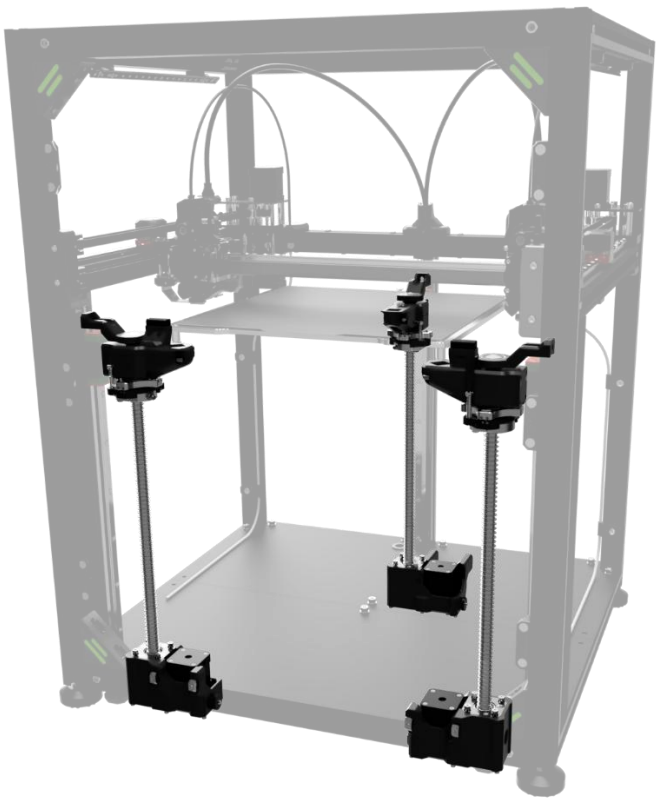
Z-Upgrade 4.0 manual

Evolutions

Indice	Date	Description de l'évolution	Auteur
0.0	30/01/2026	Création	FBR



1 Introduction

First, a big thanks if you have purchased the kit from my store, it helps me to continue development and fuel my passion

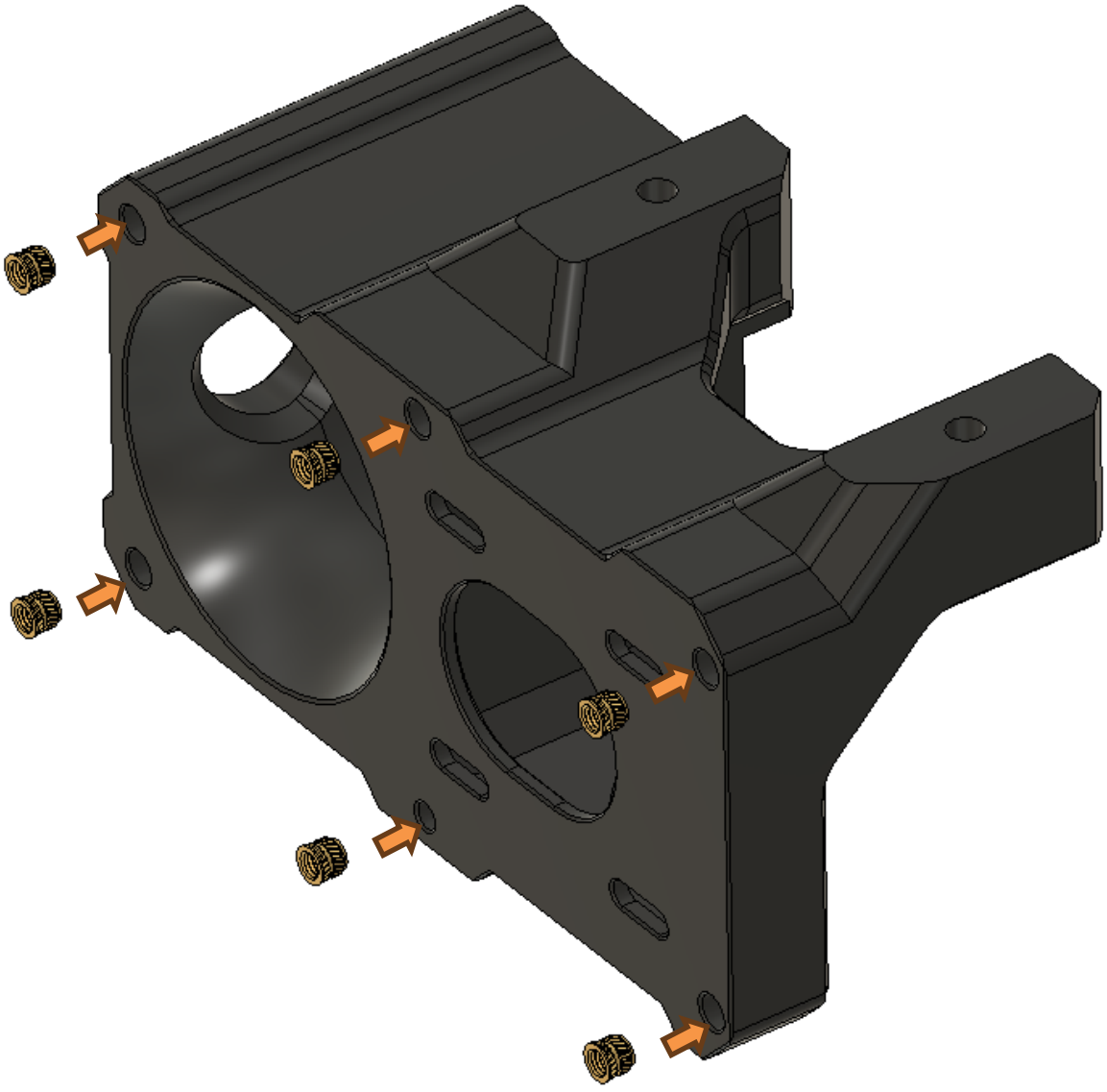
If you are a Hobbyist and make this mod on your side as DIY, welcome to the project!

2 Parts preparation

Those steps don't concern you if you bought your kit at BRS store, as I deliver it pre-assembled

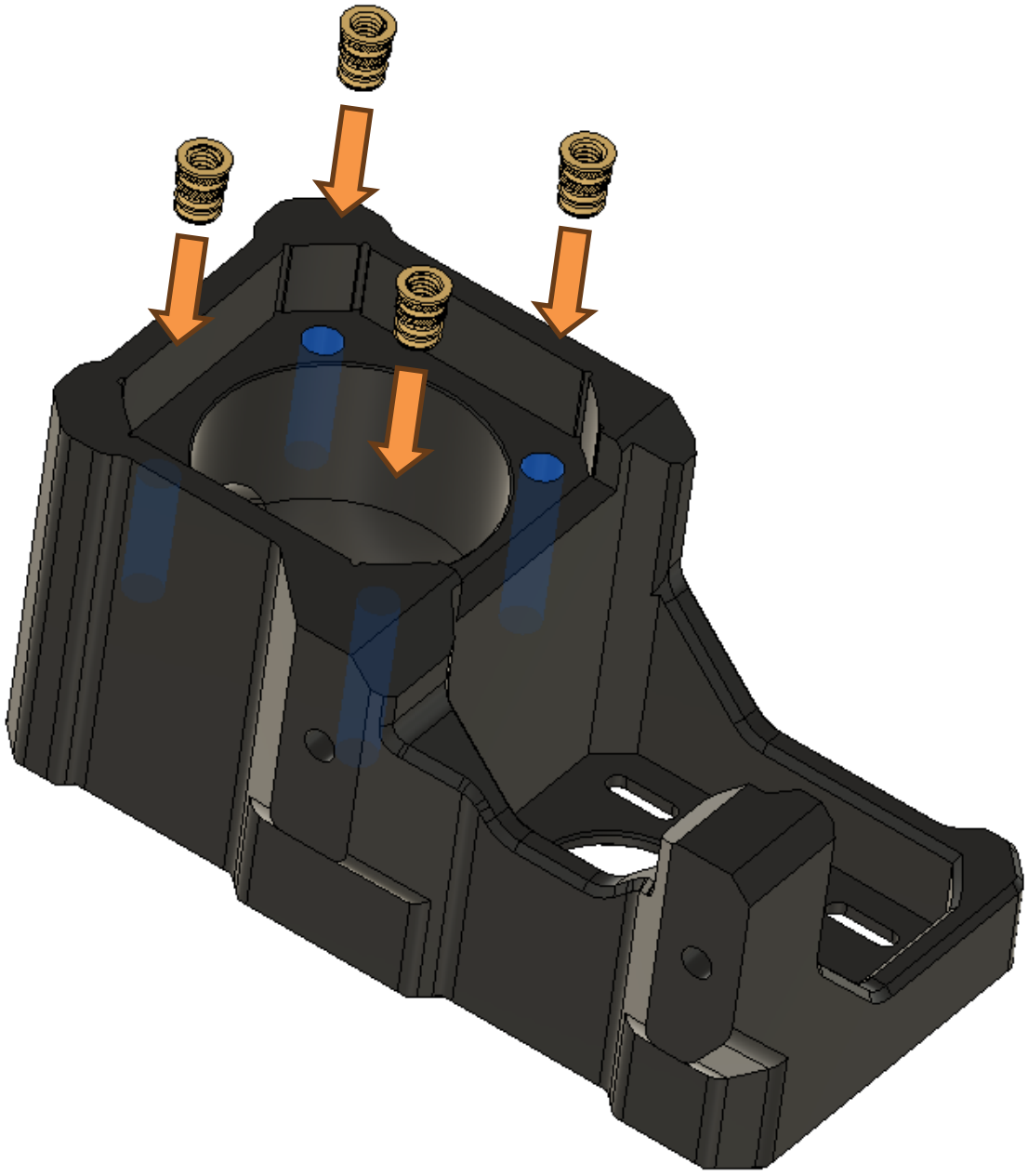
Mainparts

Place 18x M3 inserts over the main blocks, All 3 blocs have the same layout, 6 on each.

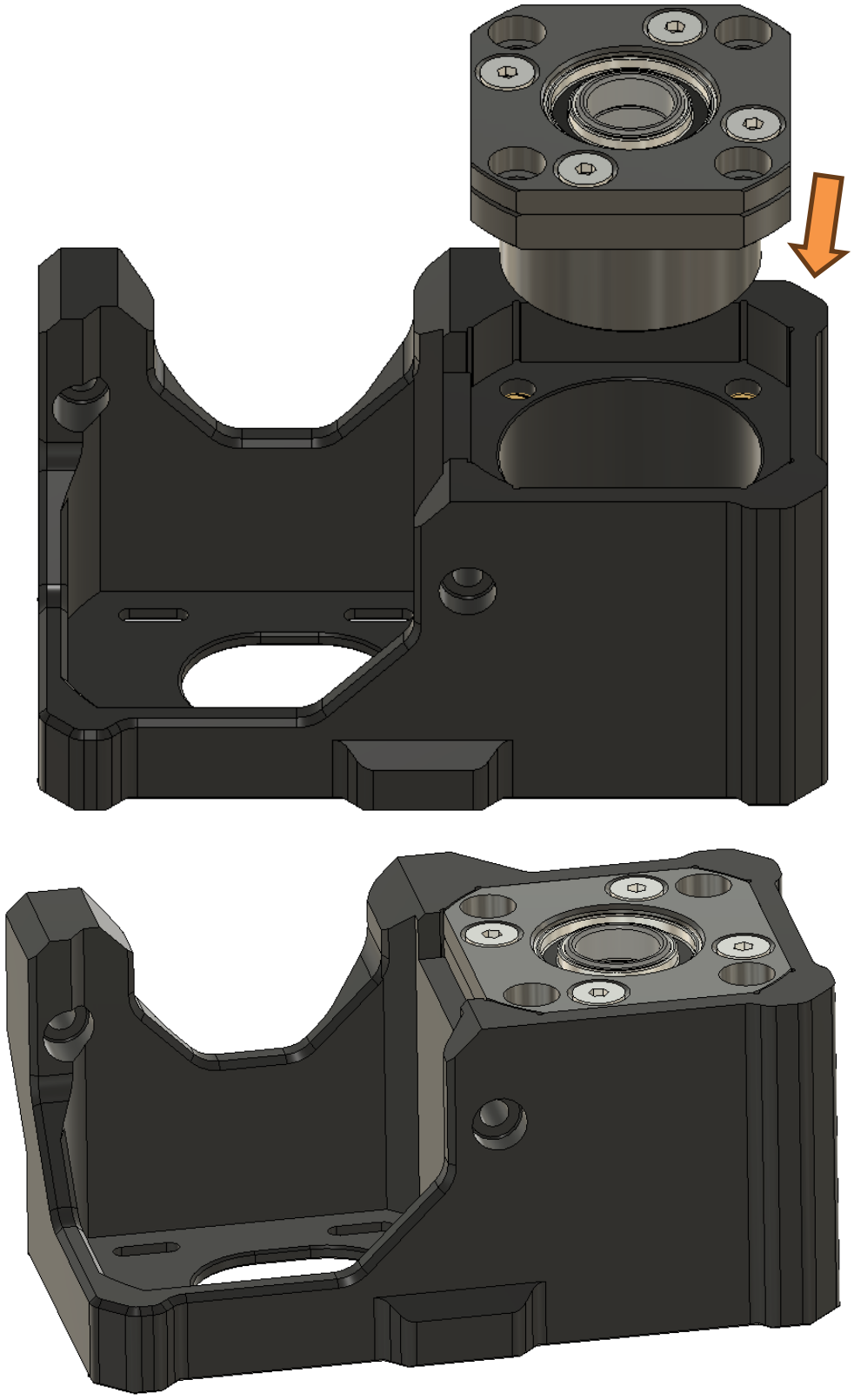


Insert the M4x10mm insert in the top of the part

A long M4 insert here is needed, the goal is to provide a strong bond

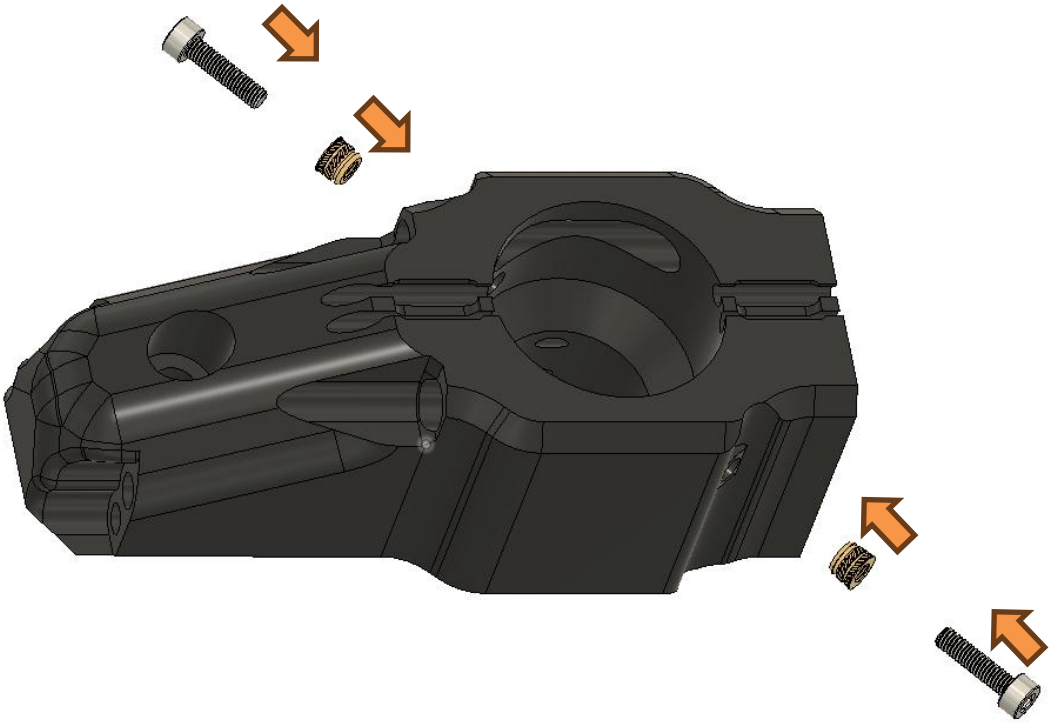


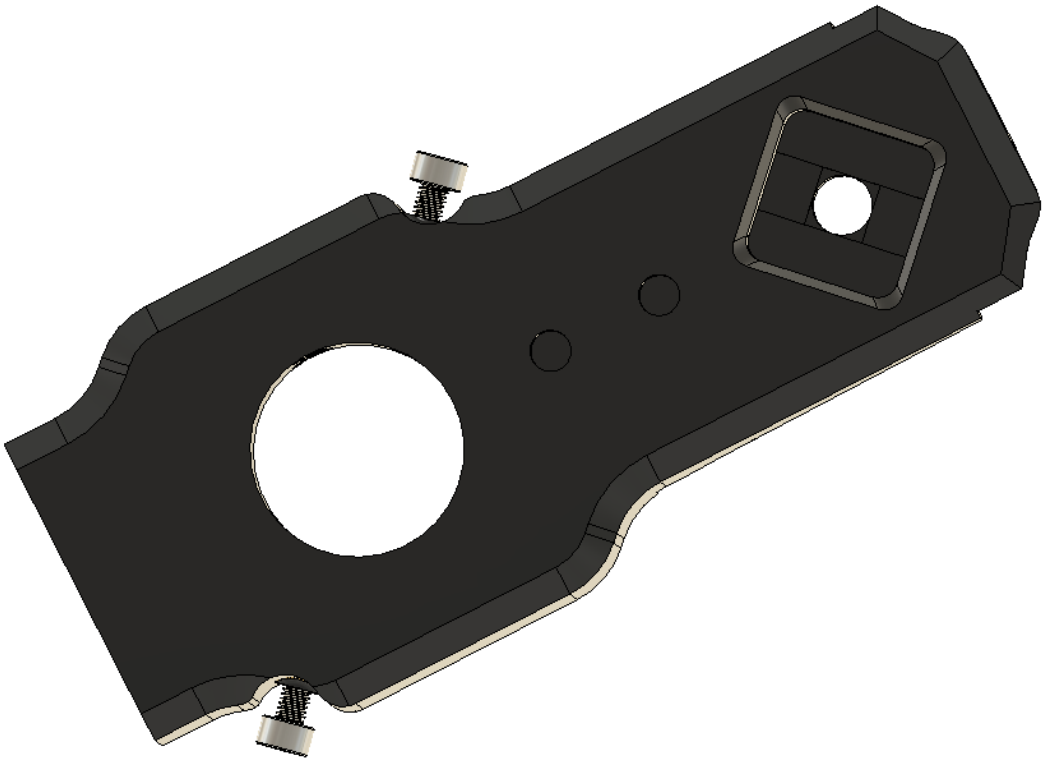
Then install the FK unit, it will lightly pressfit inside the part



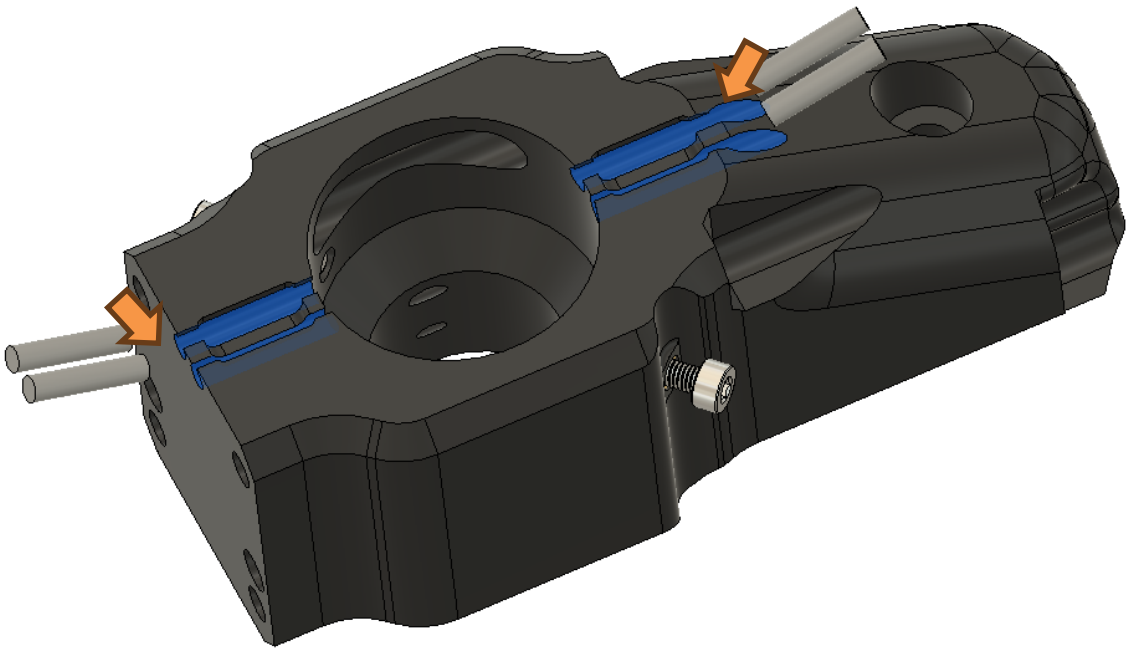
Arms

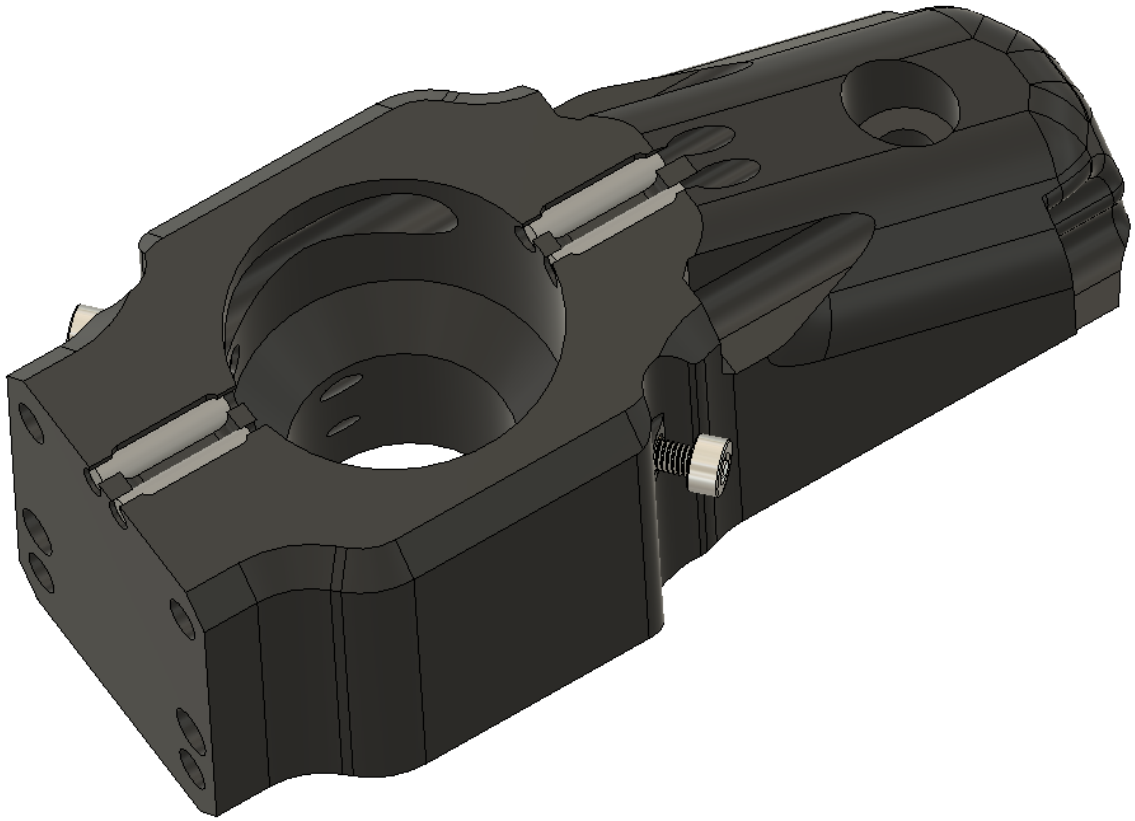
On each arms, insert 2x M3 inserts followed by the 2 M3x12mm



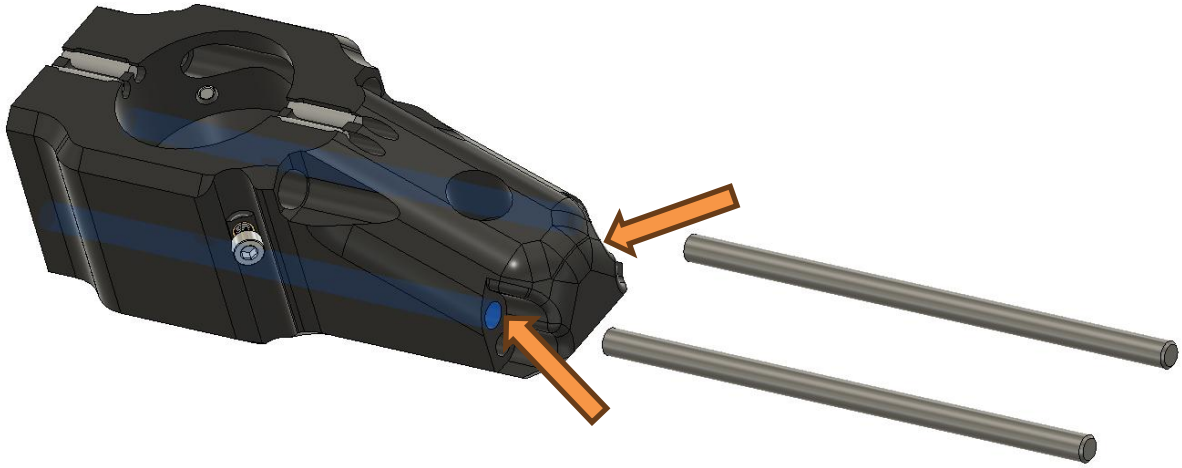


Place the 3mm pins provided with WobbleX units





If you want to reinforce the arms to use a custom bed, larger or heavier and want to be future proof, the 2 holes in each arms are here to accept 5x100mm steel rods

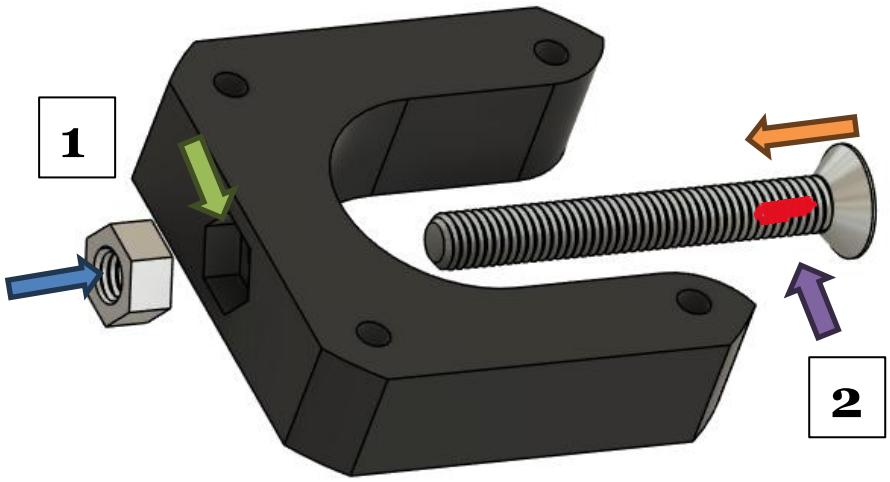


The rear arm is a bit different, one of the rod will be shorter

This step is not mandatory, tests has been made and even without those rods, no issues on the arms happened even with very heavy loads.

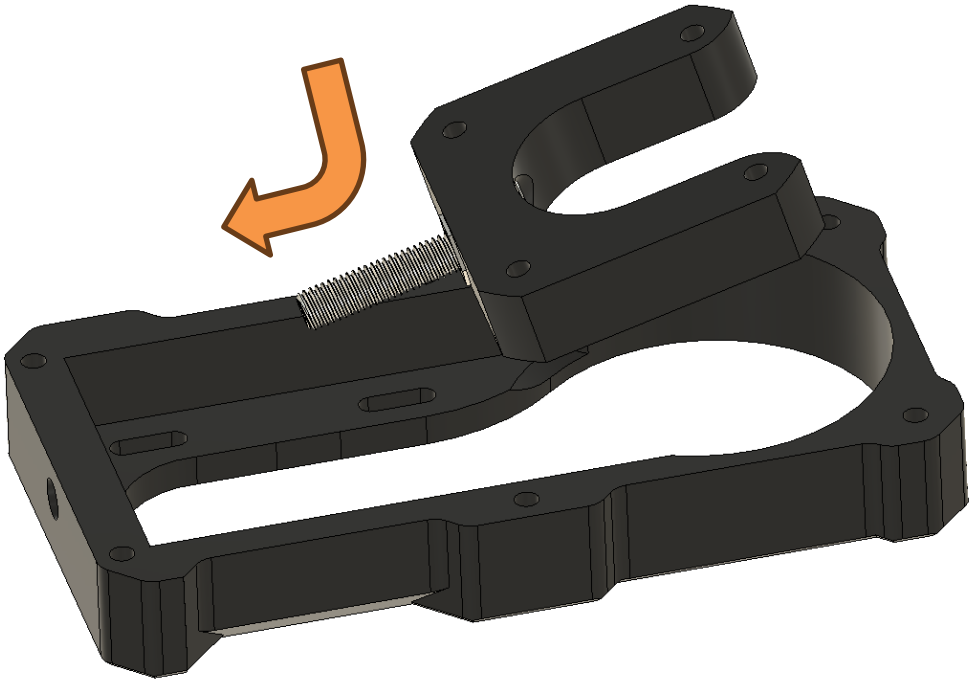
At this point you can install the wipers, and the top retainer, and the belt grabber and wire organizer following the Vcore Rat rig manual since nothing changed

Assemble the tensionner :

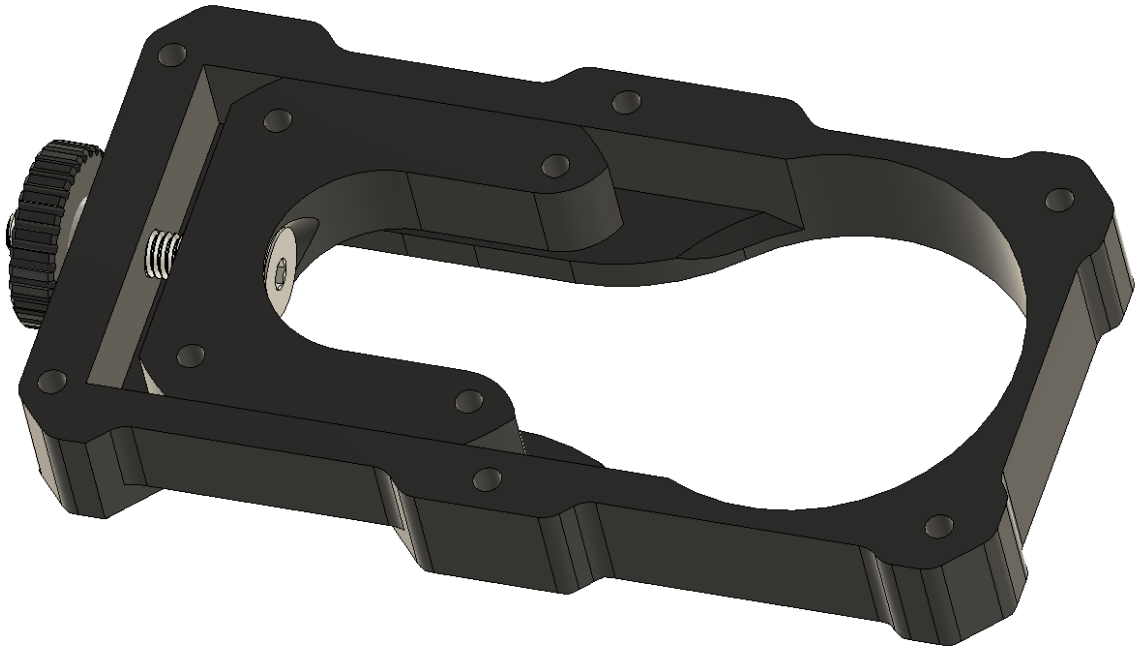


Apply glue in the nut part location. Install a M5 nut or a Nyloc M5, then let it dry 5 min. Apply glue or threadlocker on the first 6mm of the screw. Install the screw fully! Let it dry 10min

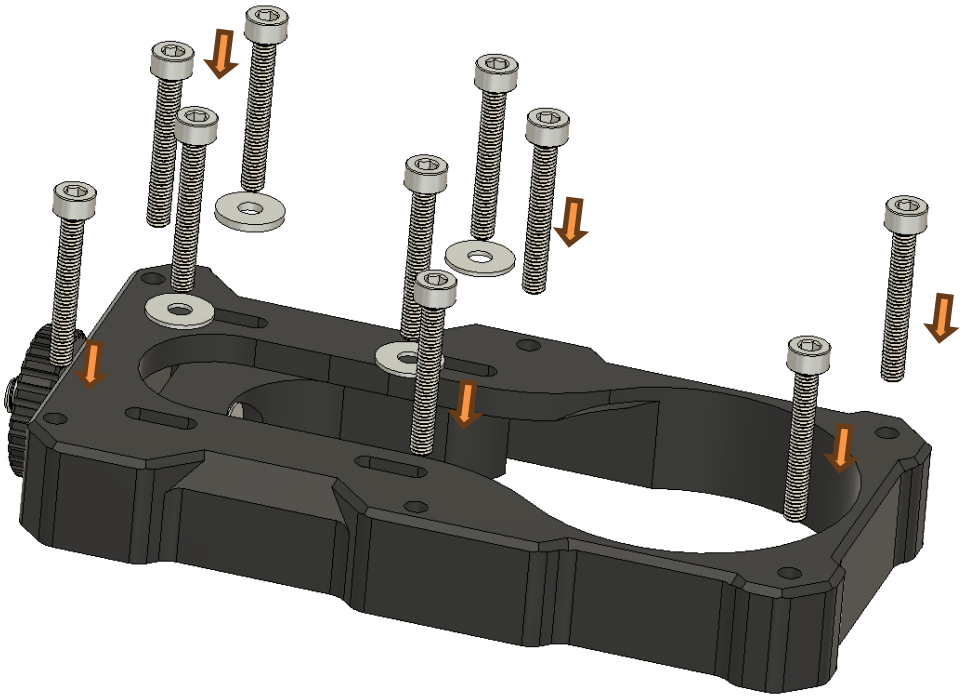
Place in inside the bottom cage

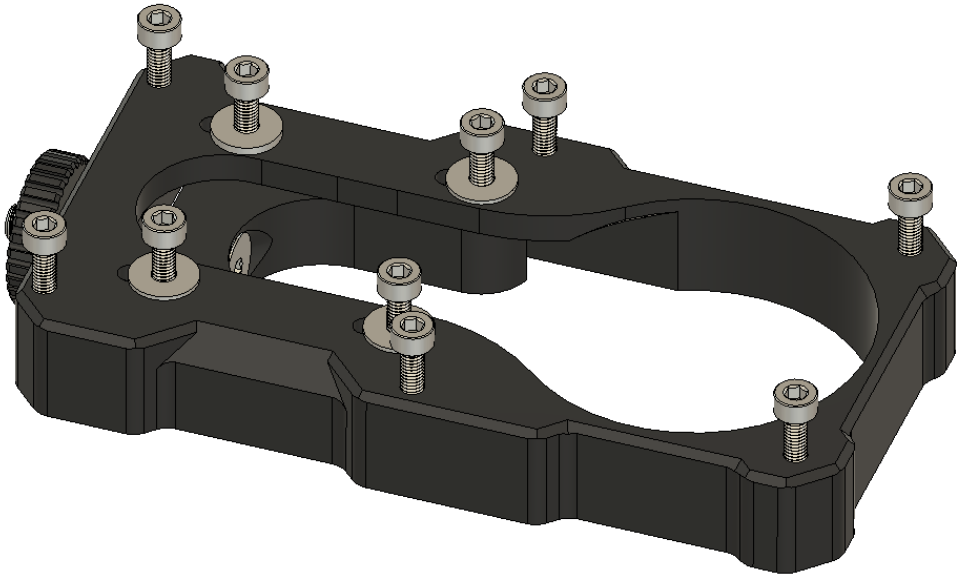


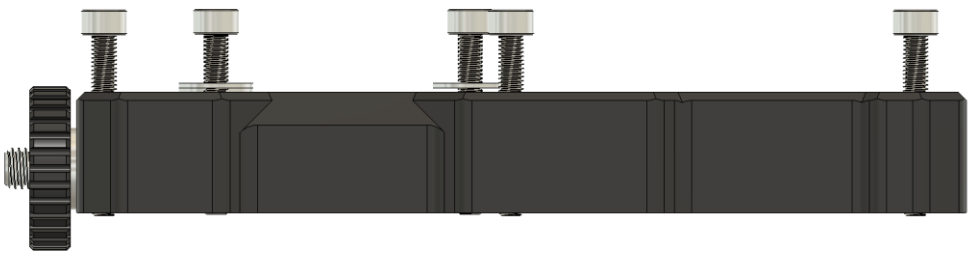
Add the washer and the knob, but don't tight it yet



Preinstall the screws for later



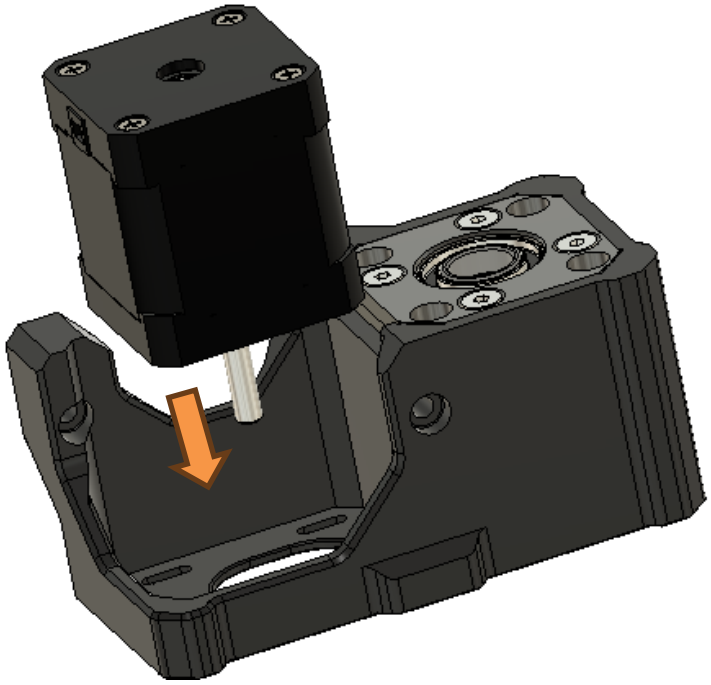


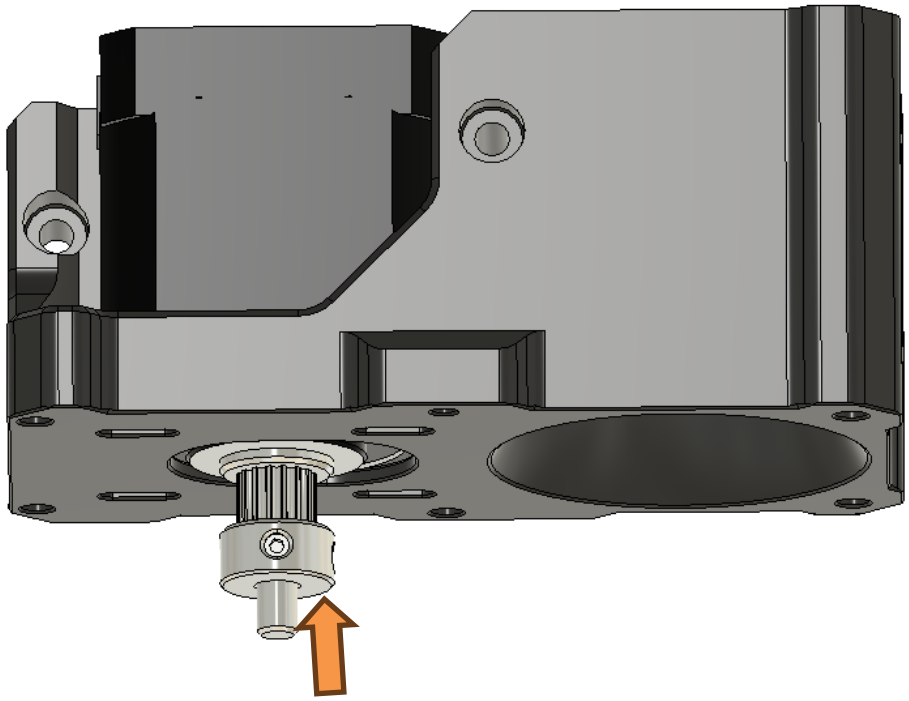


3 Blocks installation

Note: The easier way to do it is to lean the machine on the back or the side, but that is completely up to you depending the status of the machine (Kit or already assembled)

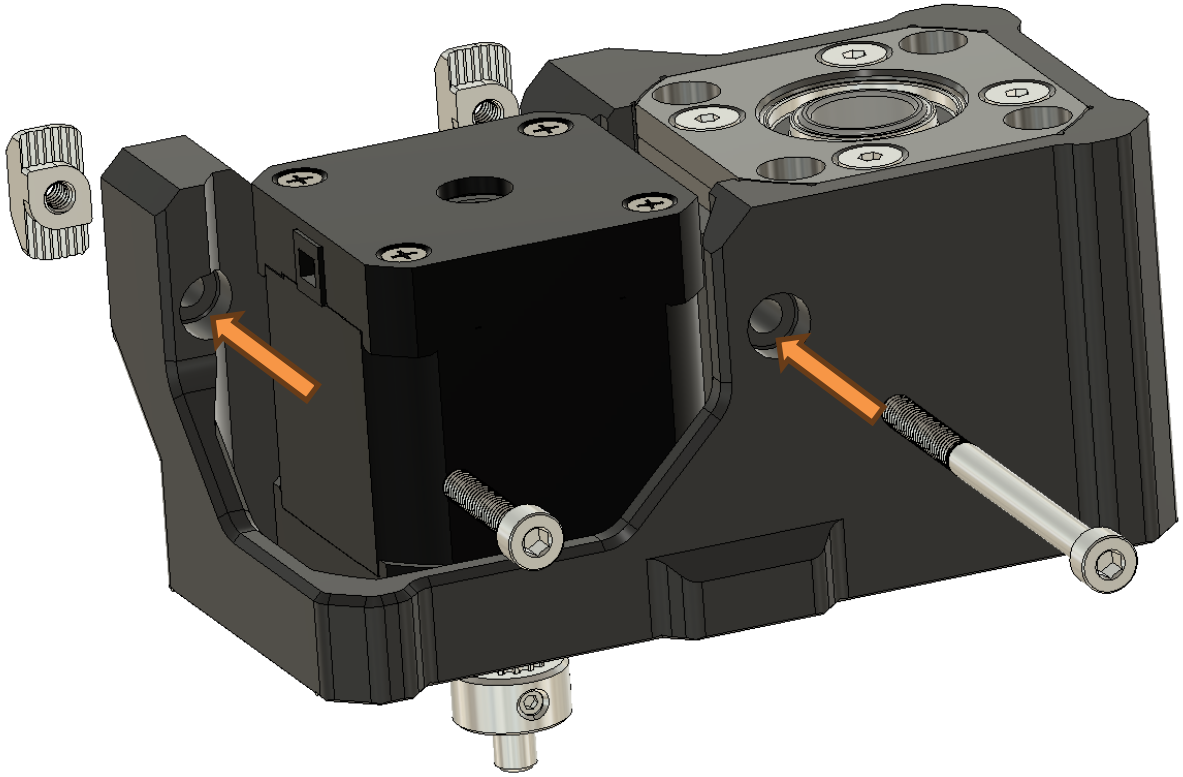
Install the NEMA17 (remember this model accept up to a 48mm motor, not more), and attach the 20T pulley.



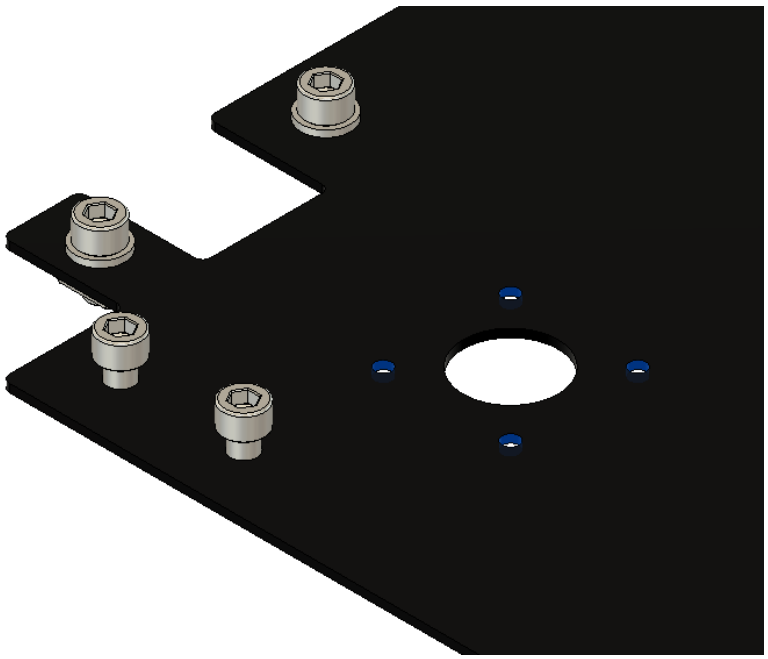


Install the M4 screws with the hammer nut (loosed) to prepare the anchoring

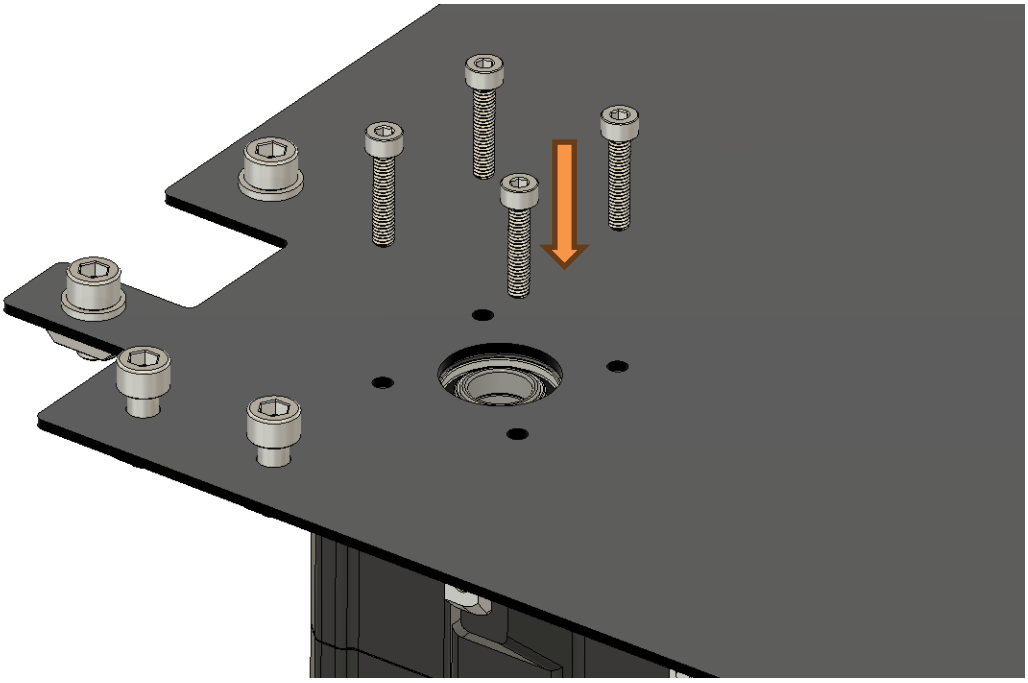
M4x60mm and M4x20mm for ech front arm, M4x20 and M4x90 for the rear block

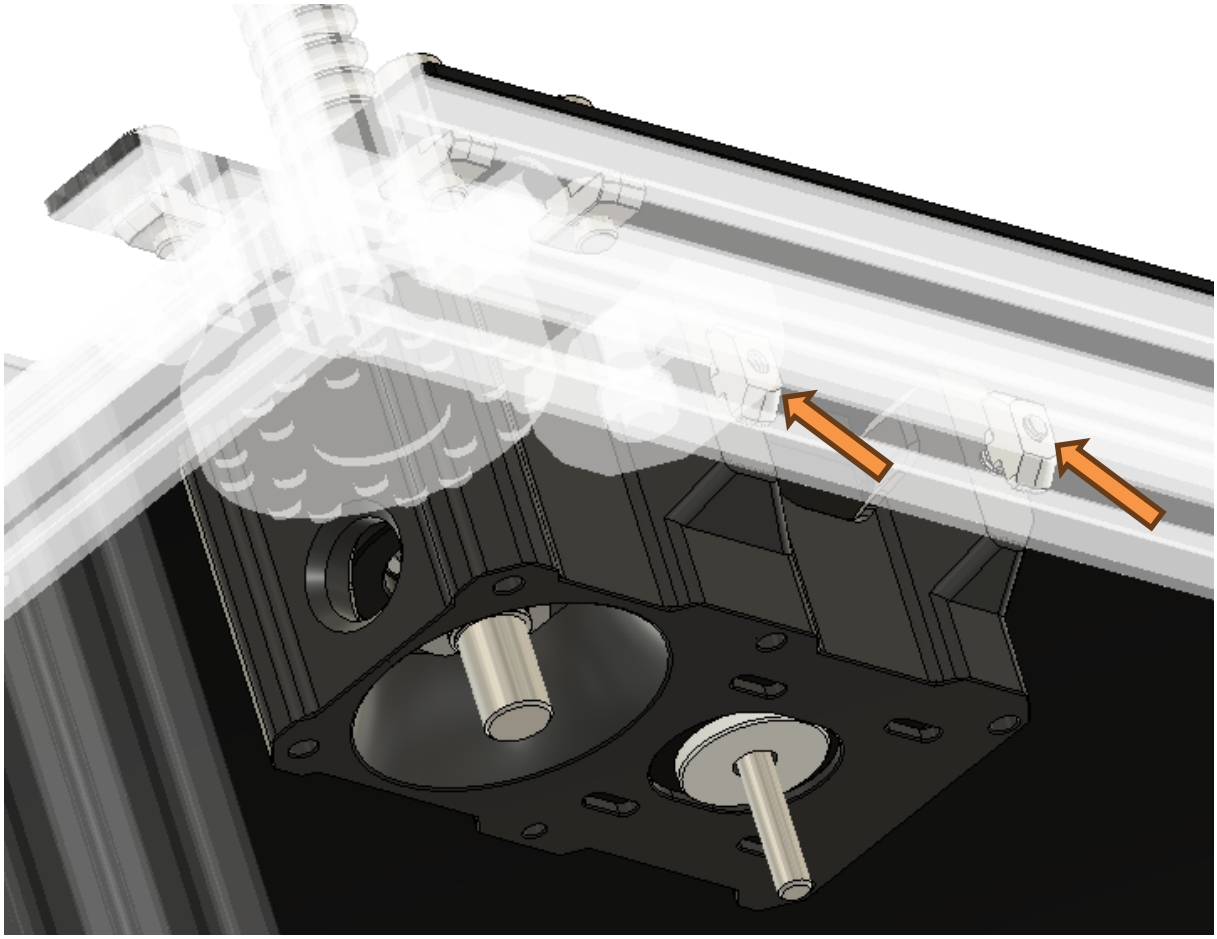


Enlarge the 3mm holes to 4mm with a 4mm drill bit



You can now place the main block in position, secure it with the 4x M4x20 screw through the plate, and the lateral screws in the extrusions with the hammer nuts

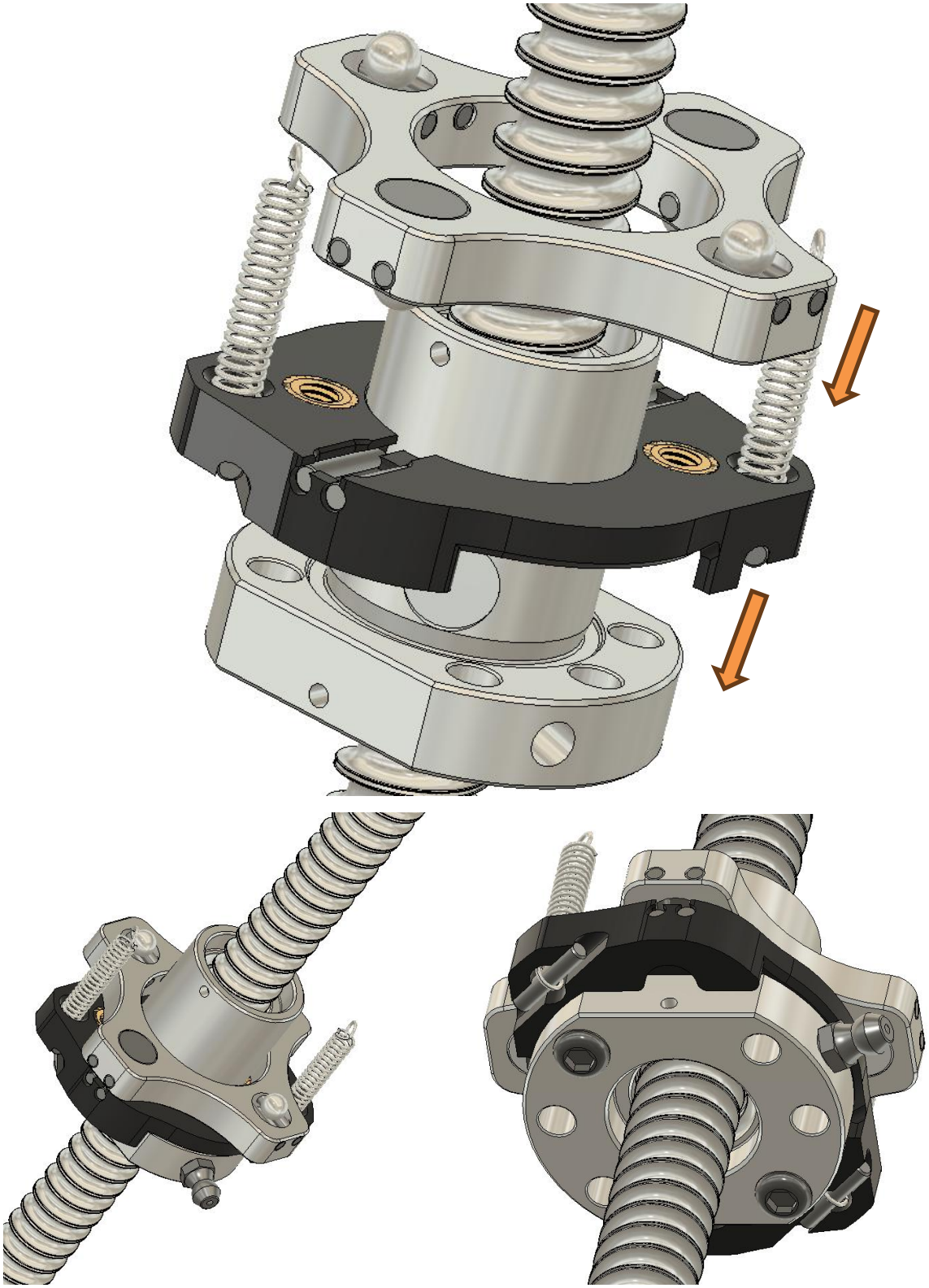




Repeat this process for the 3 blocks

4 Arms installation

On each ballscrew, installt the low ring and the WobbleX



Take the spindle assembly and insert inside the arms hole

Details

Pins locations

For the wobbleX (12/16), same logic: Add some M5x20 to fix the BS nut to the lower ring, add the WobbleX middle ring and install it the same way with the spindle motion seen above.

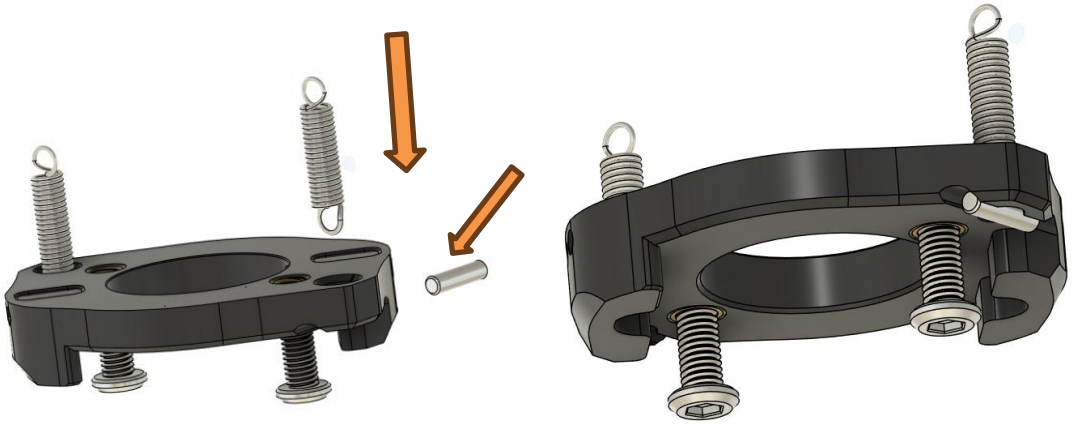
Be careful: 1204 and 1605 version got some differences:

-Discs are larger, and use a different layout, 1605 and 1204 are not compatible between each others

-Arms got a different hole layout and dimension as their pins position

At this point you can change the methods, as few exist to get to the same objective.

3.2D revision :

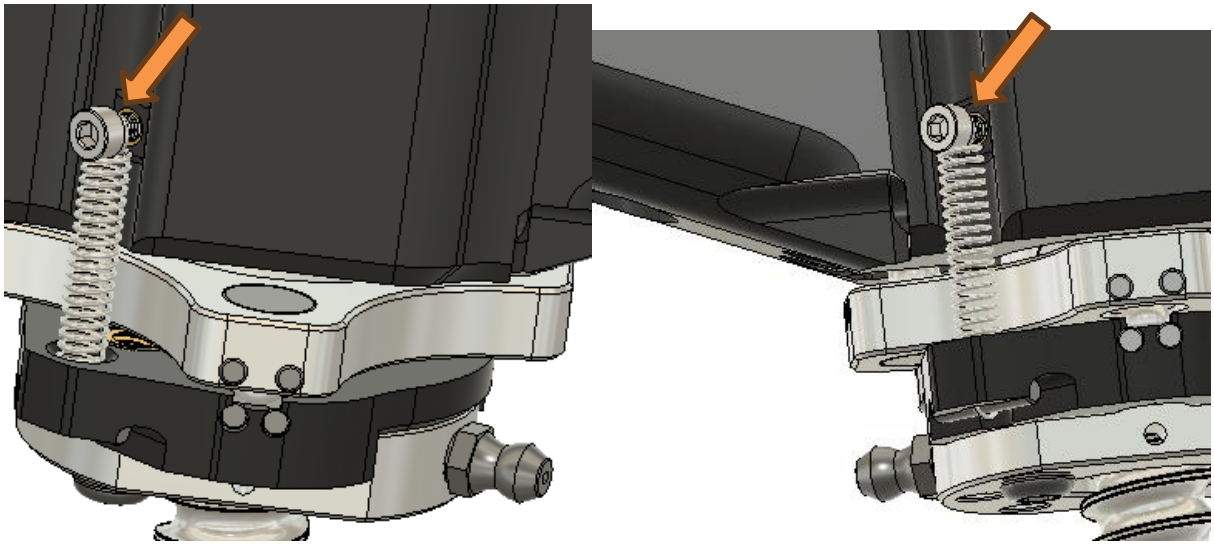


The last revision features a spring retainer to avoid lifting the full assembly and loose the ball from the WobbleX

Insert the spring in the hole, secure it with a pin

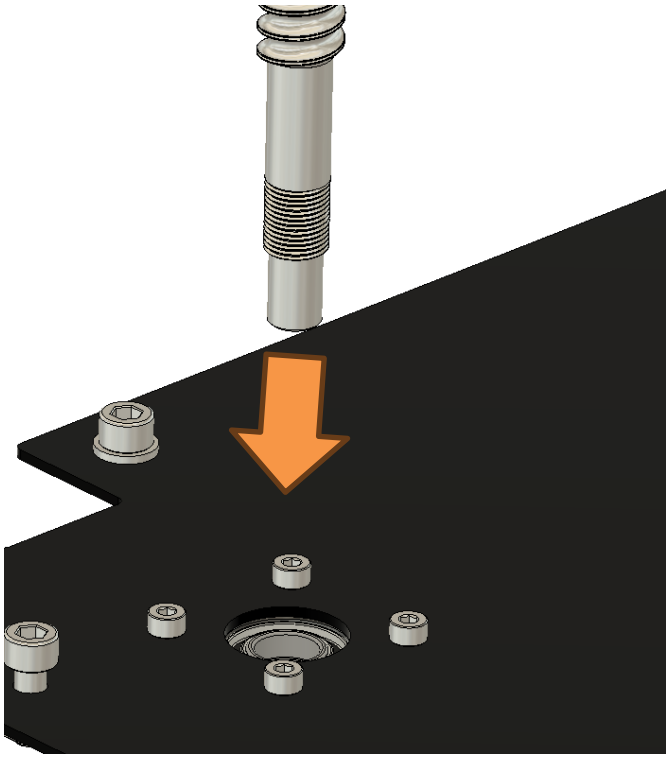
This under ring feature only 2 M5 screw new, proved to be enough in this case.

At the end of the unit assembly, use a plier to tension the spring and reach the arm mount point

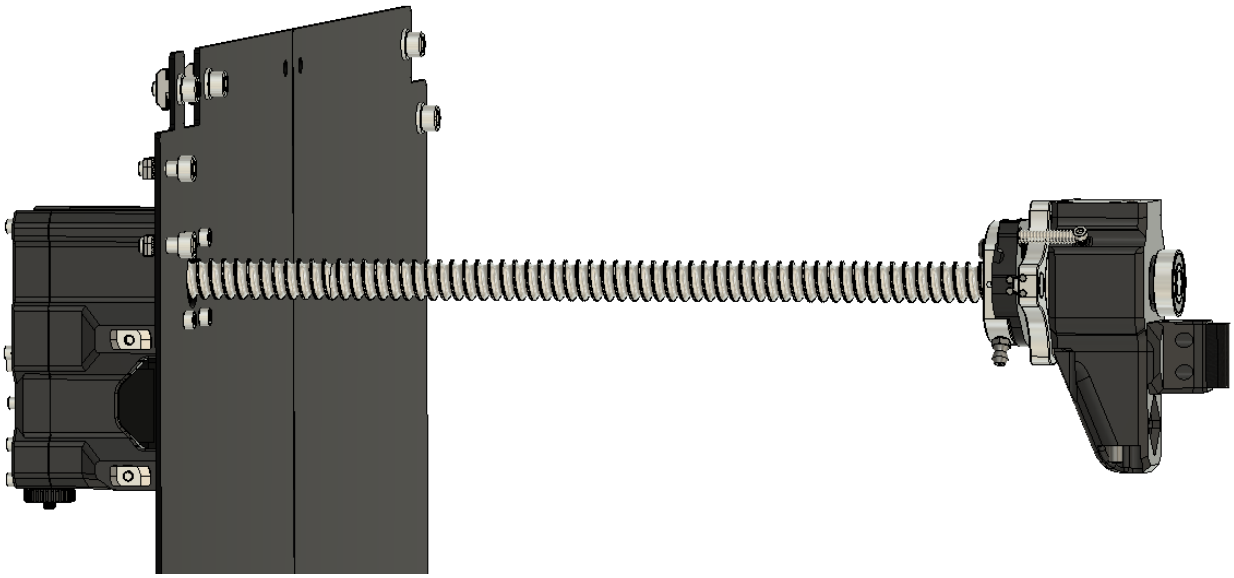


5 Ballscrews installation

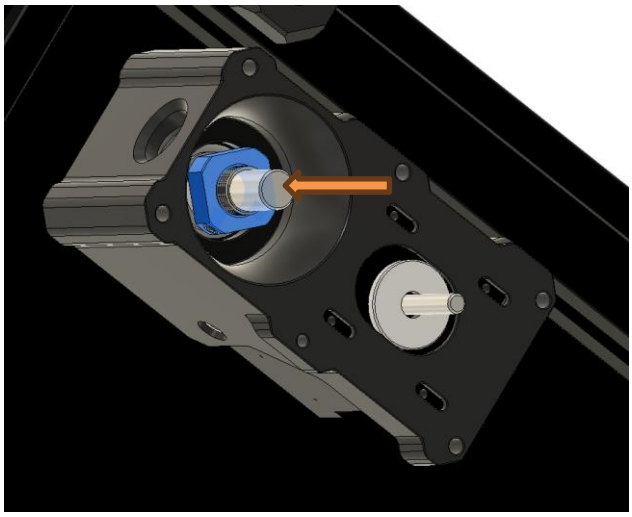
Now insert the other machined end inside the plate hole, until the ballcrew get fixed in position

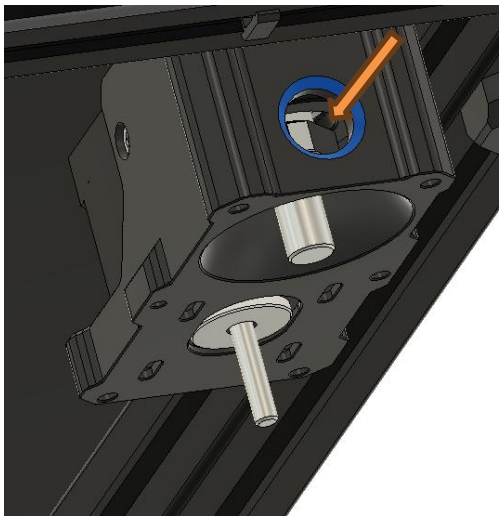


This should look like that



Secure it with the locknut bellow the block





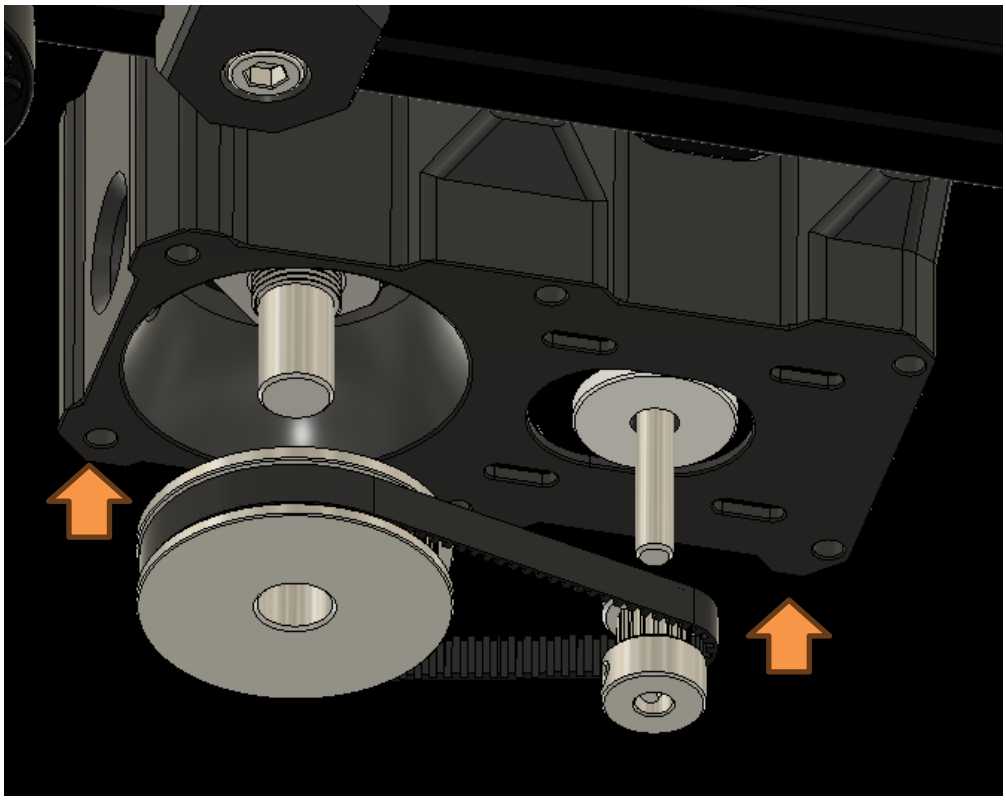
An opening exist to lockthe nut with the headless screw

6 Drive closing

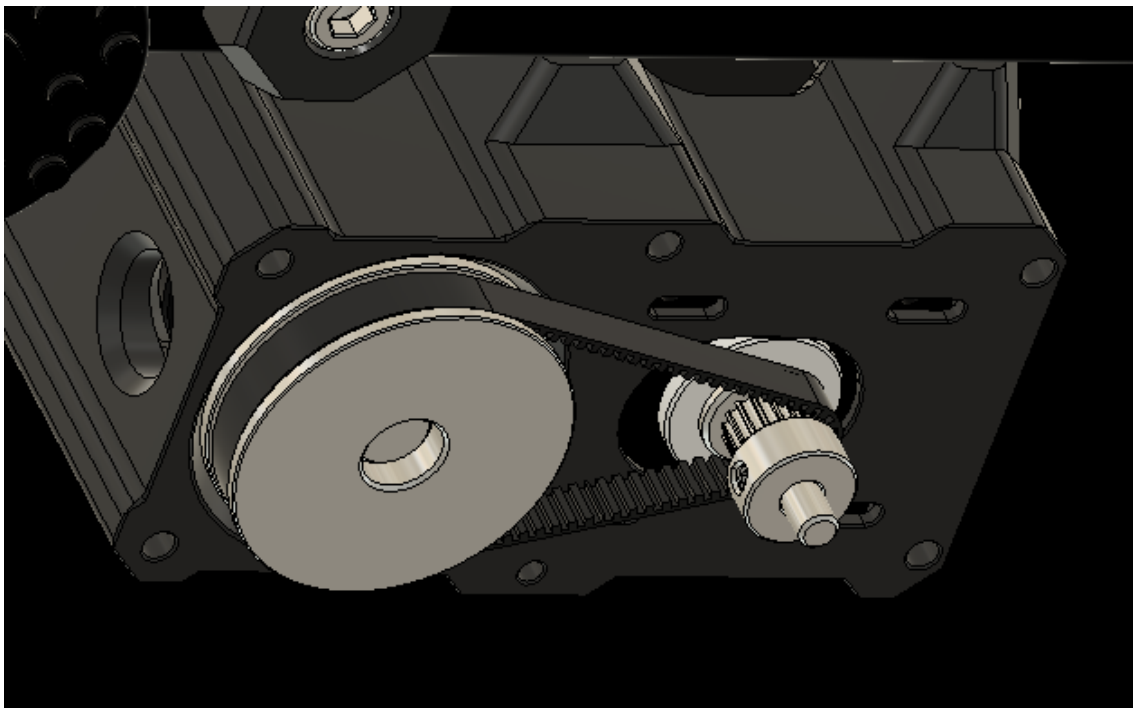
At this point we can take care of the drive system

Install the pulley with the belt

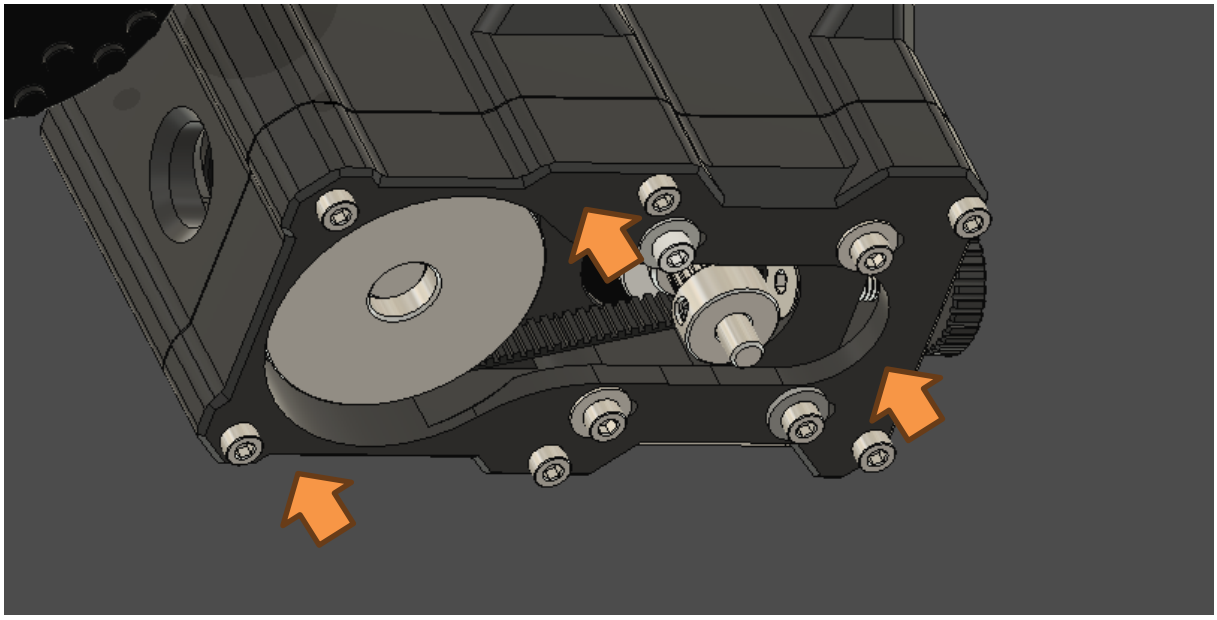
BE CAREFUL WITH THE 6oT INSERTION, DO NOT FORCE IT, ALUMINIUM CAN BE DEFORMED BY THE STEEL SPINDLE



Position ends like that



Then install the bottom assembly made earlier



This process need to be done on each 3 Z axis

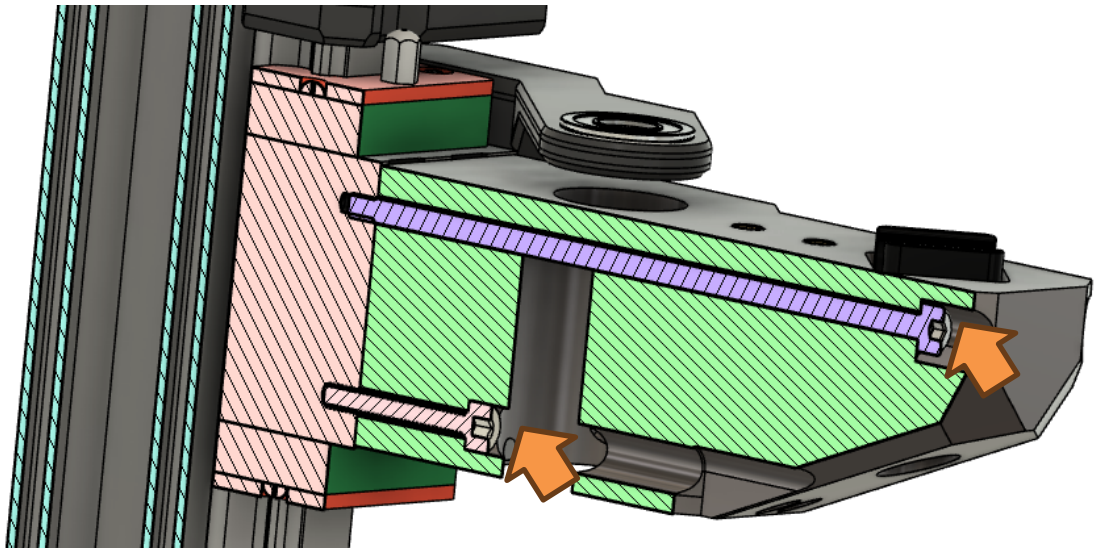
Note; don't overtighten this cage, it is maily a protective cover and guide for the tensionner

7 Arms to the HG15 carriages

For the arms, same logic than a regular VC4 kit

Use the long screw from the Ratrig kit for the 2x top retaining holes

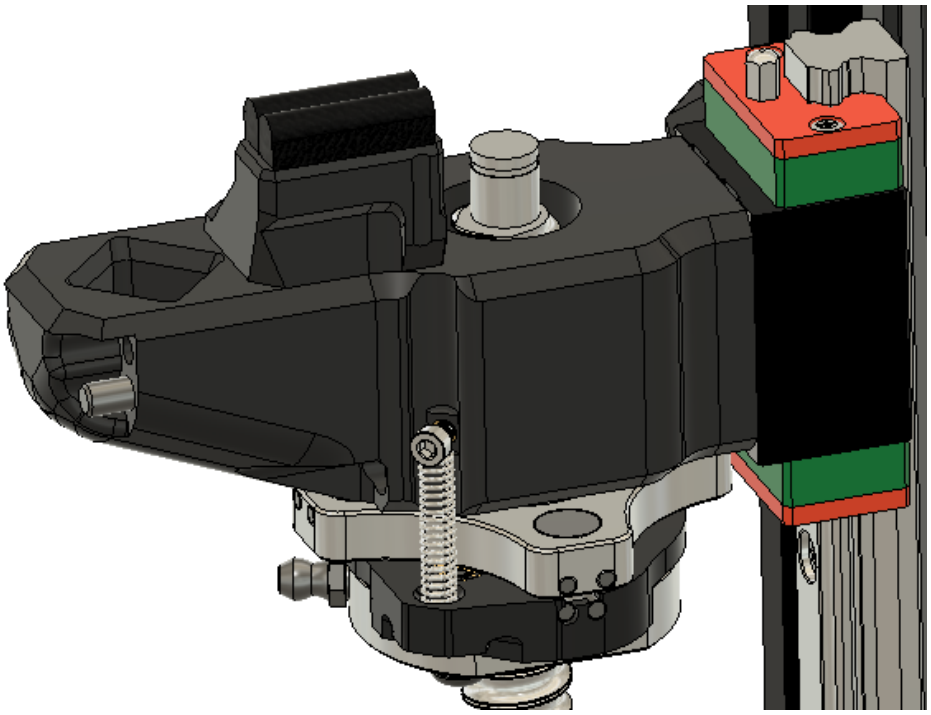
And use 2 M4x20 on the bottom retaining hole



Exemple figure

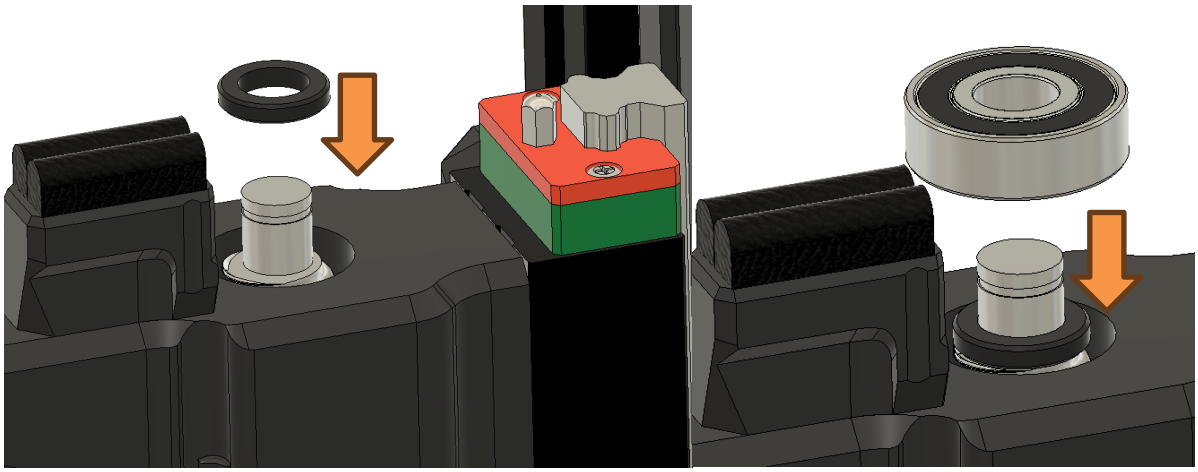
Once installed, you can hook the springs end on the m3 screw from the arm an get the sytem ready

You should end like that



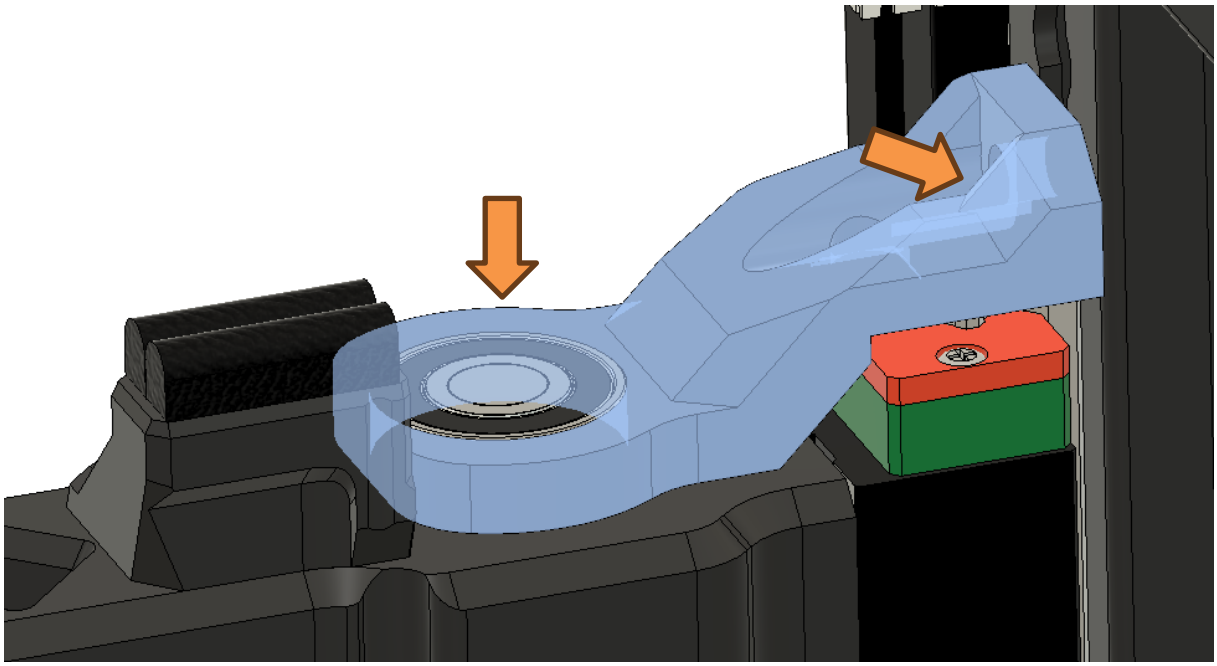
8 Top Z constrain

Add the small spacer



Then insert the 6000 bearing

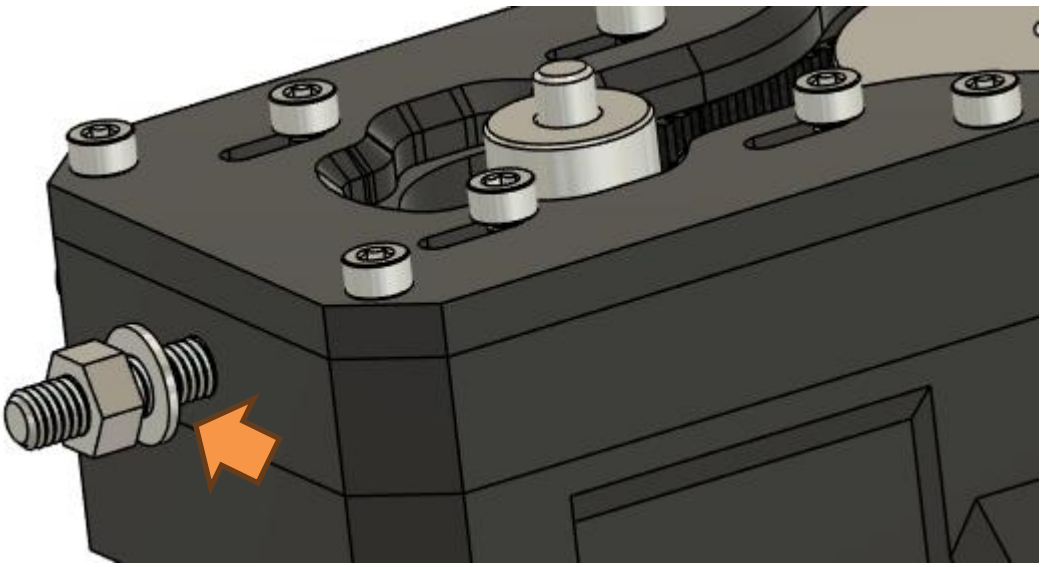
Same method that the Ratgig manual for the printed part



Repeat that on a Z axis, same parts same method

Push the M5 bolt to gain the minimal position.

9 Tension the Z drive



Now tune the belt tension through the M5 Nut + washer here (Use the knob if you prefer)

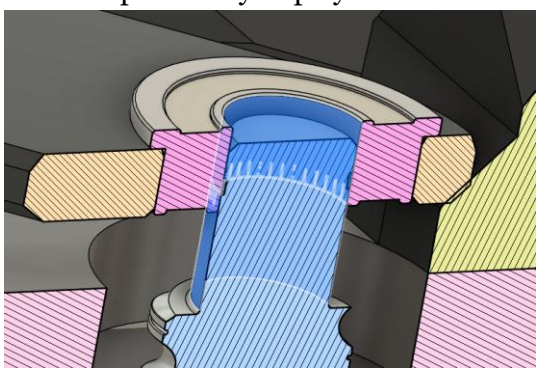
We need it to be tight but do not overtension it either, we want a ferm flex on the belt.

Repeat the process with the 2 other remaining block

10 Final assembly

For the 1204 version, simply keep the standard stock LS/BS retainer at the top, we use the same ID 8mm bearing

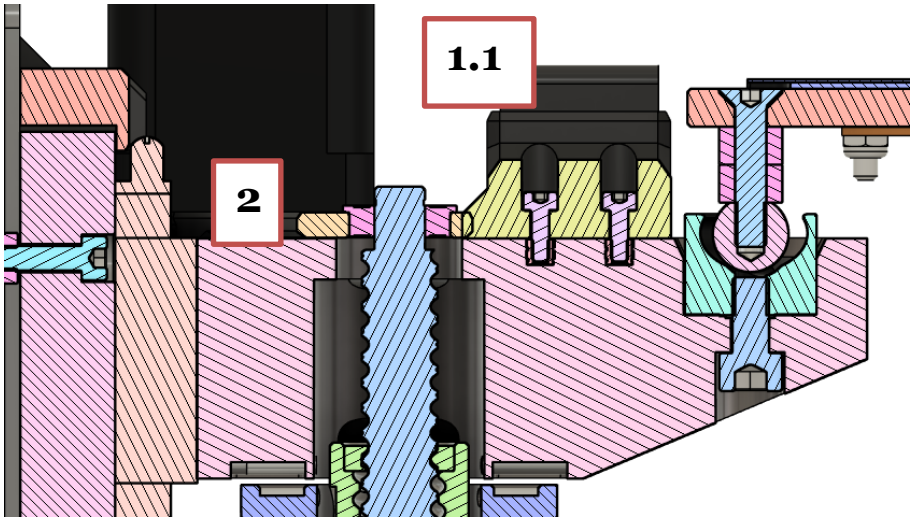
In order to get some safety for potential collision, place the retainer with 2mm margin, you have the possibility to play with the retainer position



You can adjust a bit the height of them if necessary.

You can at this point add the bearing balls into the WobbleX assembly if not done before

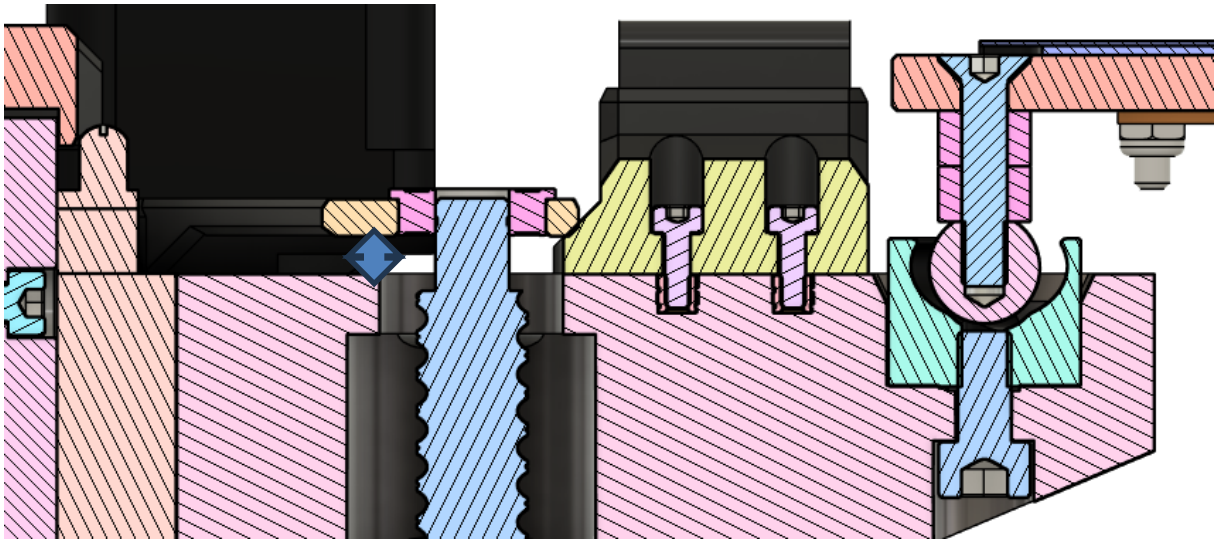
-Depending the Hot end you will use (Rapido, Magnum, Goliath, ...) or a custom bed, the max height can be different. There some adjustments that can be done to maximize it



-1/ Add some M5 washers on the bed feet, to add the necessary height missing

-1.1/ Elevate the wiper if necessary

-2/ Tune the height the the retainer: 4mm are available



11 Config cfg

The first thing to do is to correct the ***rotation_distance*** of all Z sections

1204: ***4, transformed with the 1/3 ration to +-1.3333***

1605: ***5, transformed with the 1/3 ration to +-1.6666***

Then we need to reverse the Z motors since they are inverted (pointing the bottom)

Simply add a "!" in front of the "***dir_pin***" (ex: **dir_pin: !PC12**)

Notse:

-In some rare scenario lowering the RUN_CURRENT on the Z motors, can improve the behaving of the system

-Remember that we do not need power here since the 60:30 reduction is working for it already

-I strongly recommend placing safe, low temp focuses settings on the TMC section of the Z motors to get perfect

-Use 32 or 64 microstep to avoid torque overpowering the setup in case of collision

-Keep in mind the NEMA + the 60:20 reduction + the 4-5mm per rotation motion is decupling the power of the system and can move powerful forces.

-Be careful with your fingers

12 Assistance

If you need assistance ; I can help on:

Mail : contact@brs-engineering.com,

Discord: BRS-ENGINEERING-Florent Broise
brsengineeringflorentbroise_3873

Meta Messenger: BRS-Engineering