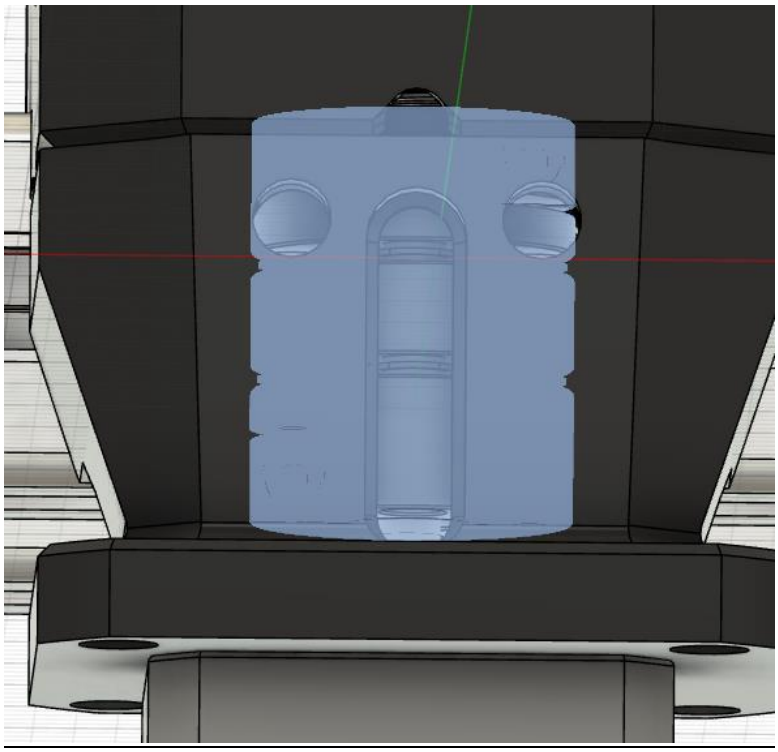
For the 1605 you already have done it.



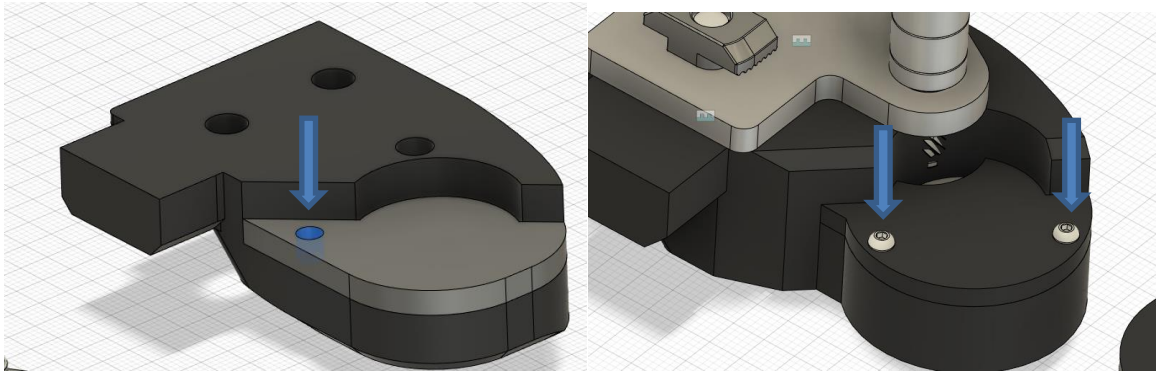
3/ Secure the Couplers (1204/1605)



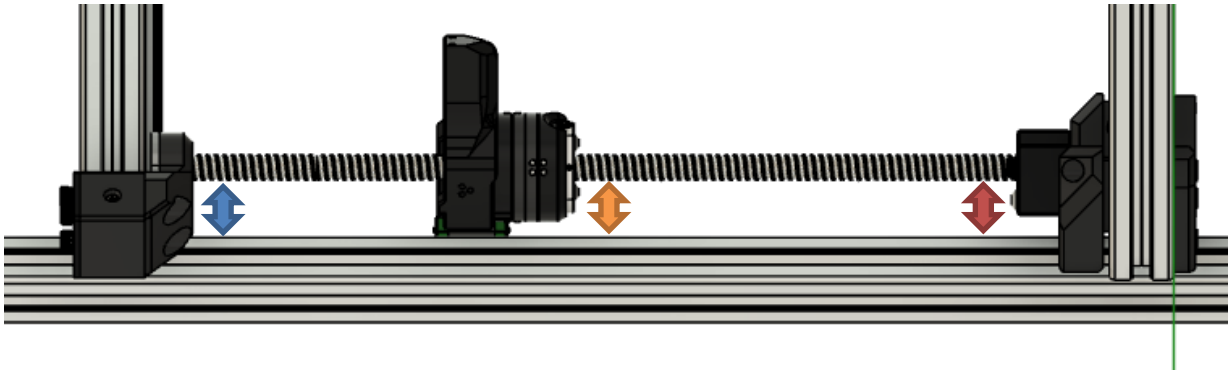
Through the Middle part openings, you can access the M3 screws to secure each axis

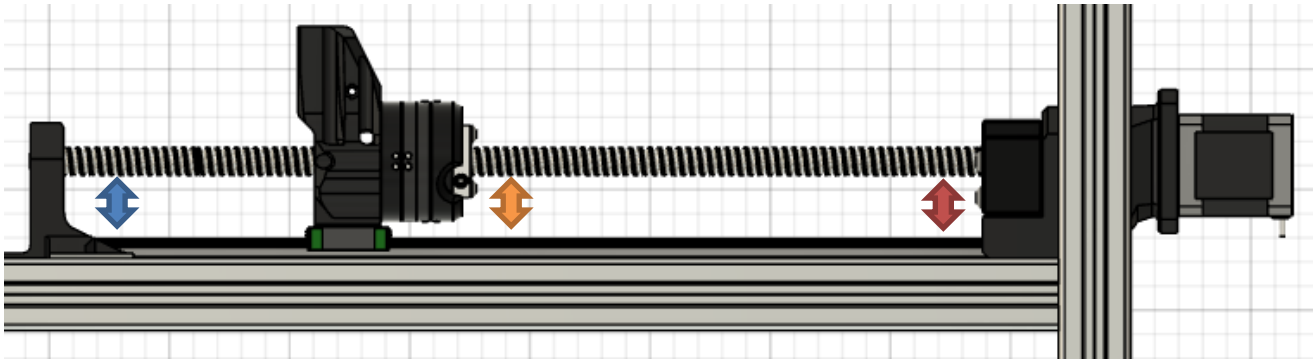


4/ Optionnal: Close the upper front retainer bearing cache



5/ Alignments Checks (1204/1605):





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.

VIII 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

IX 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

Thanks to you and your support

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