



## BRS-AWD v1.33 Drive

### Evolutions

Indice	Date	Description de l'évolution	Auteur
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Rédacteur	Responsable	Qualité
FBR	FBR	FBR

1.0	01/08/2023	Création / POC	FBR
1.1	17/08/2023	POW	AVJ
1.2	20/08/2023	Release	FBR
1.32	11/09/2023	Manual 1.0 release	FBR
1.33	18/09/2023	Corrections / SFUs	FBR

Etat	1.0	1.1	1.2
Statut	Fonctionnel POC	Fonctionnel, POW	Fonctionnel Release

### INTRO:

The BRS-AWD Drives feature an integrated 4 motors solution, adaptable to ANY Vcore 3.x iteration, with or without enclosure, without any structural modification needed. The time to set it up will be between 1-2 hours depending the skill level.



## Manual BRS-AWD D1 Drive

This upgrade is based on high quality hardware, with a specific attention to the quality of the motion; Precision Shoulder bolts, ABEC 5-7 Bearings, and Precision GT2 pulleys! Motors are silent with the decoupling ( you can use N17 dampers on this mod, like the M2 L3ver).

### BOM :

#### Printed parts list

Lower part R (All variations)	X1
Lower part L (All variations)	X1
Upper Part R (All variations)	X1
Upper Part L (All variations)	X1
Bearing Lockers (All variations)	X3
Nema holder	X2
Nema Mount	X2

#### Hardware

Heat inserts M6 Short	X4 (For open version)
Heat inserts M4 Short	X4
Heat inserts M3 short	X16
M6x40	X4 (For open version)
Tnut M6	X16 (+ - depending the variations)
F695-rs	X12
M3x12	X14
Shoulder bolt 5x35mm m4	X4
8x5x1mm microshim	X5
GT2 9mm Pulley	X2
5mmx(55/60/65mm) steel shaft	X2
Micro shim 1mm	X15
M6x14mm	X16 (+ - depending the variations)
M3x30mm	X8
NEMA 17 (same as your back Nema)	X2 (Not in BRS Orders)
Driver (same as your back Nema)	X2 (Not in BRS Orders)
Nema Cable	X2 (Not in BRS Orders)

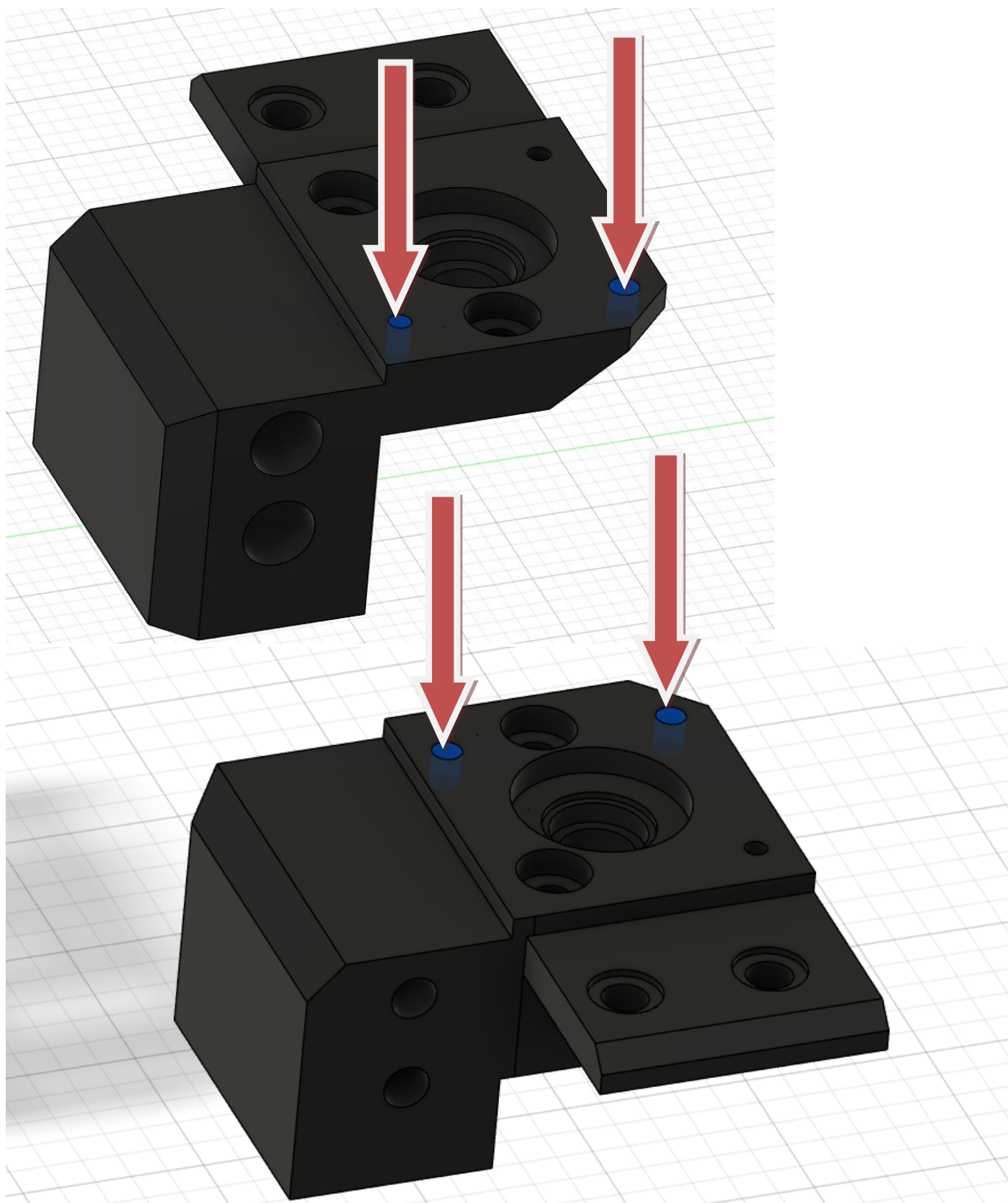
The Installation is the same regarding the Opened Frame, Closed frame, VC 3.0 and 3.1 iteration. Here for the sake of the example the manual is made upon the VC3.1 Opened version! I will track the R block here, the L block follow the exact same symmetrical assembly.



## 1-Part preparation

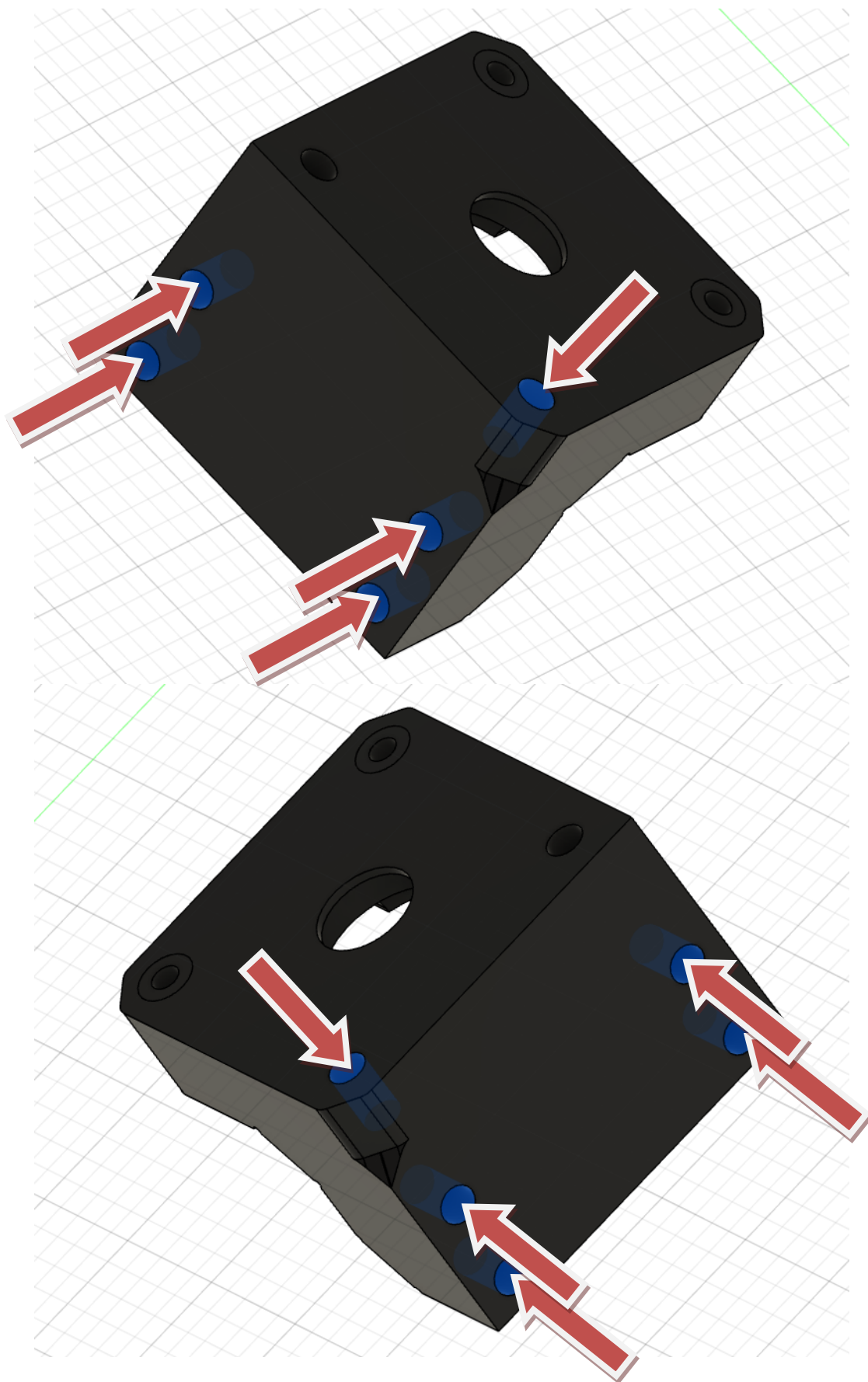
Before assembly, Install all heat inserts (for BRS Order it is already done)

Here All the M3





## Manual BRS-AWD D1 Drive

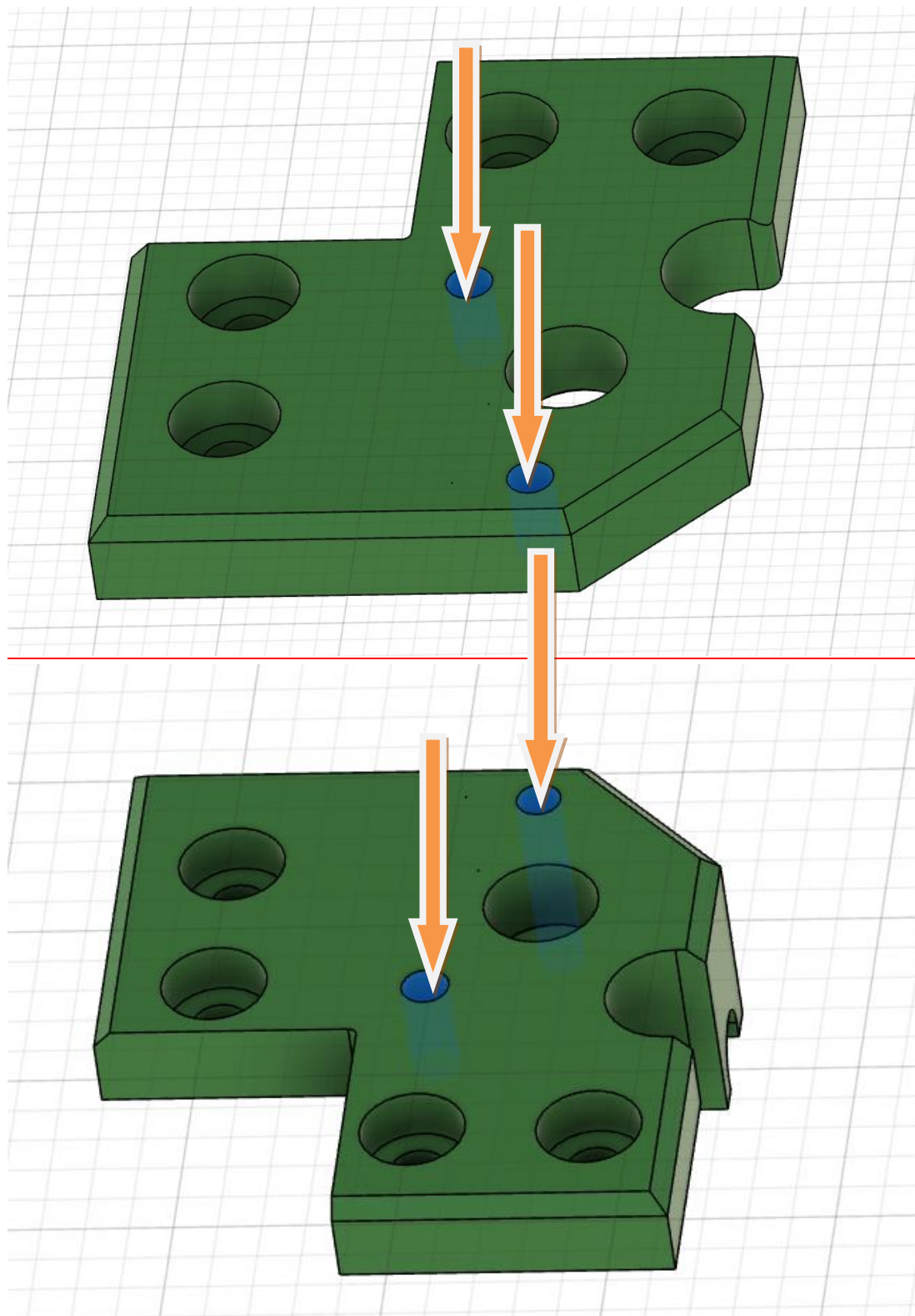




## Manual BRS-AWD D1 Drive

Here all the M4S (Short) **(Insertion FROM BELLOW)**

**On BRS Order, You will find this insert not fully engage in the parts, It is mainly because some shoulderbolts can have different threadlengths, and we need some clearances.**

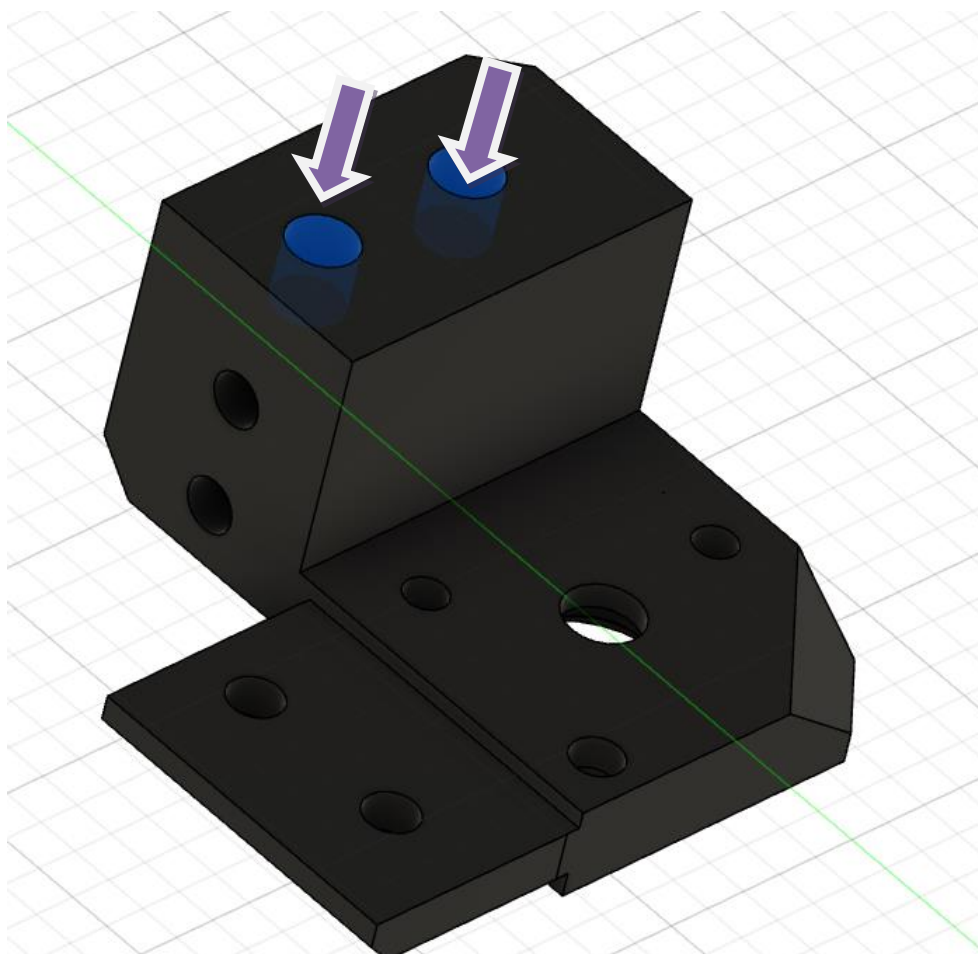
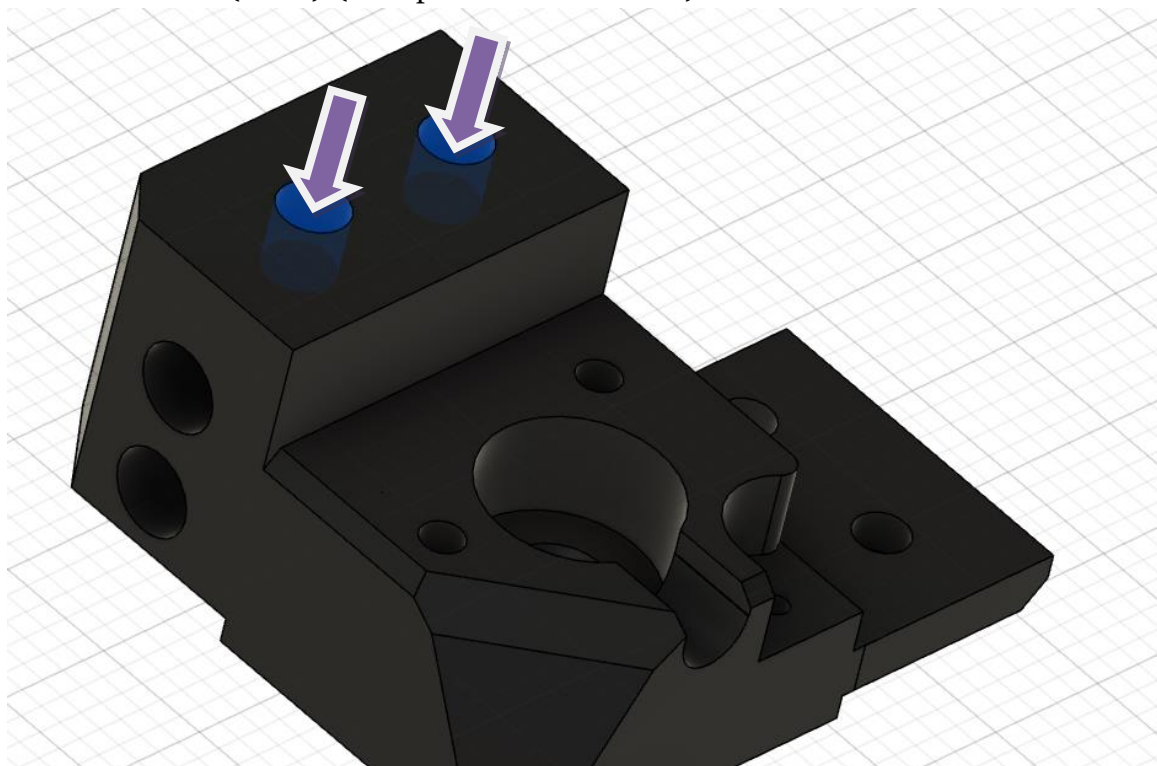






## Manual BRS-AWD D1 Drive

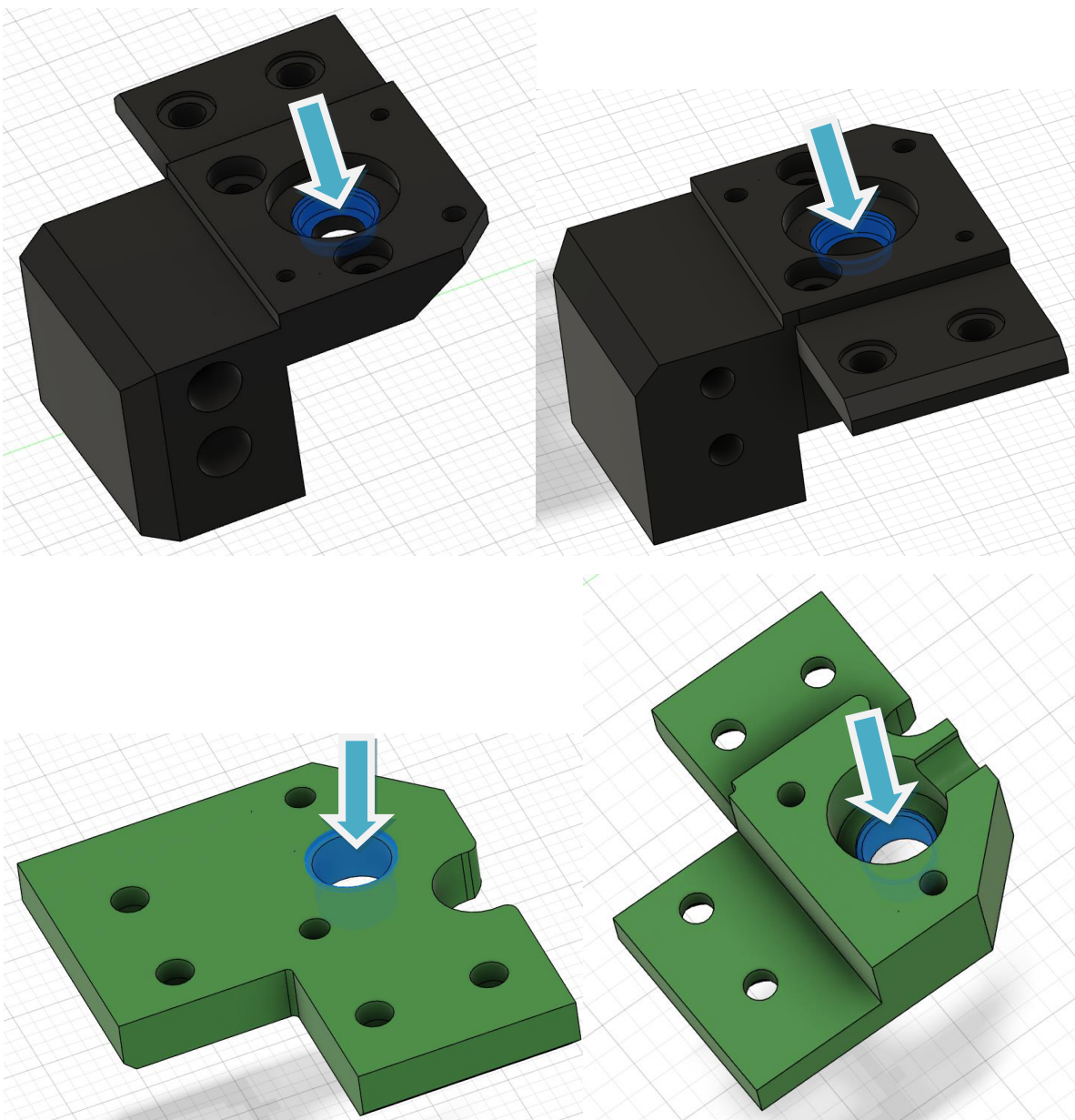
Here all the M6s (Short) (For opened version ONLY)





## Manual BRS-AWD D1 Drive

### Bearings and Locks

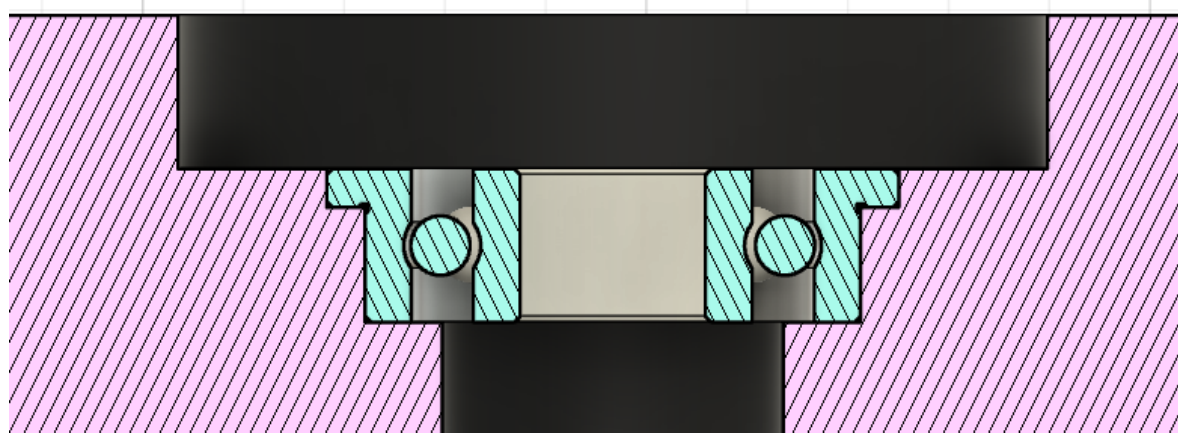
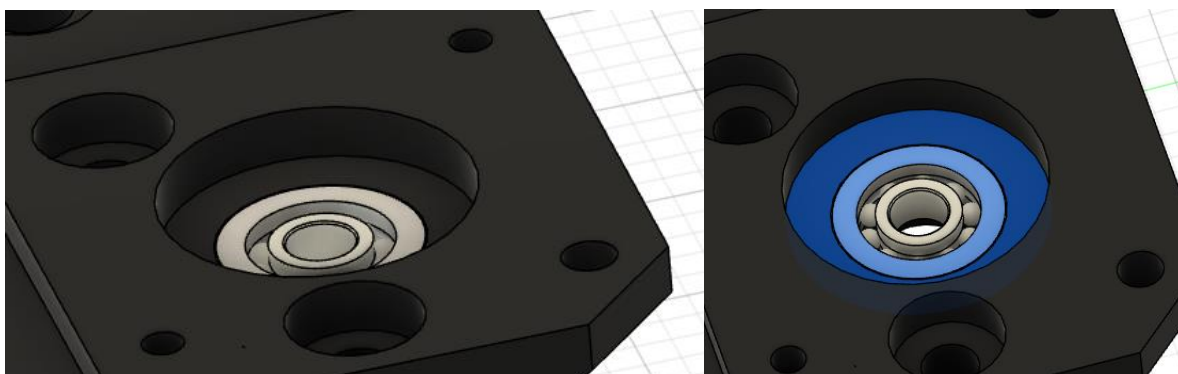


Each flanged spot on any Bottom and top parts need a F695 bearing installed here. You can use a 12mm cylindre tool (printed,...) to make the pressfit without damaging the bearings.

Bearing and lateral side must be flush in each parts



## Manual BRS-AWD D1 Drive

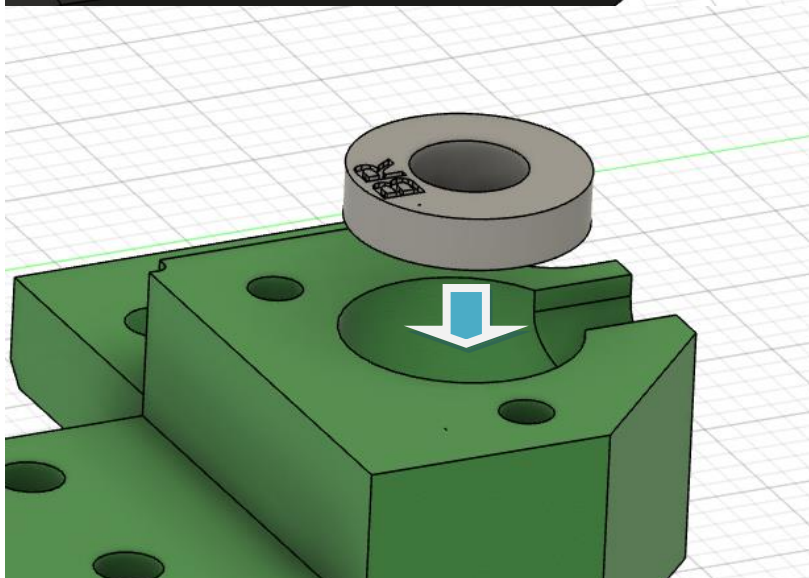
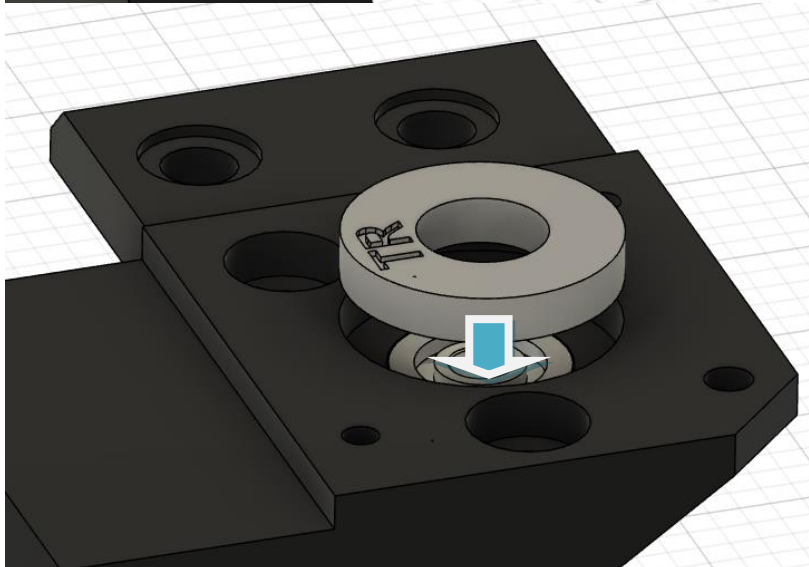
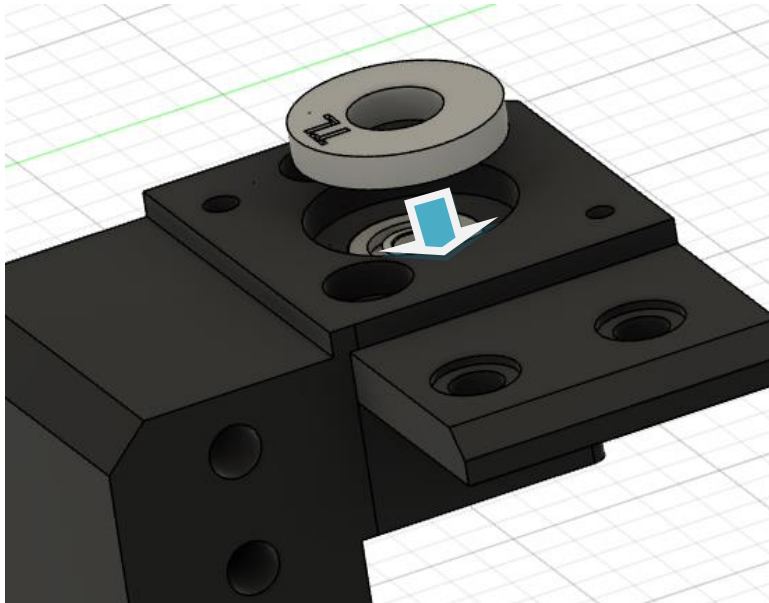






## Manual BRS-AWD D1 Drive

Once done you can install the Bearing locks, there is 3 of them



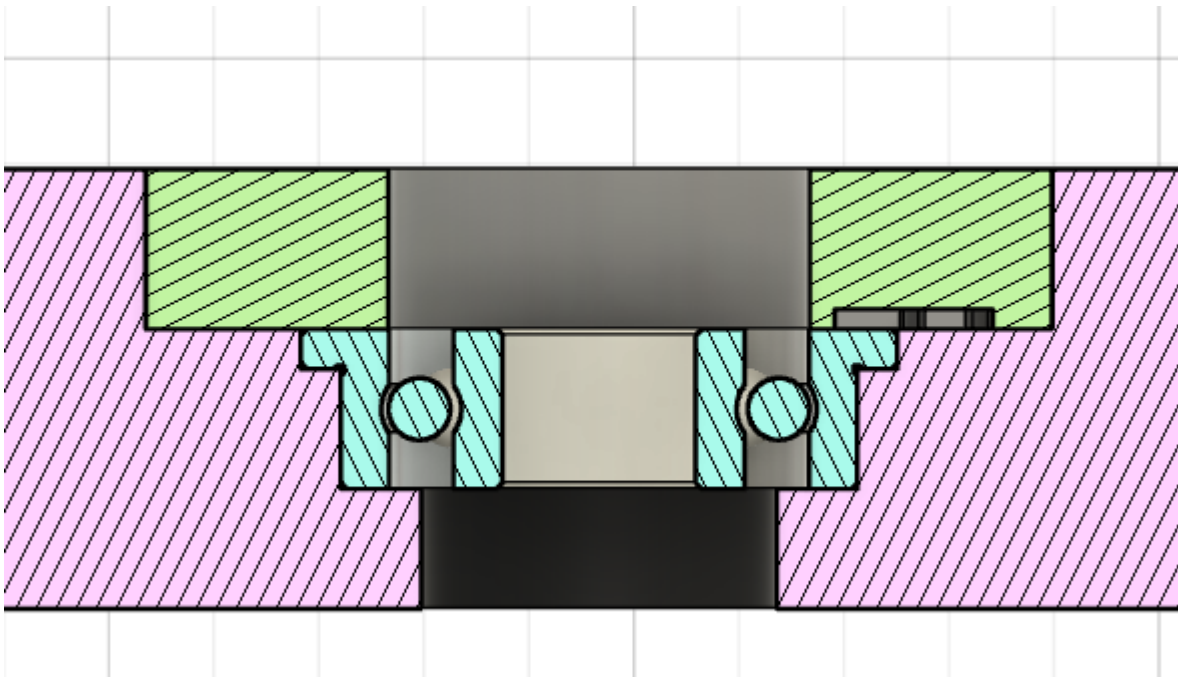
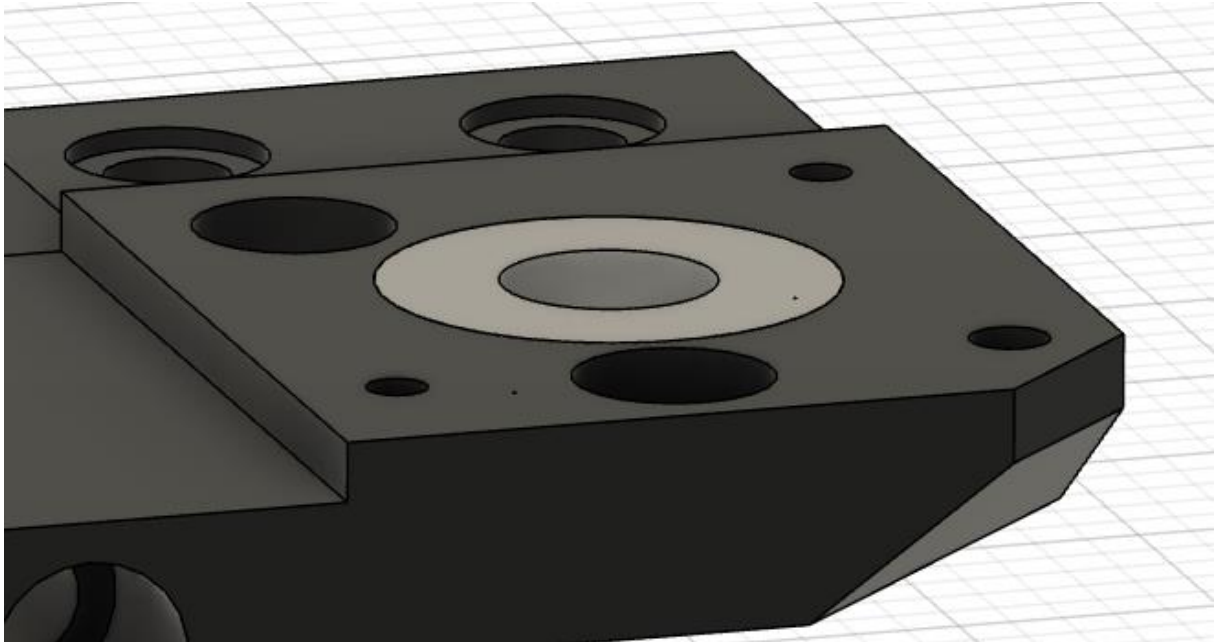


## Manual BRS-AWD D1 Drive

Now we need to pressfit them (Already done in all BRS orders)

Same logic, the top must be flush to the parts

The goal here is to secure the bearing completely, I can be removed to make maintenance afterwards if necessary. It can be glue, however the top mount will fix them in place

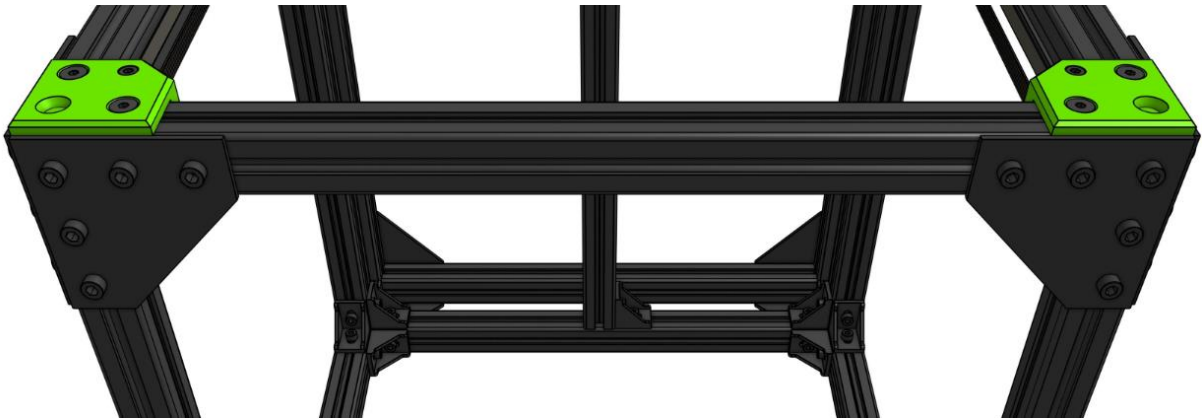




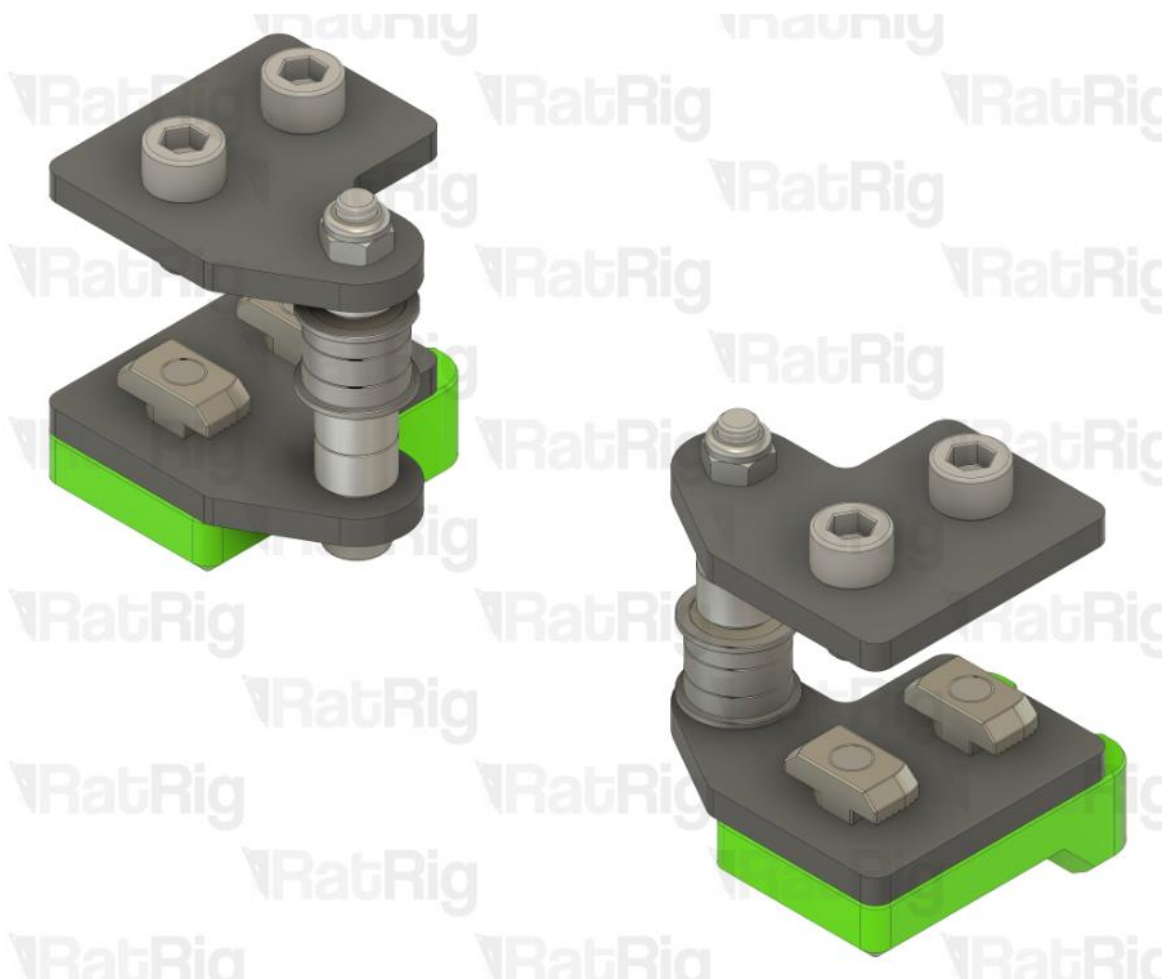
## Manual BRS-AWD D1 Drive

Prepare the front of the Frame

- For Vcore 3.0 you need to remove the corner idler assembly:



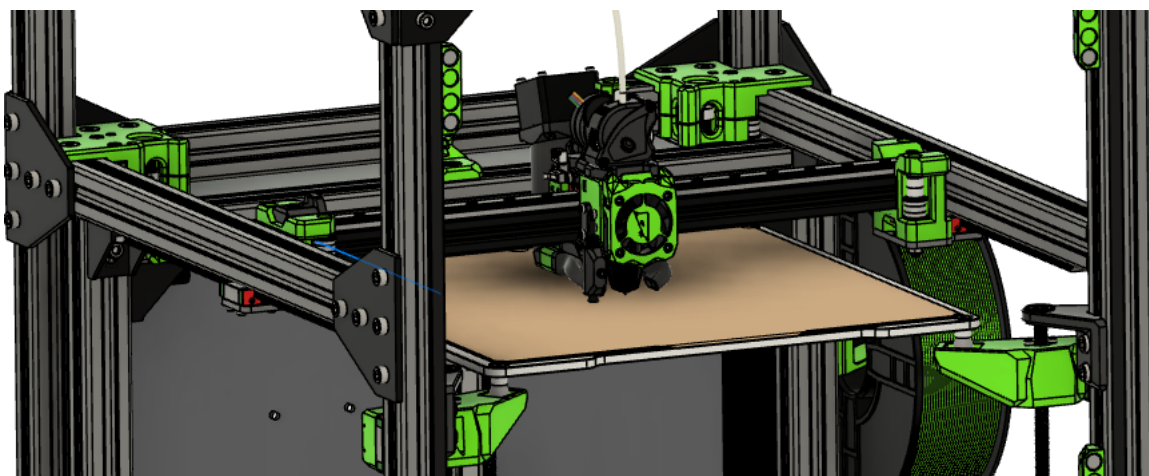
- For Vcore 3.1 and 2.0 frame extension, remove the idler in the front



- For the Z-Upgrade 2.0, remove the Top retainer parts + the idlers ensemble



## 2-General installation



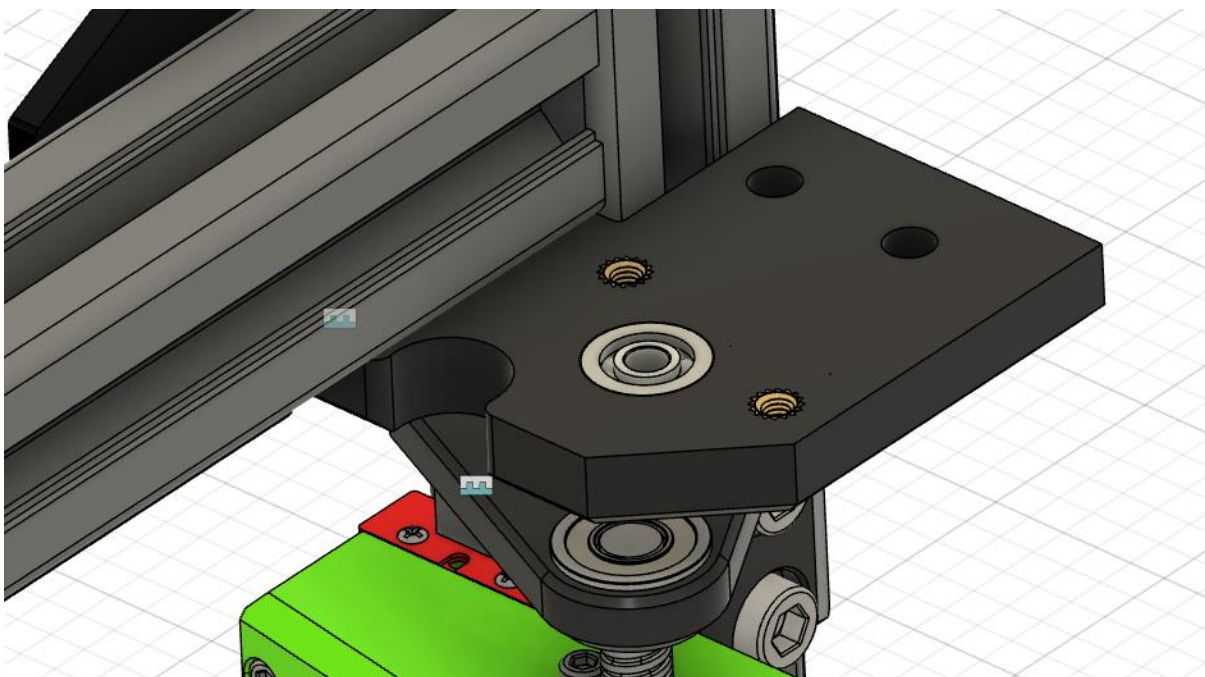
You should start with a clean empty front machine

To ease the guide, I will remove some 3.1 part for a clear view

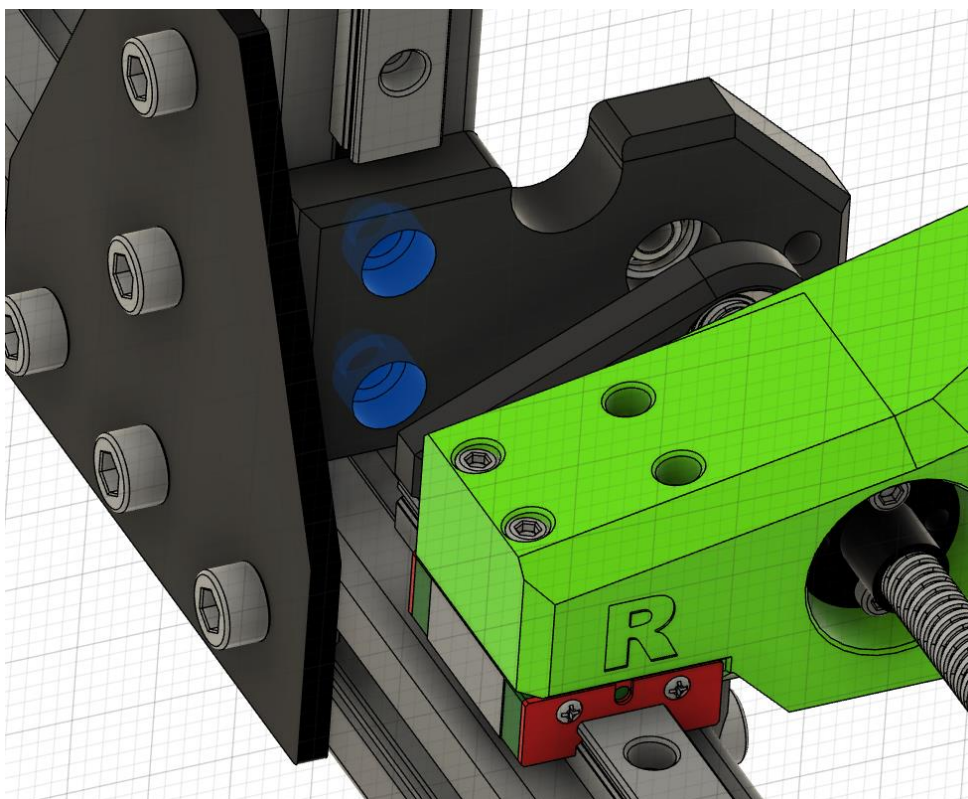
### A/ Underplates

Slide the undeplate in the corner between the leadscrew retainer and the crossed frame join

Secure it with 2 M6 screws with according Tnuts



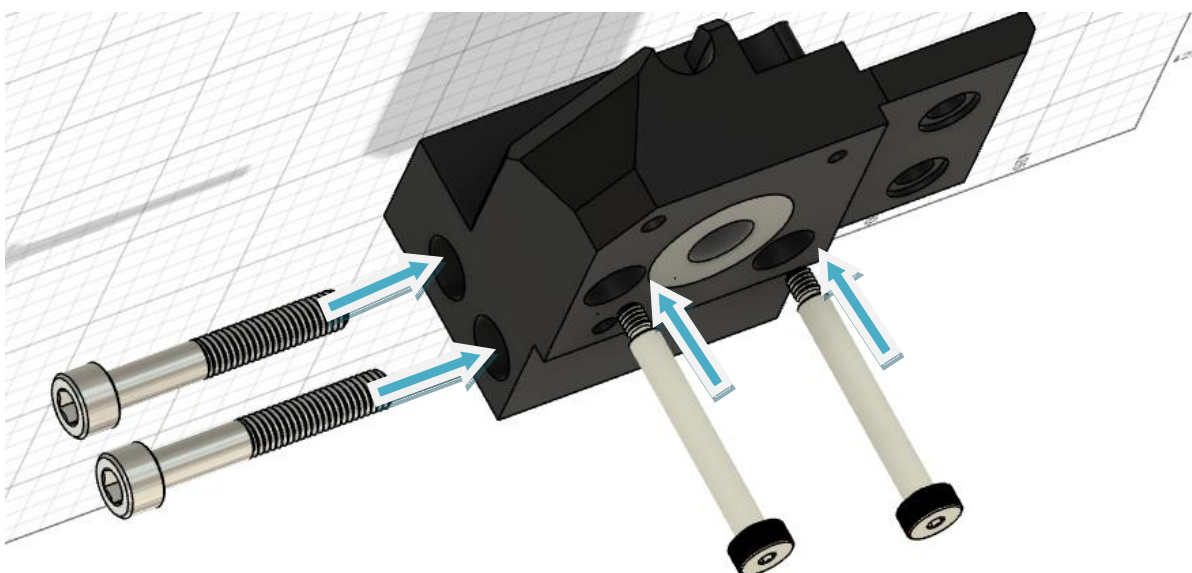




Repeat the operation for the L side

## B/ Top parts

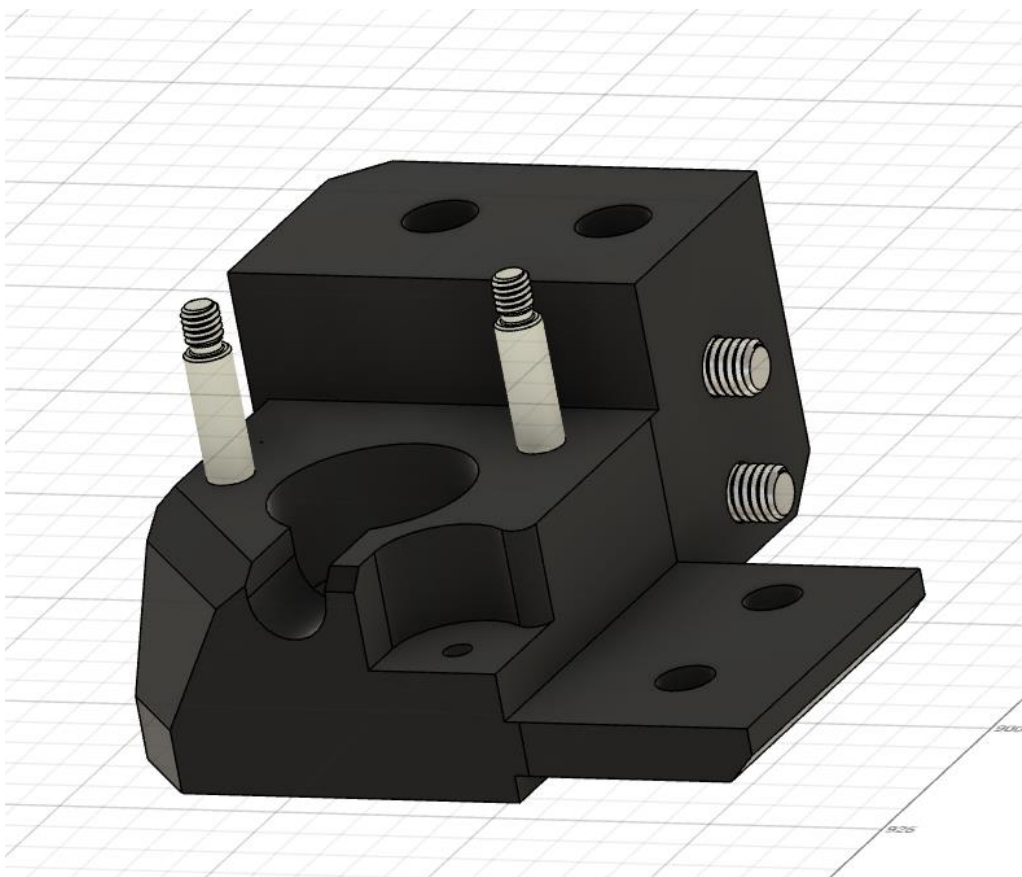
Here we need to install some Shoulderbolt and M6x40





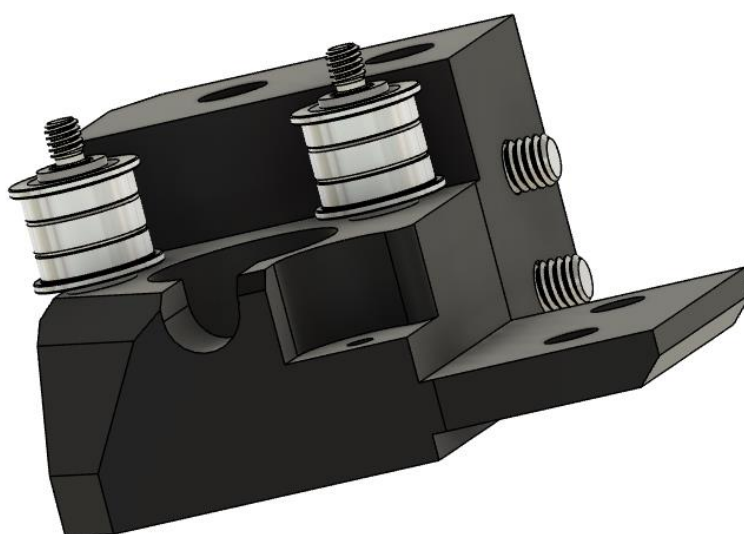


## Manual BRS-AWD D1 Drive



Install 2 Stacks of bearings

**1 stack= microshim-F695-695-F695-microshim**





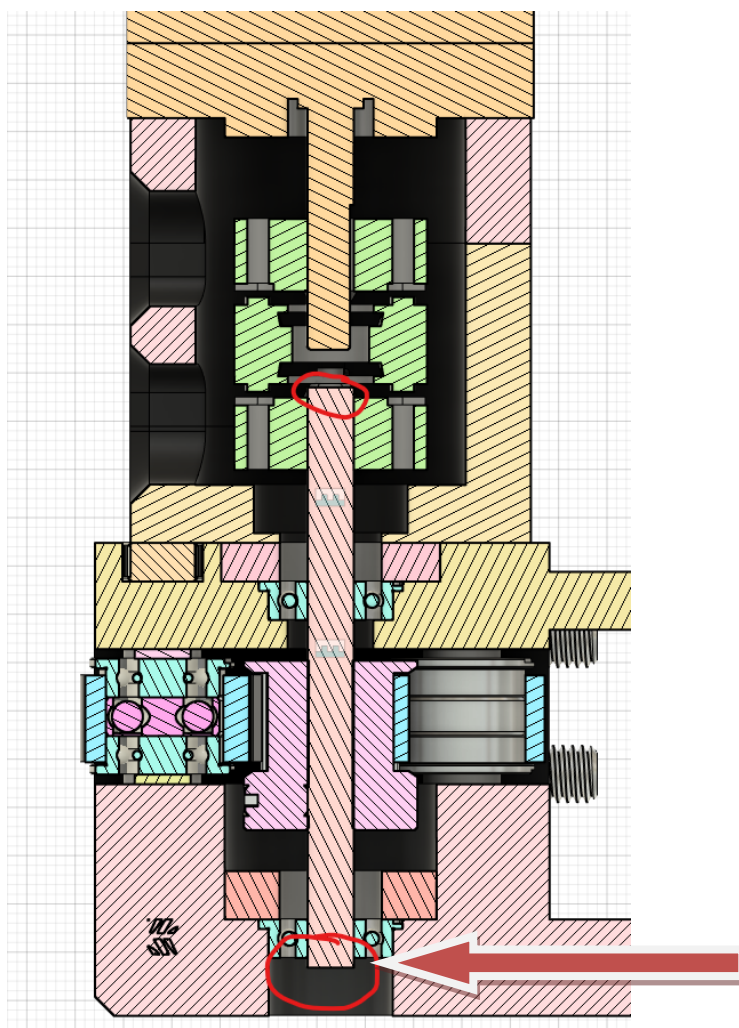
## Manual BRS-AWD D1 Drive

Install the shaft with the pulley

*Note: Depending the Coupler outer size you are using, you can choose between 55, 60, 65mm long shaft*

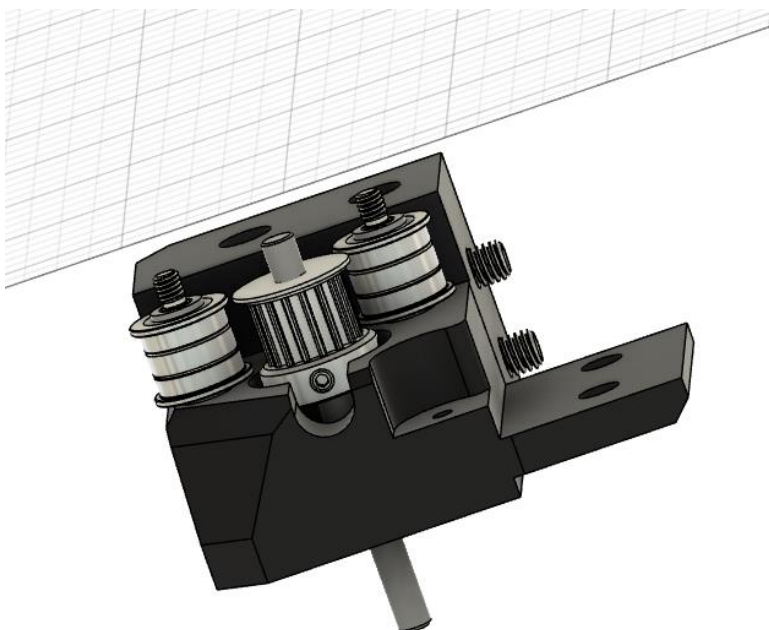


*You only need to be sure the shaft is grabbed enough by the coupler used, and be sure that the 2 F695 top and bottom bearing are on it fully:*



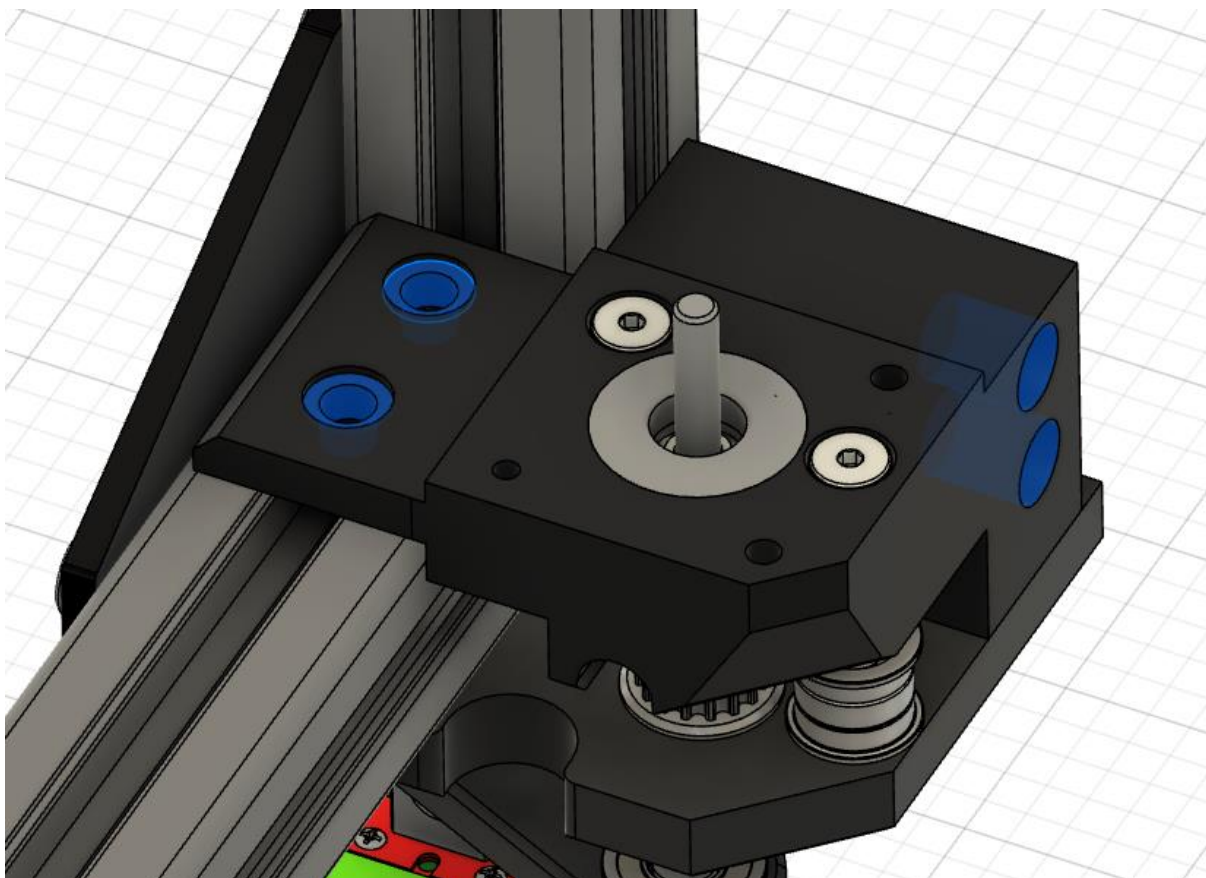


## Manual BRS-AWD D1 Drive



Place everything and secure the assembly with the 2x Shoulder bolts

The 2x m6x40, and the 2x m6x14





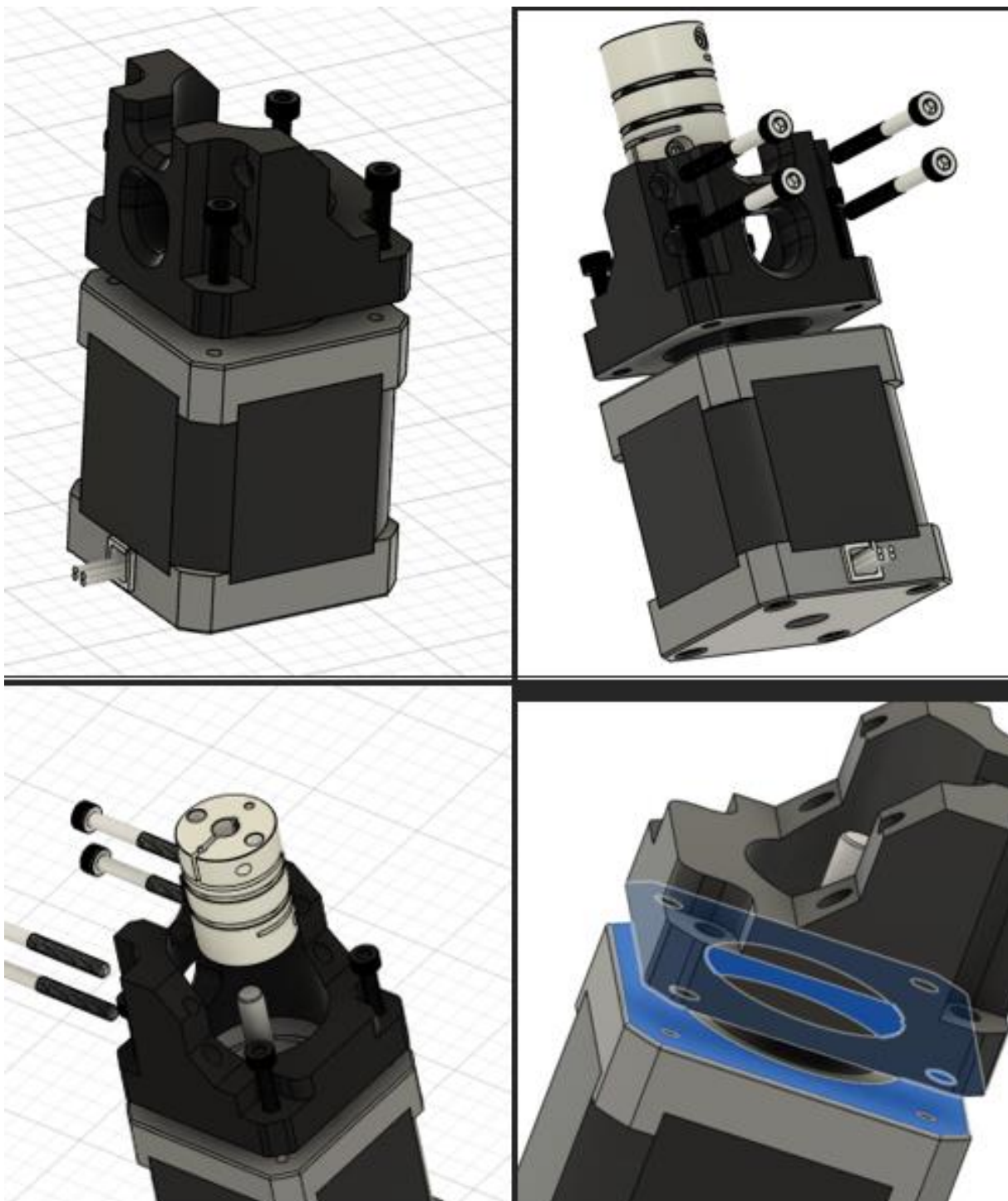
## Manual BRS-AWD D1 Drive

### C/ Nema mounts

Install the Nema with the 4x m3x12mm

Preinstall the 4x m3x30mm

*Between the NEMA and this block, you can install a damper, it is compatible*



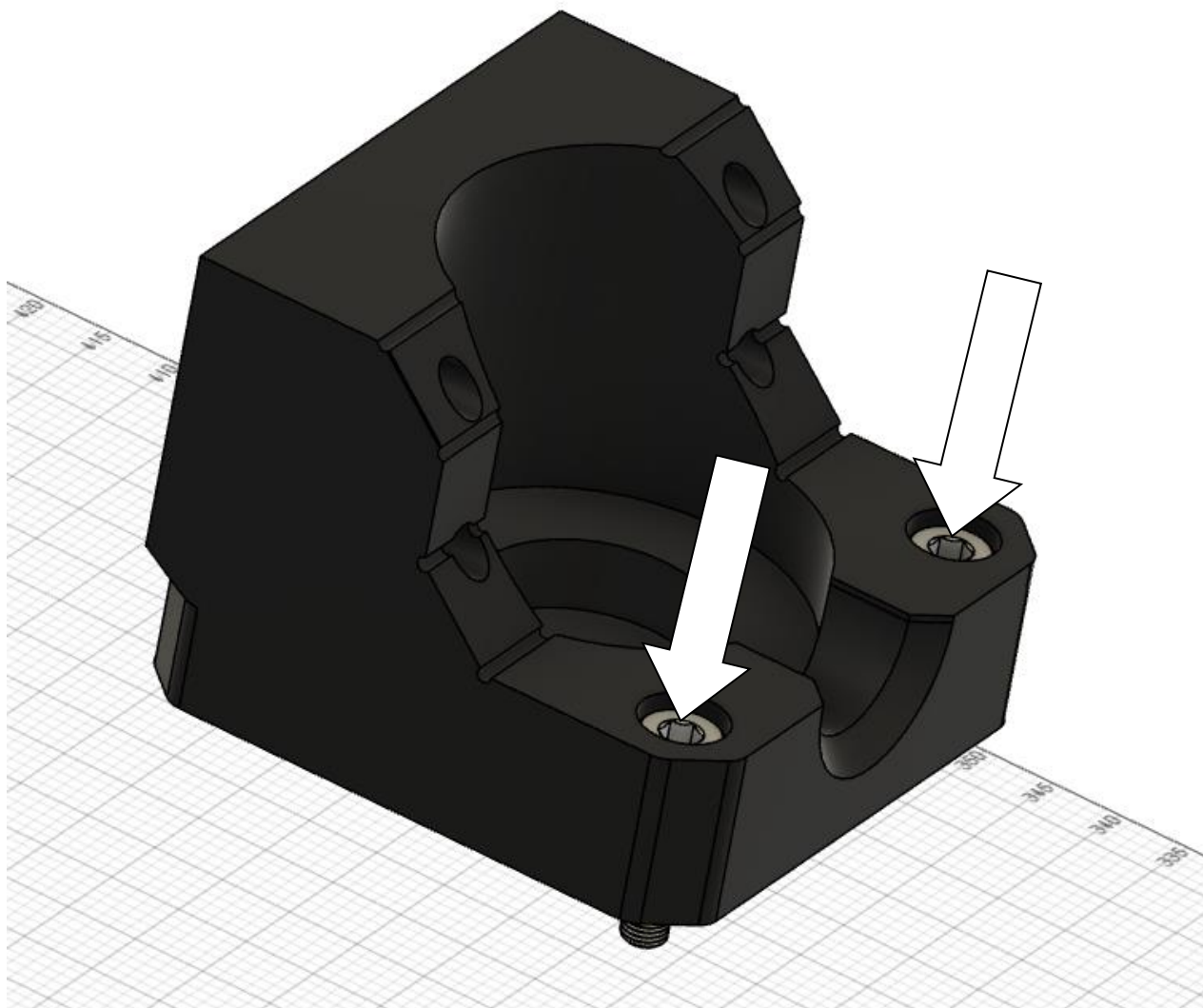




### D/ Final assembly

Preinstall the Disk coupler on a shaft end (NEMA side or Block side)

*In this part you have a 625zz bearing socket. It can be used*



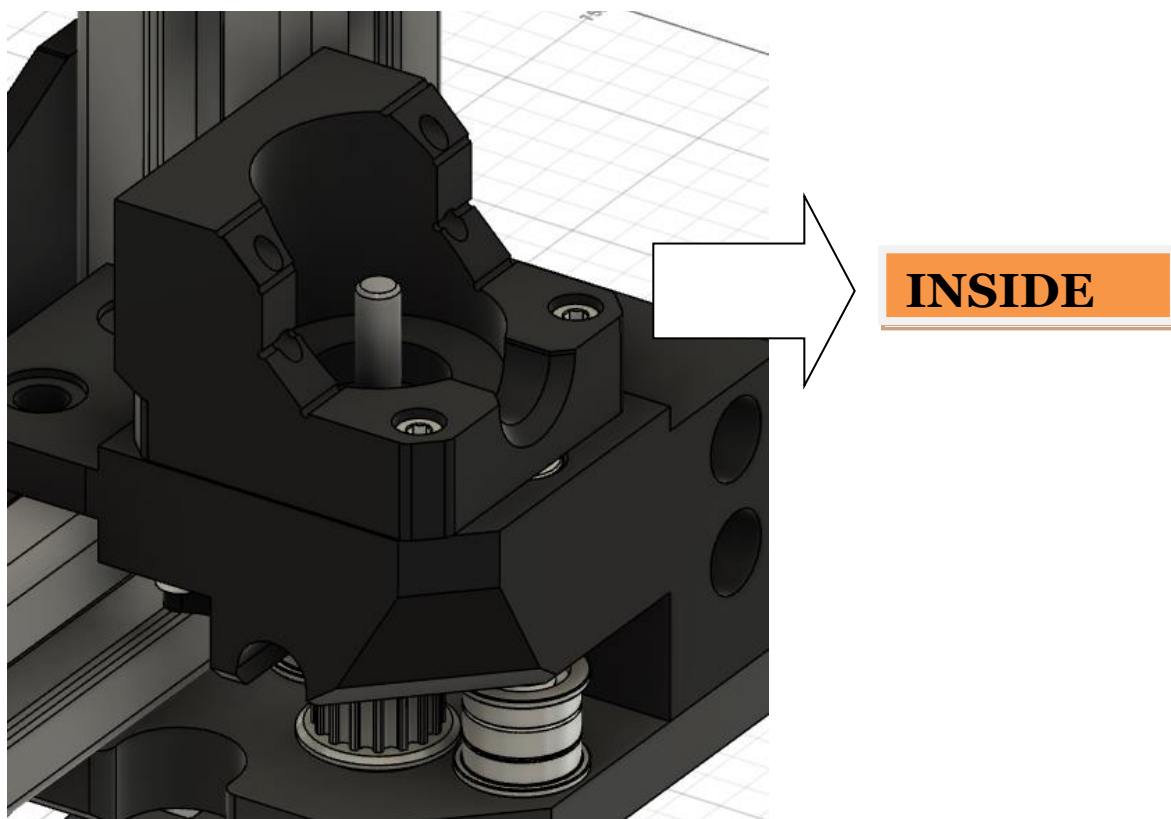
Install 2x m3x12mm in this part

**Recheck the 2 M4 Shoulderbolt, tightening them now for good is advised since it will not be available after without some disassembling.**

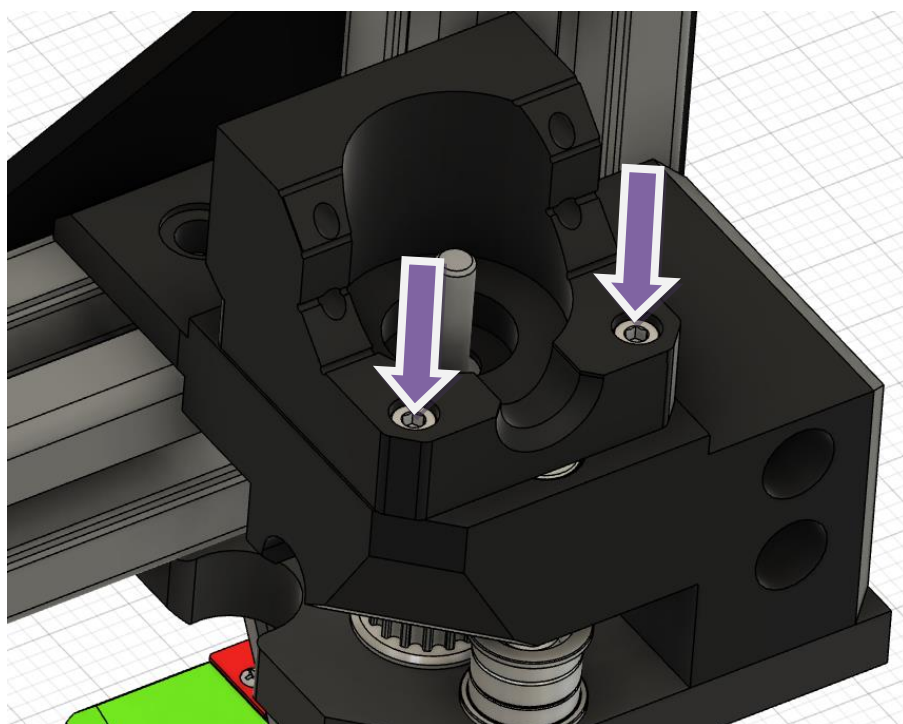




## Manual BRS-AWD D1 Drive



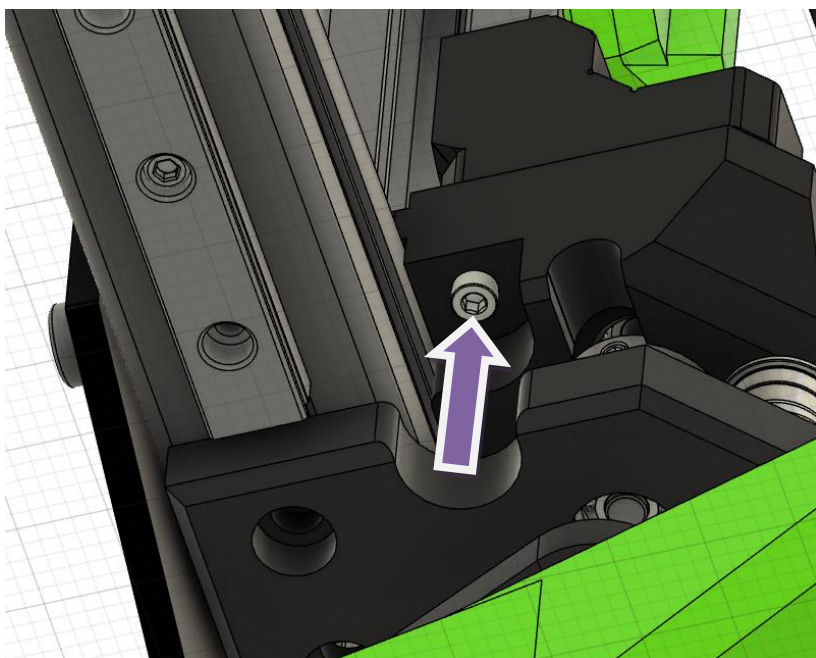
Then place it the opening toward the inner side of the machine



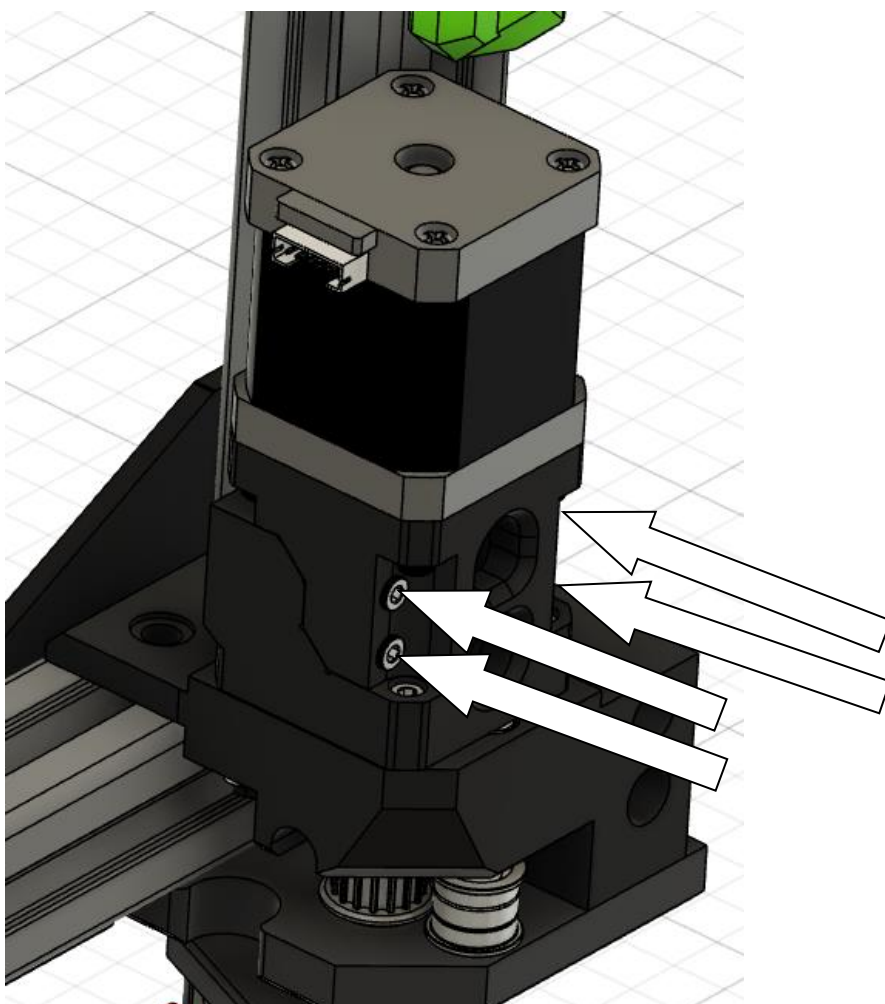
Secure the 2x m3x12mm



## Manual BRS-AWD D1 Drive



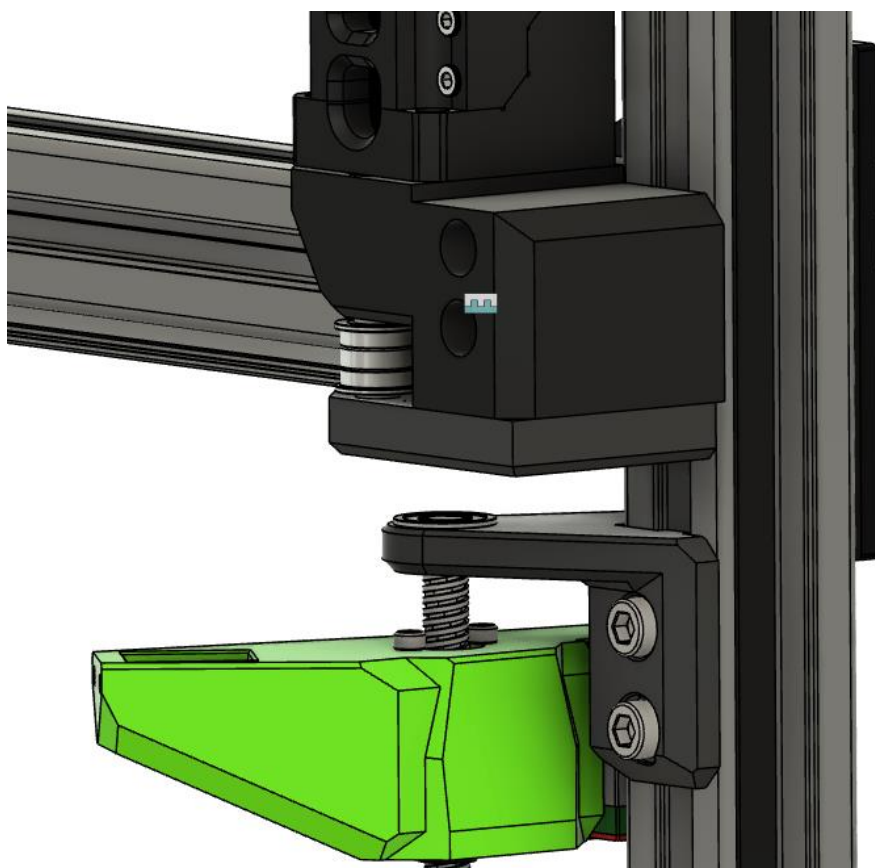
Add a m3x12mm from under, an opening has been made to access it easily



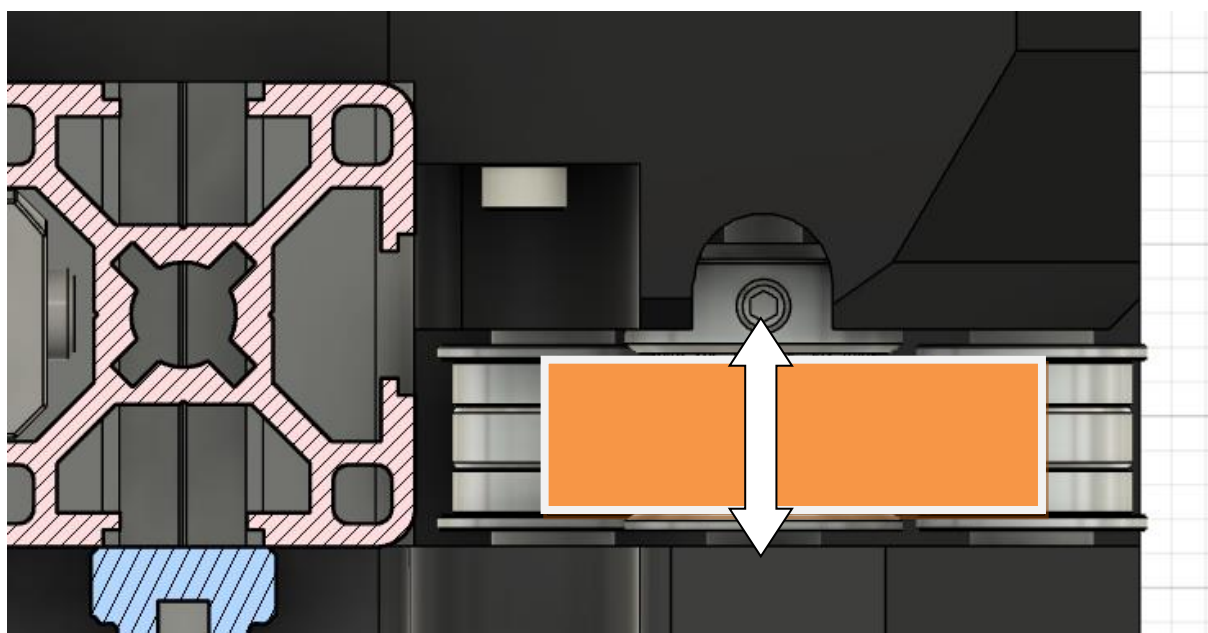
You can install the motor (Same mounting technique than the L3ver M2), secure the 4x m3x30



## Manual BRS-AWD D1 Drive



Check the clearances, and re-tight a bit the screws to secure the assembly.



Check the alignments, the pulley can be easily adjusted with the notches to access all the headless screws.

Here the Shaft are round without flat spot, It is a personal choice, but if you use a flat spot shaft, be sure it will need to be finer tuned to avoid so concentricity issues.

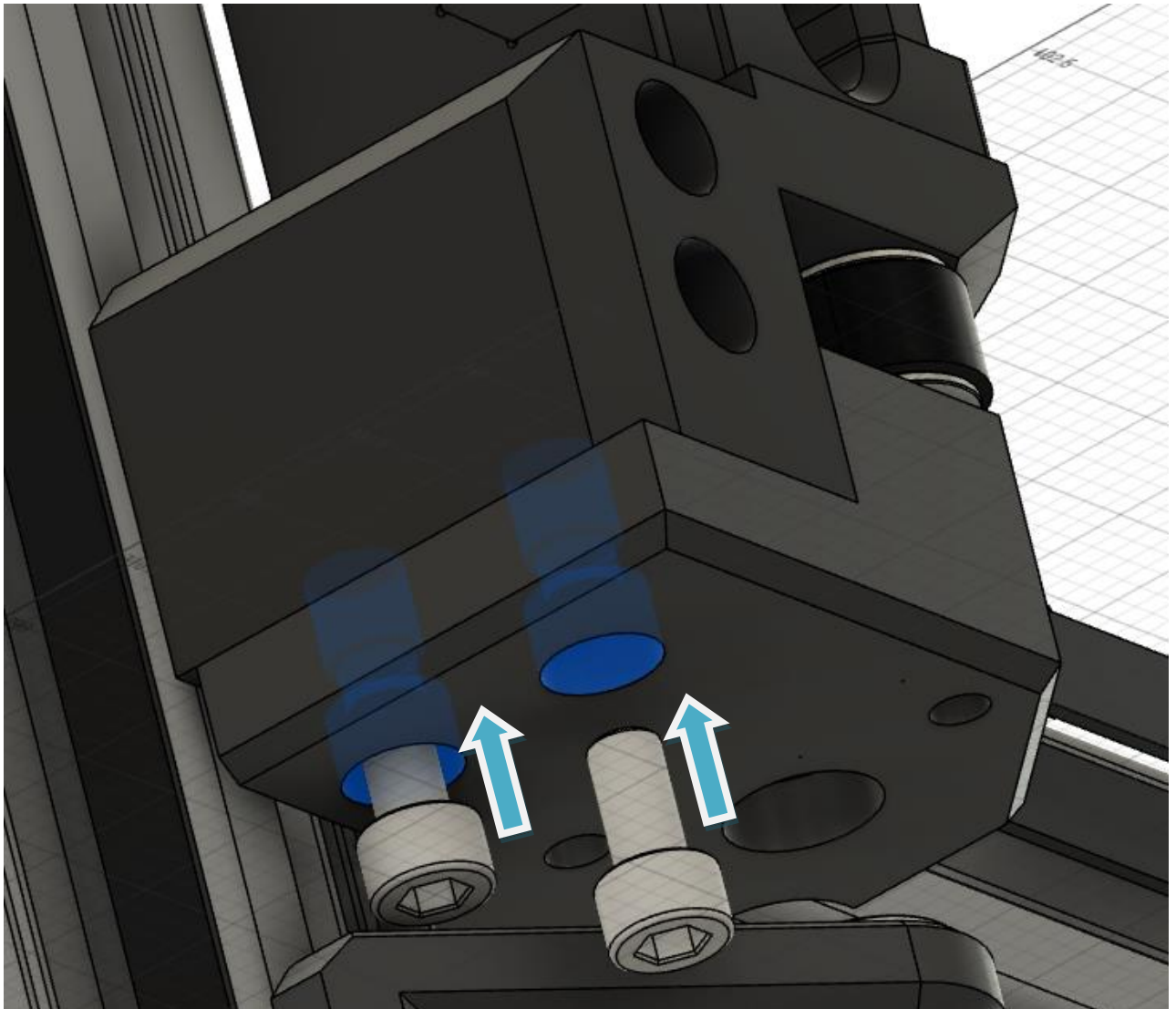


## 3-Under plates: Stock, SFU1204 and SFU1605 modules

This AWD design has been made to work with a stock VC3.0, a stock VC3.1, A VC equipped with either Zupgrade 1.0 or 2.0 with 1204 or 1605 ballscrews size/

### A/ Stock

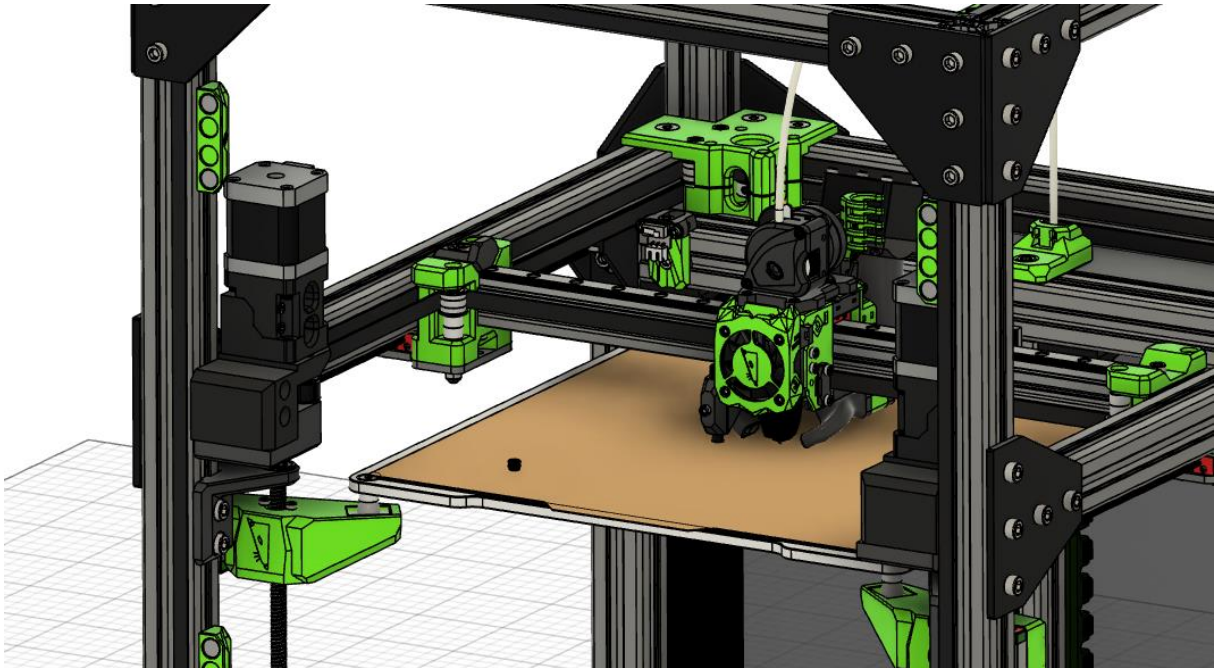
The actual manual is based on the stock plate mount, At the end you need to secure the last 2 M6 screws here:





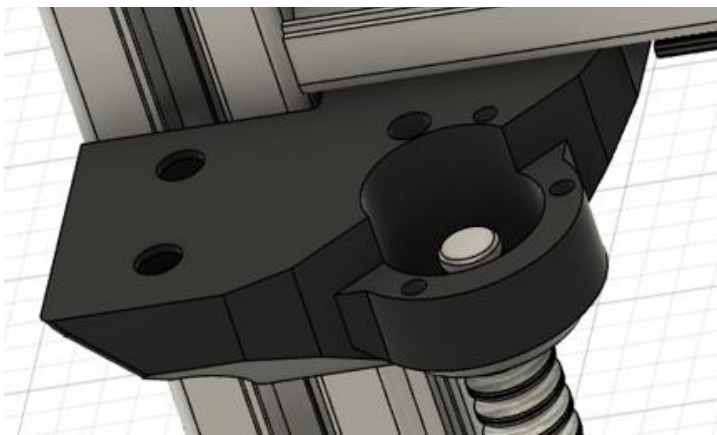


The result:



## [B/ Z-Upgrade \(1.0/2.0\) with SFU1204](#)

Same method than the Z-Upgrade 1.0/2.0 retainers parts, here the original parts is splitted in 2 section, to accommodate the AWD modules



*The Stock Z-upgrade retainer (to be removed)*

You need to remove the Open front V2 (or else).

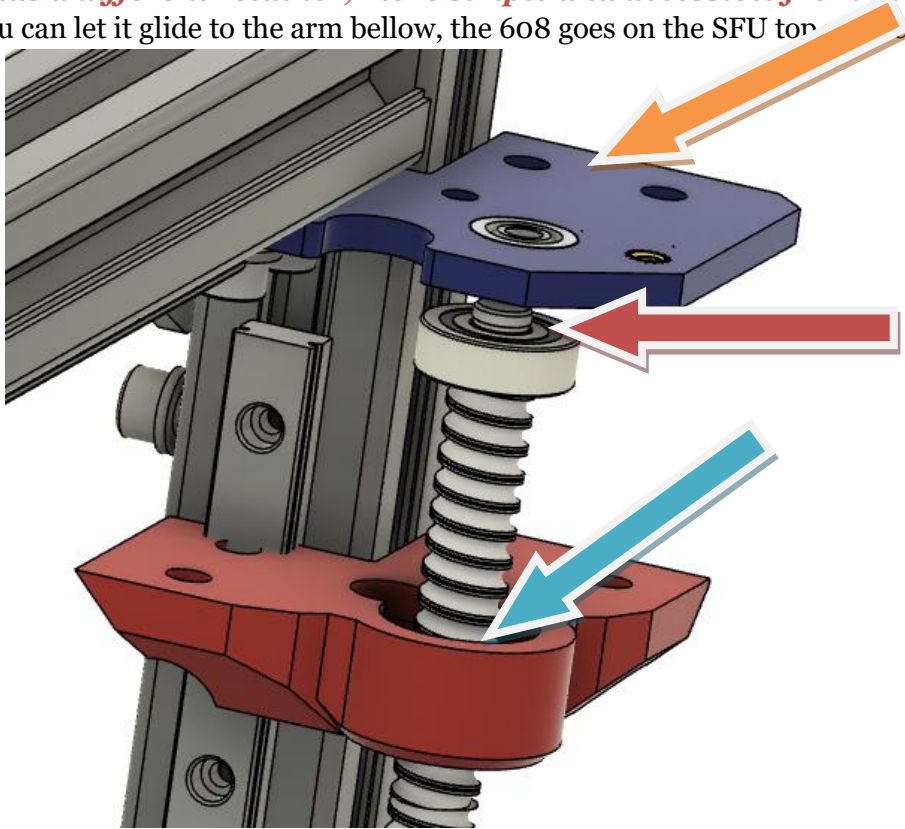
The installation is globally the same; The Blue part is where the Shoulder bolt grab the insert, and just bellow you have the red part, the retainer





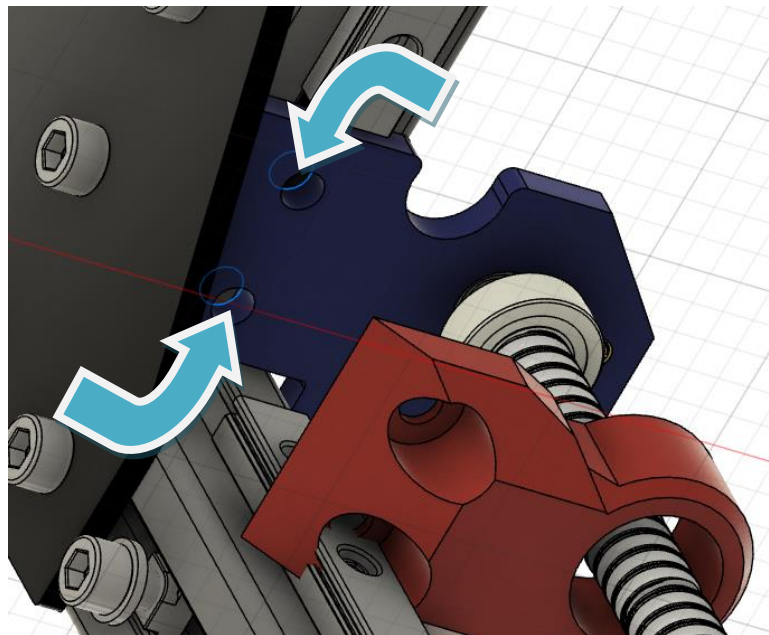
## Manual BRS-AWD D1 Drive

First, put the red part on the SFU, and then the 608zz bearing (since the release, SFU1204 has a different retainer, more simple and accessible from both ends), you can let it glide to the arm bellow, the 608 goes on the SFU top



Now you can make a normal assembly with the blue plate as the bottom AWD Section.

I suggest using Tnut with ball lock to fix them in position to be locked later tout the red and blue part. Standar TNUT works but is more tricky to place

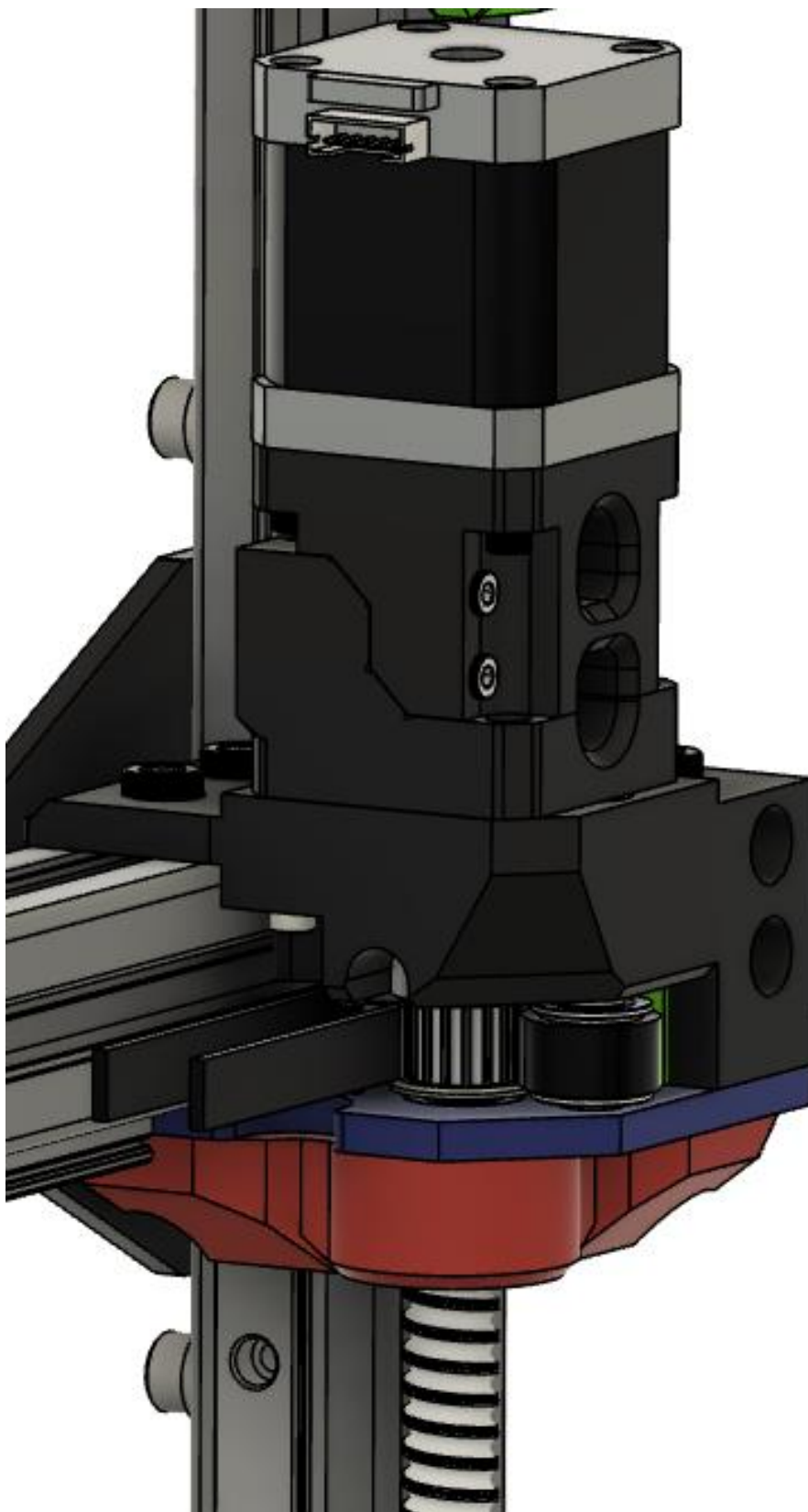


As the clearances are more tight in this SFU configuration, a bit of patience and wiggle job may be needed



## Manual BRS-AWD D1 Drive

*The final result:*

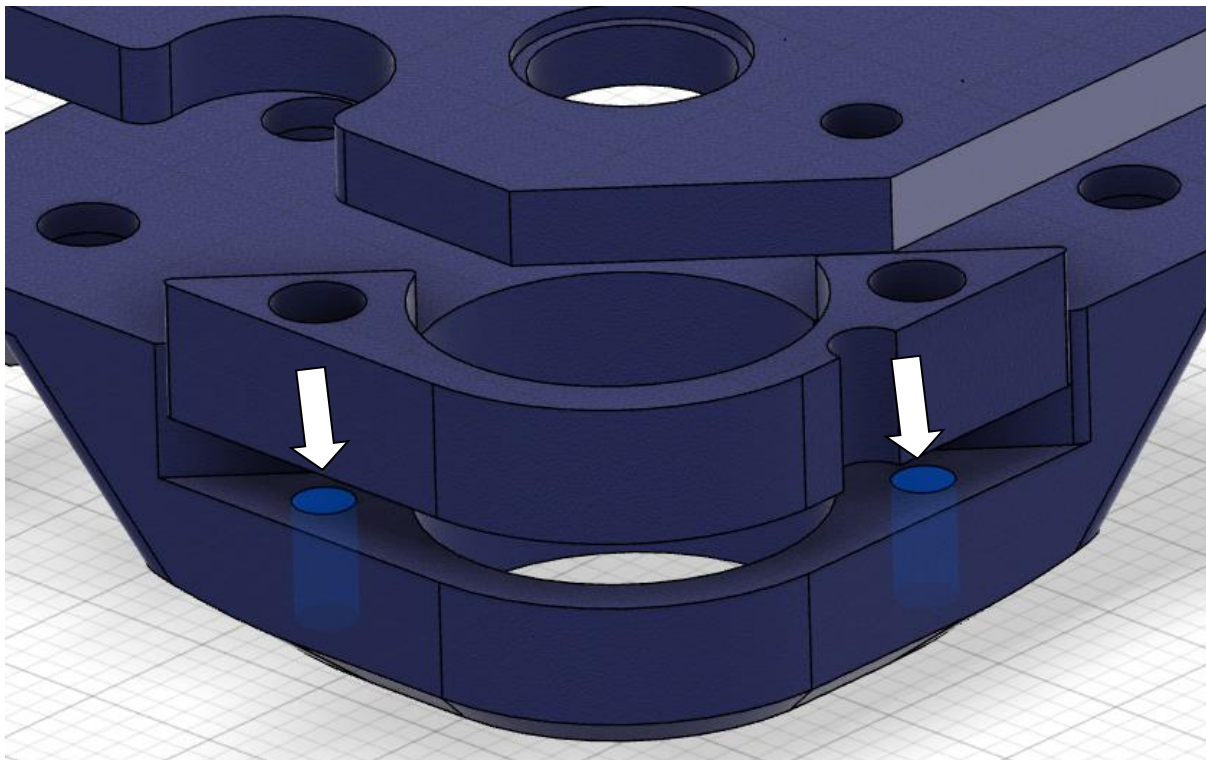




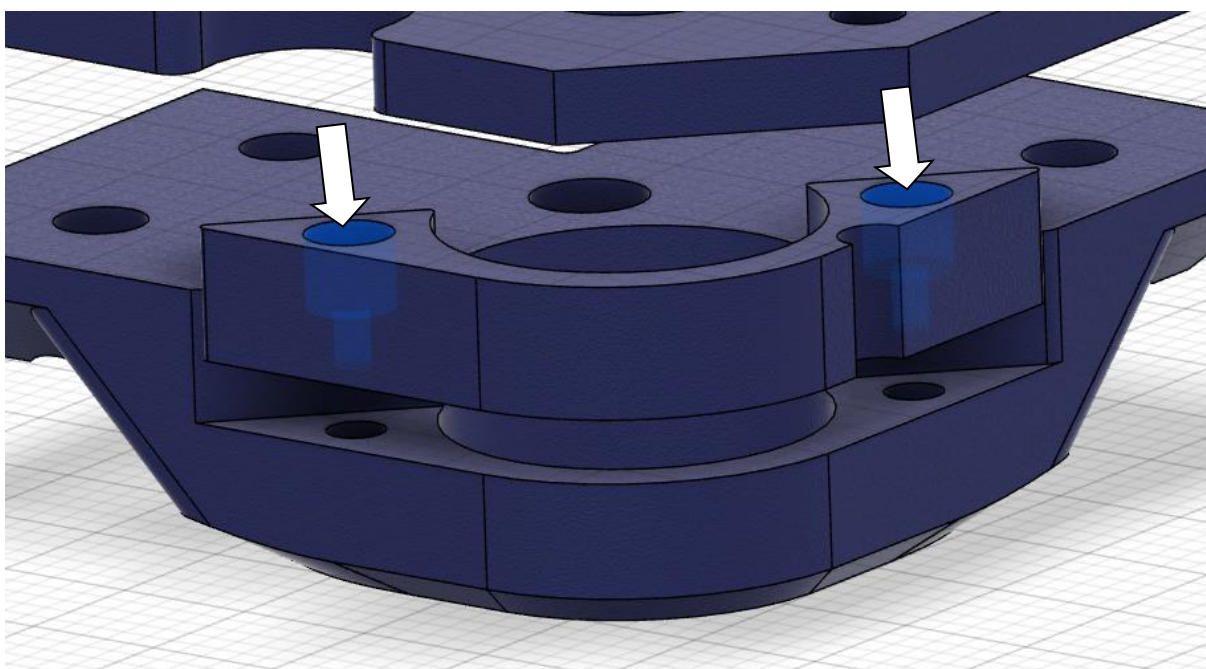
### C/ Z-Upgrade (1.0/2.0) with SFU1605

Basically the same methode than 1204, Only a part need to be fix to cover the bearing section (this part isn't mandatory)

*2x M3s inserts here*



*Fix the part with 2x m3x5*





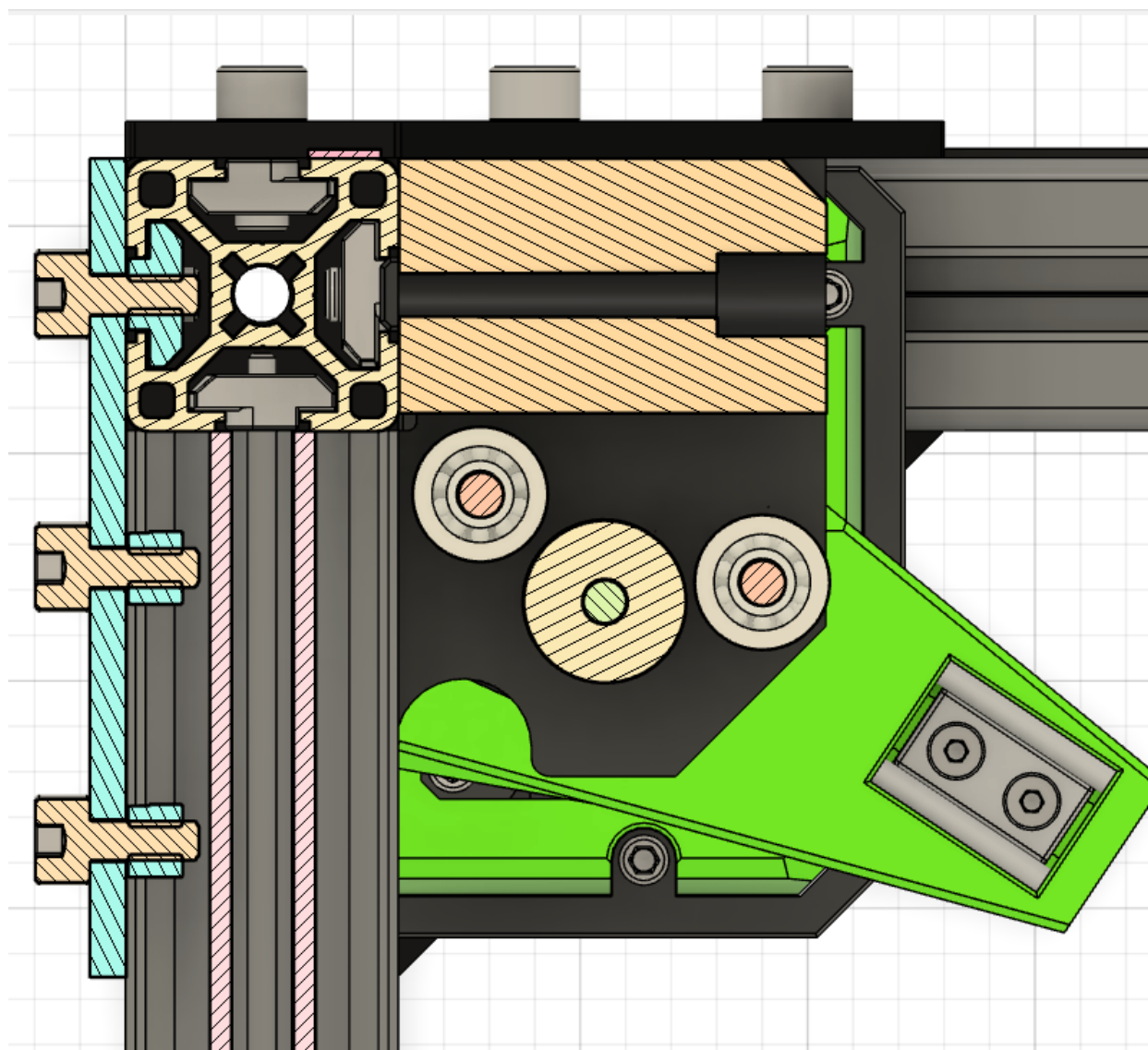
### 4-Belts routing :

Belt routing on this mod has been made to maximize the grip and the torque transmission of the 9mm toothed pulley (90° compared to a 180° degrees rotation) without the need of a big block in the front and to keep the belt length as close as the stock one.

All this fact make it quite polyvalent for the usage we need:

Enclosures are compatible, nothing outside, Printing volume clearances still at 100% (Vz toolhead)

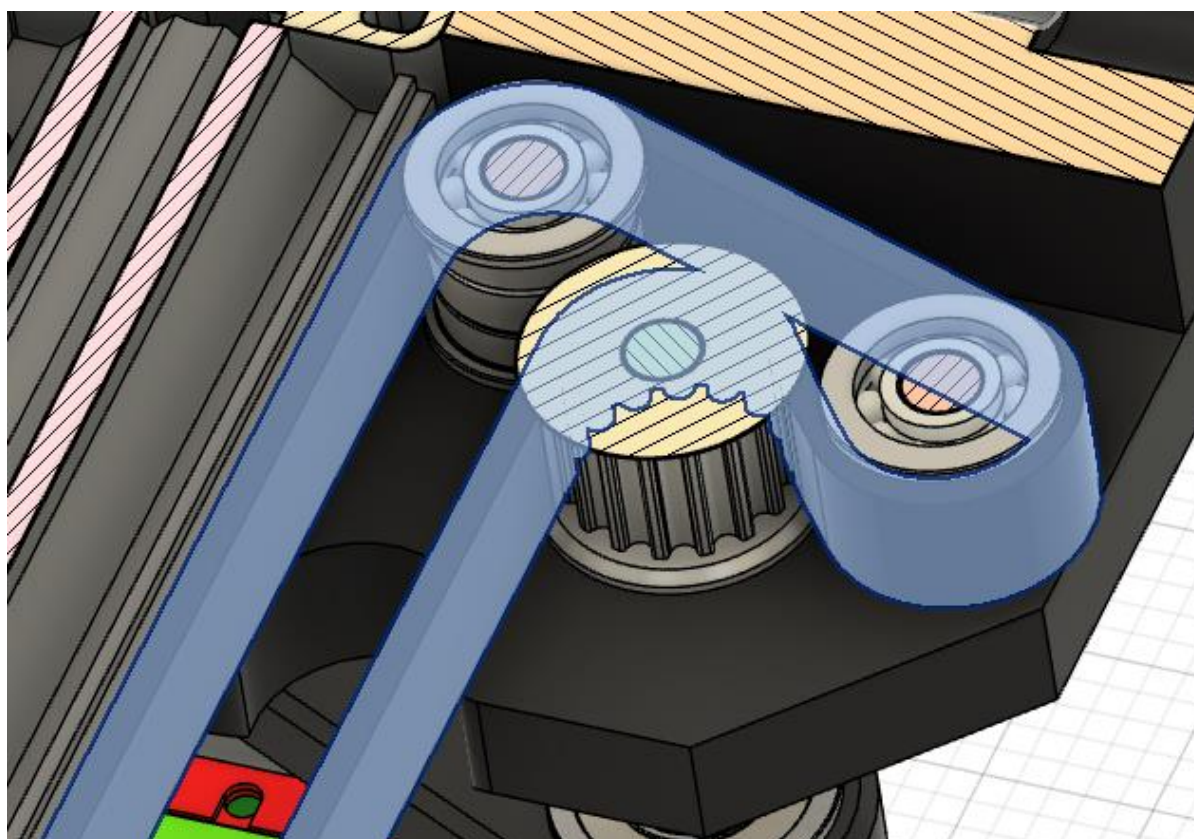
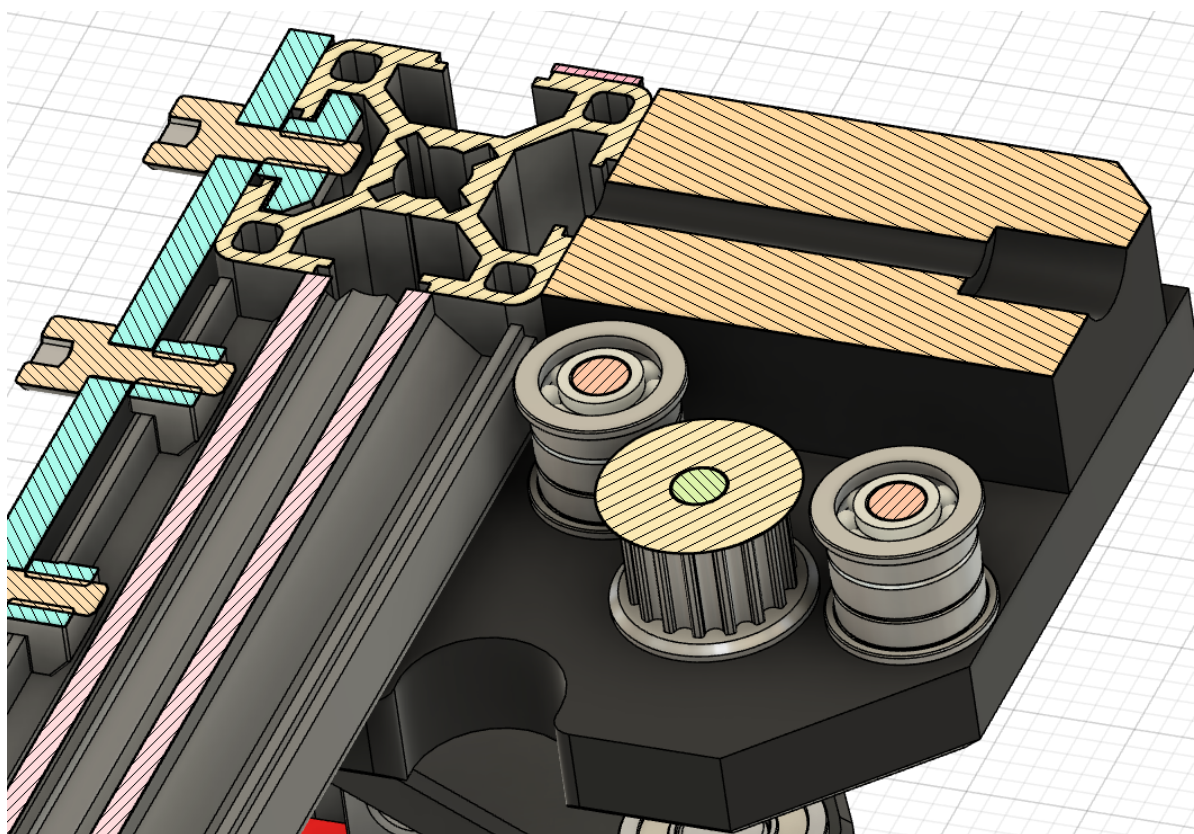
Here the layout we have to route the belt, no need to redo a full routing from the beginning, the mod adapt to any Vcore! As the assembly is done at this point, I advise the usage of a zip tie to help you routing the belt.







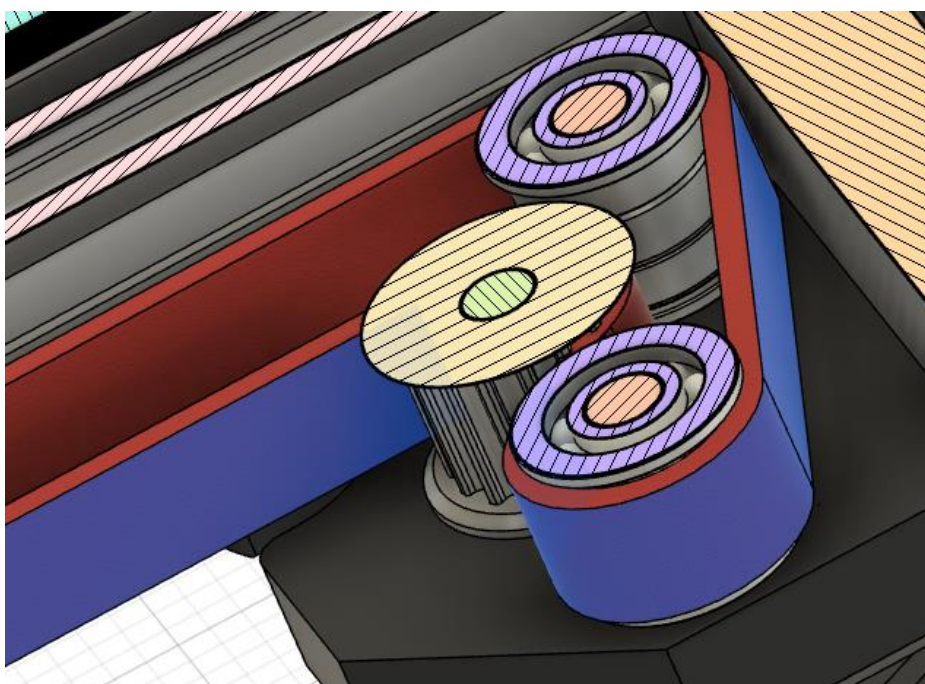
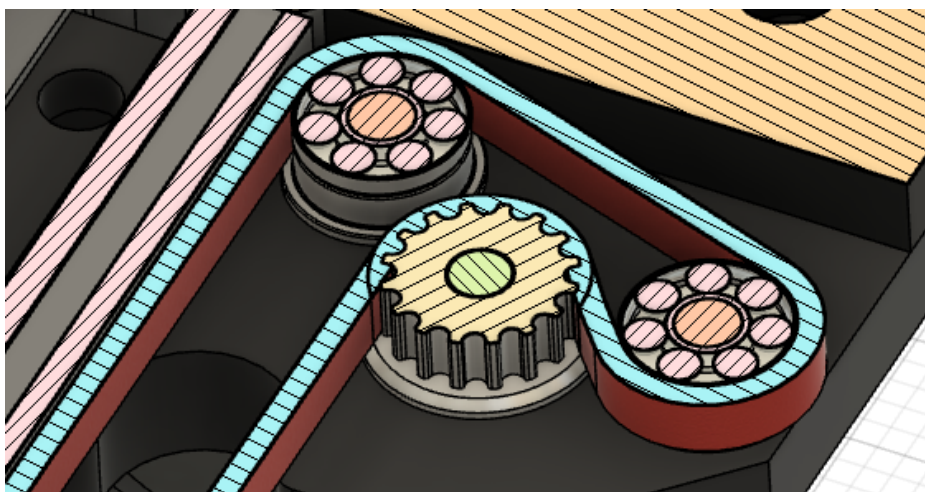
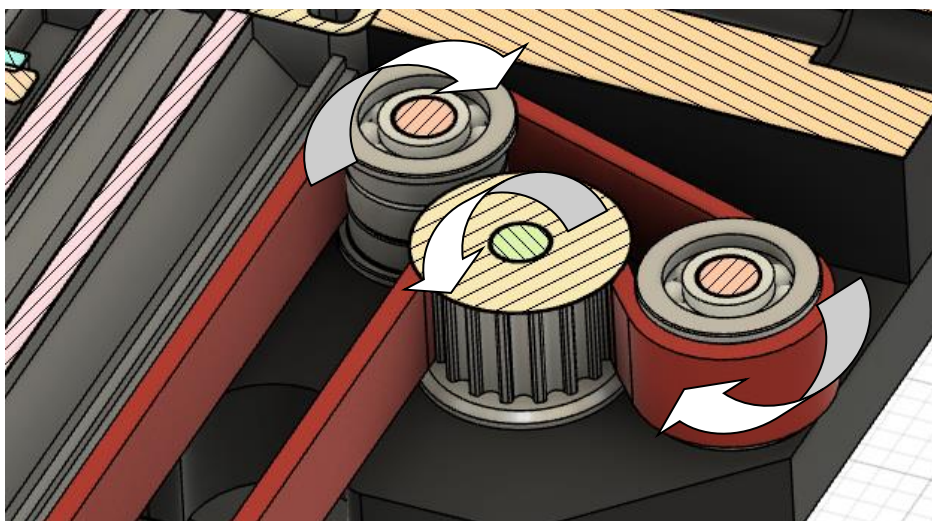
## Manual BRS-AWD D1 Drive







## Manual BRS-AWD D1 Drive



The blue face is the toothed face

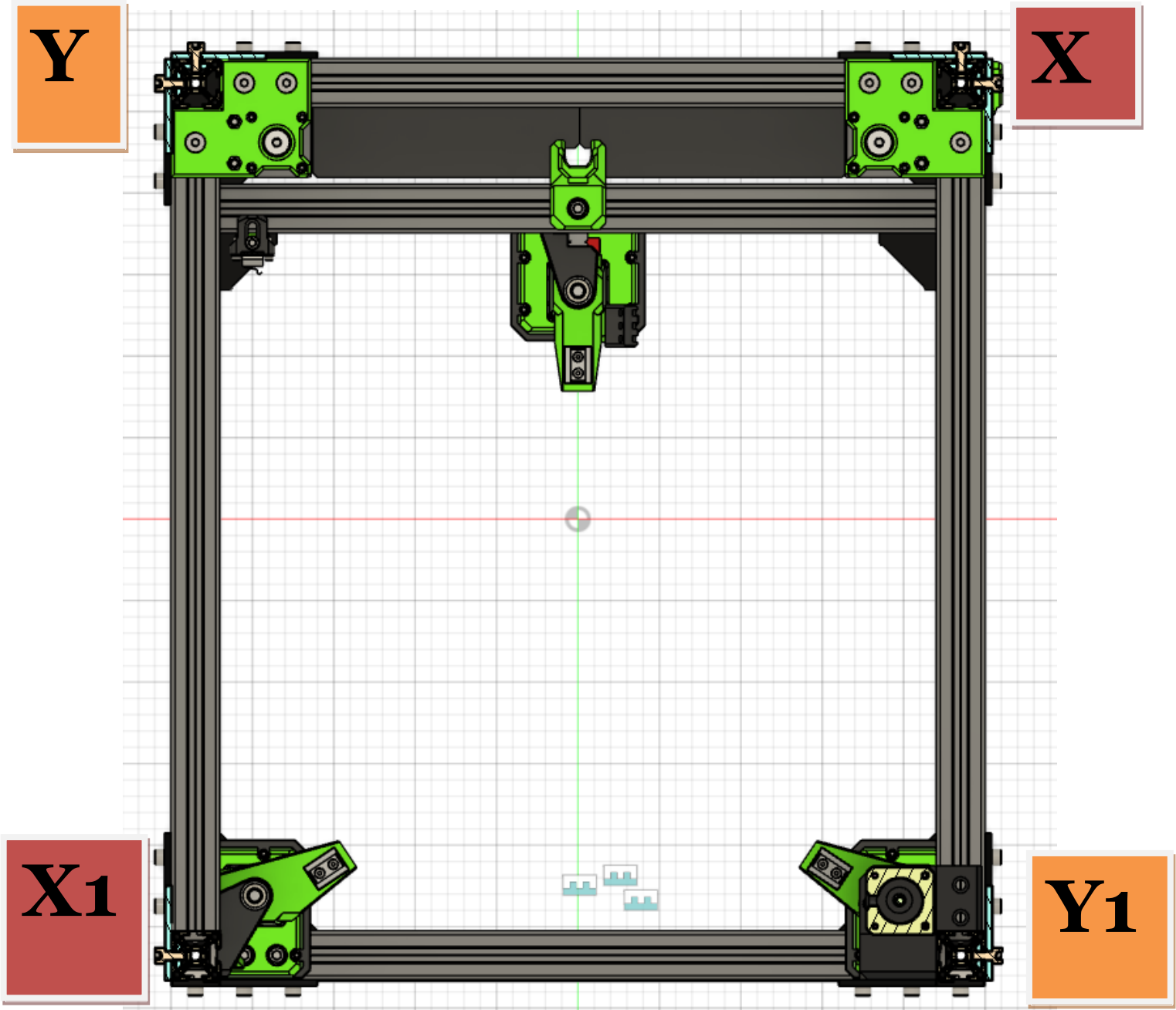


Refer to the instruction to tune the Tension on the GITHUB [Belt-tension.pdf](#)

## 5-Wiring

You need to add the 2 drivers to your board, then make sure the wiring is correctly made to allow X and X1 to run in the same motion logic, same for Y and Y1

-Now the placement for each motor





## 6-Printer.cfg implementations

You will find here the template to accommodate the AWD in the CFG

<https://github.com/FlorentBroise/BRS-Printers-Mod/blob/main/manuals/KlipperconfAWD.pdf>

**DON'T FORGET THAT ALL THE MOTORS NEED THE SAME ROTATION DISTANCES, SAME MICROSTEPPING SETUP, SAME TMC SETUP**, If not you will be surprised by heavy noises and vibrations.

## 7-Motor Sync

To have a clear motion, we need to synchronize all the motors, this step is mandatory for a smooth running system.

I encourage you to make a specific macro to call this gcode arguments:

*[gcode\_macro enable\_stepper]*

*gcode:*

```
SET_STEPPER_ENABLE STEPPER=stepper_x ENABLE=1
SET_STEPPER_ENABLE STEPPER=stepper_x1 ENABLE=1
SET_STEPPER_ENABLE STEPPER=stepper_y ENABLE=1
SET_STEPPER_ENABLE STEPPER=stepper_y1 ENABLE=1
```

AND

*[gcode\_macro disable-steppers]*

*gcode:*

```
m84
```

**Step 1:** Set belt tension like on a normal machine, following this [documentation](#)

**Step 2:** Loosen the grub screws on one of each set of motors,

**Step 3:** Start up the printer and order “enable stepper”.

**Step 4:** Then tighten the stepper grub screws and disable steppers again.



## 7-License :

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## **Assistance**

Like always, I provide an lifetime assistance:

As this manual is the first release, even after having made the assembly myself, I could have missed some specificities, don't hesitate to ask me if something seems wrong!

**Any question or issue can be submitted to Florent Broise on Facebook/Discord or at [contact@brs-engineering.com](mailto:contact@brs-engineering.com)**