

# FLOATBOXX CXC mechanical assembly instruction

Release version

Document v0.2

March 2024

## Disclaimer

These are Do-It-Yourself products. Floatboxx is not responsible for damages or harm caused by the proper and/or improper use of these parts. We do our best to make the boxes waterproof, but cannot give guarantees about waterproofness. Test yourbox for waterproofness during and after assembly. Check your box regularly for water ingress. This assembly instruction is not aimed to be complete.

Powderpaint is used to seal the gaps. We lay it on thick. This has 2 **less** desired consequences:

- On some locations larger drops of paint are formed.
  - o Large drops can crack in the oven leading to less visual appealing looks. The Floatboxx function and waterproofness is not hindered.
  - o Large drops of Powderpaint can hamper the fitting inside the rails. In this case you should cut off some paint.
- Auxiliaries (switch, charge port, cable glands) might not fit. You should cut off some paint for fitting.

We use a sharp cutter to cut away the paint. Don't use a dusty grinding machine.



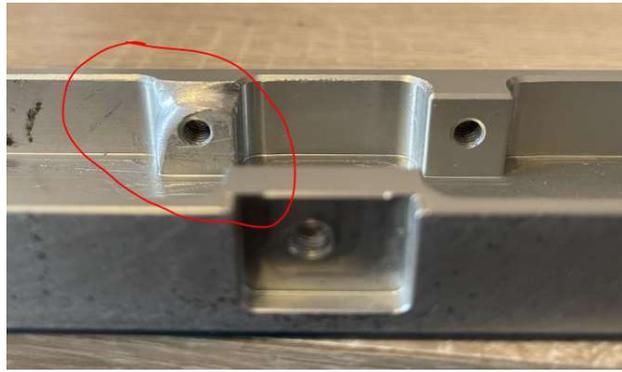
## Tips

- Easiest is to first assemble the Floatboxx and then solder your battery cable because you need the cable glands for both steps.
- M5 screws happen to fit inside stock #10-32 threads. (other way around is not advised)
- Metric 3 mm Allen key (for M5 countersunk screws) happens to fit the #10-32 countersunk screws.
- Stock #10-32 imperial screws are black. We use shiny stainless steel screws for Metric.
- It is not advised to use power tools to screw bolts and nuts !

## Known conflicts

We tried to design with all popular accessories in mind to make it easy to install on most combinations. Yet there are still some "collisions" that remain. These can be solved by simply grinding/cutting the conflicting element:

- TFL WTF and Growler rails have an extreme large threaded protrusion for the footpad screw. This collides with the cable gland.
  - o Best file the protrusion on the rails to not touch the cable gland (see picture)
- Badger Bumper: Floatboxx CXC is not compatible with the front Badger Bumper.



## Required parts

- Floatboxx CXC + lid + foamrubber sealing + aluminium controller plate for your VESC type
  - o Including vent stickers, bag of screws, polymer sealant
  - o Optional: JST extension wires, cable glands
- VESC:
  - o Little Focer V3 or V3.1, Tronic 250R, X12 and 1 mm thermal pad
  - o Ubox 80V or 100V, Thor-300
- on/off switch  $\varnothing$ 19 mm (pre-wired available from MakersPEV/Customwheel)
- charge plug Neutrik NC3 MPR-HD XLR (pre-wired available from MakersPEV/Customwheel)
  - o or use the GX16 charge plug with our optional adapter.
- Footpad connector cable:
  - o Either wire your footpad directly through an M10 cable gland without extra connector
  - o Either use the classic method with a footpad connectors. Get our pre-wired footpad connector cable with the stock connector, or make your own.
- M20x1,5 or PG13,5 messing cable gland with lock nut suitable for XT60. **Make sure the Dome Nut is 22 mm (not 24 mm).** Or get the Fungineers female HIGO 1019 panel connector.
  - o For battery: The XT60 can never fit trough the plastic insert and dome nut of the cable gland. So you have to solder the XT 60 after adding the cable glands to the cable.
  - o For the motor: the 6 pin JST can fit through the cable gland.

## Tools



Flat-nose plier with bend	Allen key screwdriver		Socket Driver		Spanner 22 mm
Ideally 40° - 200 mm	3 mm	2 mm	For M3: 5,5 mm hex *	For M4: 7 mm hex	For M20 cable gland

\*smallest outside head diameter you can find, to avoid damage to the electronics components!

## Installation of connectors

First install all connectors, cable glands and the button. You have more access to the nuts fixing these auxiliaries before permanently fixing the controller plate.

**Preferably lock the nuts with Loctite so they cannot loosen due to vibrations.**

### Cable glands for battery and motor cable

1. Place the counternut of the cable gland inside the Floatboxx.
  - a. The 24 mm nut should brace itself against the wall or help brace it with a thin plate/screwdriver.
2. Mount the cable gland from the outside and turn it tight with the 22mm spanner.
3. Keep the plastic/neoprene insert and dome nut on the cable gland for now.

Note 1: if you use PG13,5 (OD 20,4 mm) you might need to make the hole in the Floatboxx larger. Scratch of some paint and metal with a deburring tool or dremel. Try to keep the hole round.

Note 2: remember for later: if the XT60 does not fit through the body of the M20/PG13,5 cable gland, you must slide it over the cable before soldering the XT60 in the cable step !



### Cable glands for footpad and LED

Similar as above but with M10 cable gland.

### Charge port

1. Grind the corners of the counternut\* so it fits inside a circle of  $\varnothing 26$  mm (inside height of boxx is  $\sim 26,5$  mm). You can use a file or a power tool. Most nuts are made of messing so they are easy to grind. Make sure to keep some of the hexagon intact so you can still tighten it.
2. Place the charge port in the hole in the preferred orientation (use the charger cable to align and hold the port in position)
3. Apply some Loctite on the counternut (against vibrations) and tighten with the Flat-nose pliers.



\*Alternatively, you can use our special XLR long nut. This is  $\sim 25$  mm, nylon, threaded bush with 22mm hex on the far end.

## On/off button

Place in the hole and tighten the counter nut with the Flat-nose pliers.

## Fixing the controller plate to the box

Floatboxx CXC is a modular system that can support various VESC controllers. You select the specific controller plate at the time of purchase. The aluminium controller plate is a large heatsink and also acts as splash cap/connector cover.

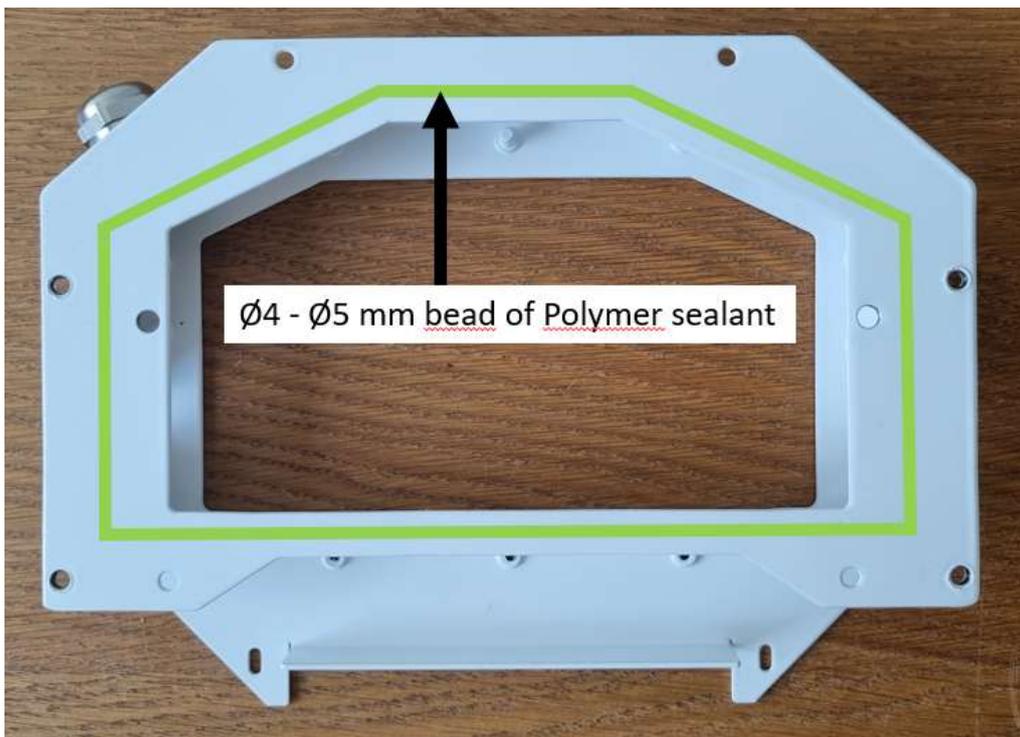
The aluminium controller plate is mechanically and chemically fixed to the Floatboxx to form 1 strong unity.

## Preparing the surfaces

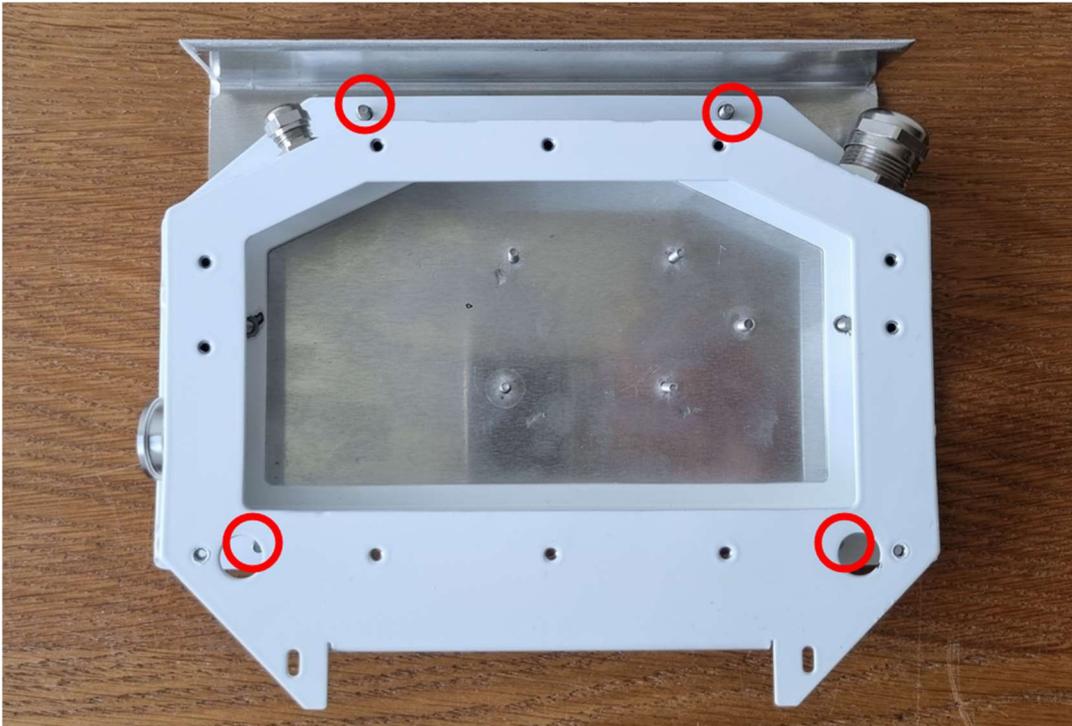
Powdercoating can be tricky for silicone/polymer sealant to stick. Before glueing the Floatboxx CXC body, the powdercoated surface must be chemically roughened for good adhesion. Use a cloth with surface activator or thinner or acetone and rub the powdercoated surface. The difference will be hardly visible, the surface becomes somewhat dull.

Before glueing the controller plate to the Floatboxx CXC body, the surfaces must be clean: free of dirt, grease, dust.

1. Place the CXC body upside down on the table
2. Apply a  $\varnothing 3$  to  $\varnothing 4$  mm bead of Tec7 MS polymer sealant in a continuous bead on the CXC body.



3. Place the aluminium controller plate on the table with the studs upward.
4. Position the CXC body over the 4x M4 studs of the controller plate. Press it well.
5. Fix the assembly with 4x M4 lock nuts (red circles)
  - a. Tighten handtight with a 7 mm socket driver (maximum torque of M4: 4 Nm = 3 lbs.ft)
6. Remove excess sealant while it has not hardened yet



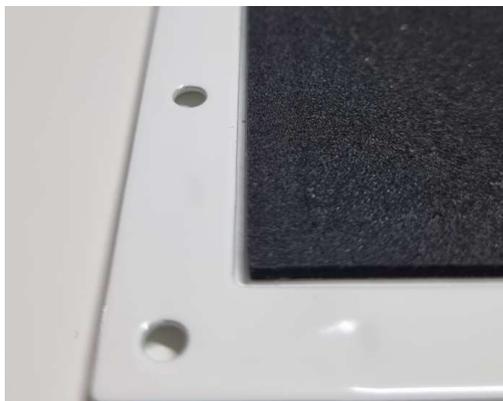
Tec7 is a strong, somewhat elastic adhesive/sealant. It takes 24h to cure. This process is kinda irreversible.

## Prepare the lid

Glue the self-adhesive foam rubber on the inside of the lid. Make sure

1. the lid is free of dirt, grease, dust
2. The foam rubber fits nicely within the boundaries of the mounting edge
  - a. Test-fit, so you can visualise the gaps around
  - b. Peel off 50% of the paper, fold it.
  - c. Start putting the foam rubber on 1 side, while making small adjustments.
  - d. Once started well, roll out the rest while avoiding airbubbles.

Note: only about 10 mm edge of the foam rubber is needed to seal the box around, so you could cut out a middle section of the foam rubber before glueing.



## Placing the lid

1. Place the lid on the Floatboxx
2. Insert all 13 M3 screws first, then tighten them
3. Limit the tightening torque for M3 to 1,5 Nm = 1,1 lbf.ft
4. The mounting edge of the lid should touch the mounting flange of the boxx: metal-to-metal. This compresses the seal 1 mm (from 3 -> 2 mm).

## Testing for waterproofness

Now that all connectors are placed, you could test and fix the waterproofness. Refer to other Third party kits. Cable clans can be closed by placing a pencil or small cap in them and tightening slightly.

The Polymer sealant can be used to close any holes in the structure. Prepare the surface well as described in the other steps. Polymer sealant is much stronger than silicone and irreversible ! Do not use it on joints that you want to take apart again later !

When waterproofing is done you can close the vent hole with a sticker. Be sure the surface is free of dust and grease.

## Mounting of the Little Focer

---- This section and pictures are taken from the Floatboxx MLC manual ----

Before installing the controller, make sure you are satisfied of all the connectors.

Use some tape to keep the cables out of the way.

During the installation of the controller, be carefull not to damage the electronics components ! It is advised to wear gloves to avoid ESD (electrostatic discharges).

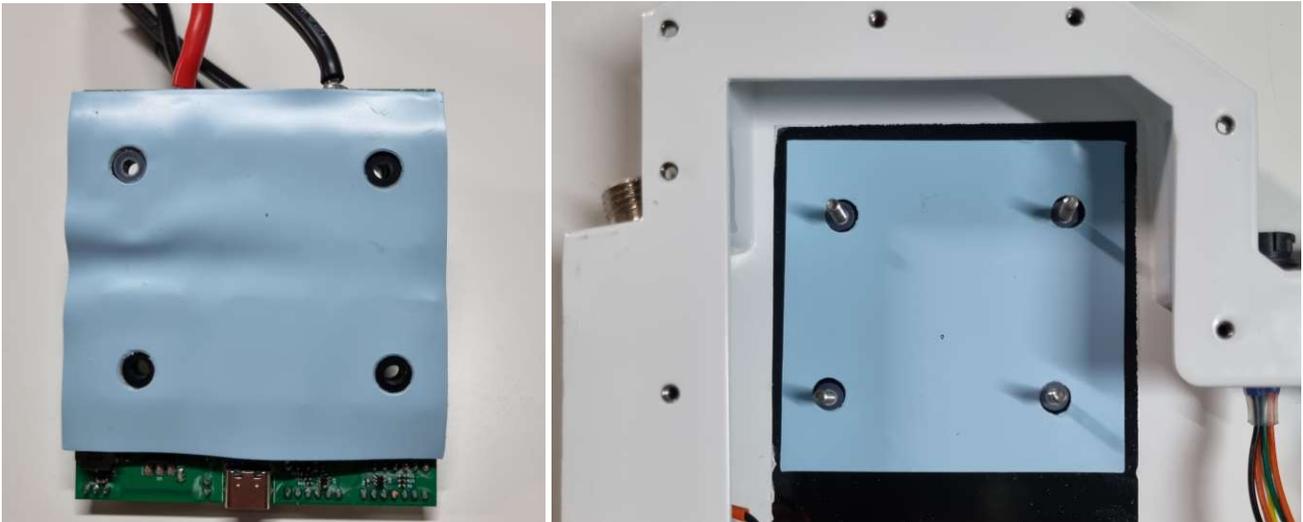
The position of the Little Focer is fixed by the 4x M3 studs. The USB port is in the front.

1. Place 4 nylon washers on the studs first
  - a. The MOSFETS of the controller should NOT touch the aluminum bottom plate. The nylon washers guarantee a distance of minimum 0,5 mm.



2. Place the thermal pad
  - a. Place the thermal pad temporarily on the MOSFETS of the controller and make 4 holes in the thermal pad for the M3 studs. Make the holes a little larger ( $\varnothing 7-9$  mm) so the thermal pad will not rest on the nylon washers.

- b. Remove the thermal pad from the controller and place it carefully in the box over the studs and washers.
- c. Strike the thermal pad flat. If you have wrinkles, they are best between the MOSFETs and not below them.



### 3. Place the Little Focer

- a. Hold the controller in 1 hand and guide the powercable with your 2<sup>nd</sup> hand to fit nicely next to the controller.
- b. Lower the controller until it rests on the M3 studs. Then slide it gently backward while guiding the powercable under the edge of the box, until the holes meet the M3 studs
- c. Then lower the controller on the M3 studs while still guiding the powercable
  - i. Make sure the powercable sit comfortable and is not pinched below the controller.
- d. Check that the controller is touching the thermal pad and sits nice and even. Basically all 4 studs should show equal length of thread.



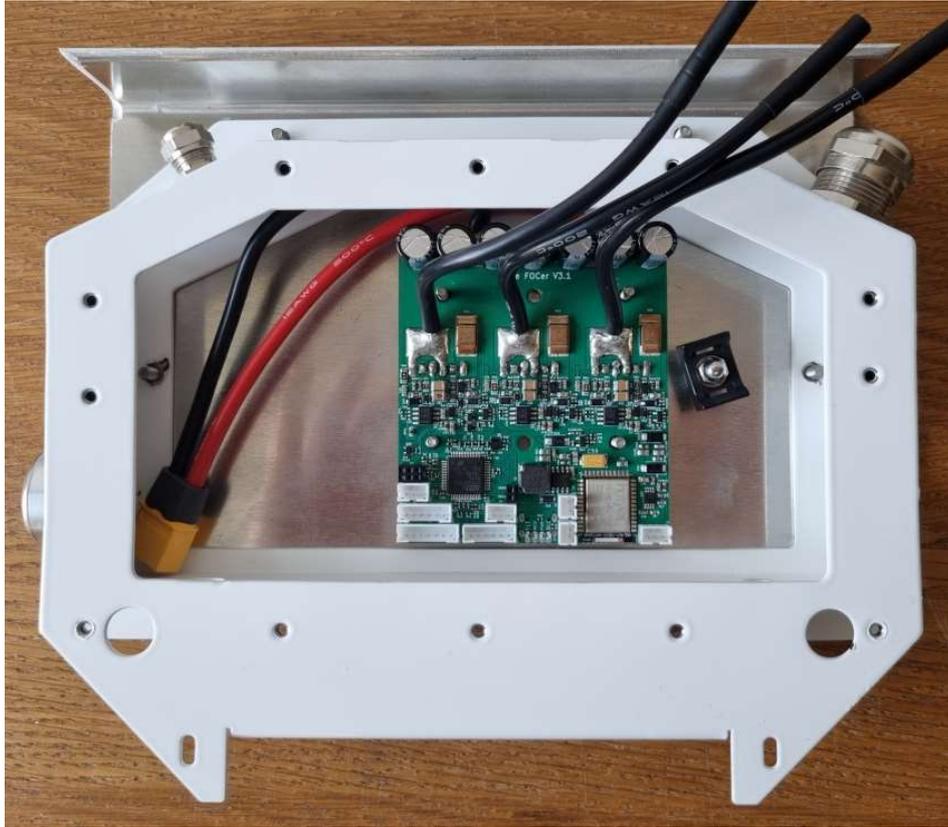
### 4. Tighten that Focer !

- a. Put a nylon washers on each studs. (these protect the PCB from the metal nuts)
- b. Mount the 4x M3 locking nuts by hand as far as possible
- c. Use the 5,5 mm socket driver to tighten them more. But carefull to never sink too low and touch electronics components. Max M3 torque 1,5 Nm = 1,1 lbf.ft

### 5. Connect the 3 motor phase bullets to get them out of your way

- a. Make sure all small wires are below the 3 motor phase wires

- b. You could mark the mating wires for later, but if you always do left-left, middle-middle, right-right, you should be good.



The tie wrap anchor can be placed. It can be used later to tie down the phase wires.

## Cables

### Battery harness cable step 1

1. Now you install the battery harness cable through the gland.
  - a. Carefull without touching the electronics components
2. Cut the wires to lengths and solder your connectors.
  - a. Make sure the glands are on the cable before soldering !
3. Only tighten the cable gland after you test fitted the box within your rails with the battery box and motor installed. And give the battery cable some millimeters slack.

### Installation in the rails

Before tightening the battery harness cable, you best install the Floatboxx in the rails with motor for test fitting.

1. Check the list of potential collisions and solutions at the beginning of this manual.
2. Use 2x M5x10 countersunk screws in the 2 rear holes of the Floatboxx.
3. Also fix the left front of the Floatboxx to the rail with the M5x16 so that the boxx is fixed by 3 screws.

### Battery harness cable step 2

1. When everything fits, remove the right rail again.
2. Layout the cable like it should go through the axle block. Give a few mm slack.
3. Tighten the dome nut to fix the battery cable.
4. Install the right rail again with 1x M5x10 screw.

## Internal electric connections

Now all other internal connectors can be plugged. Do not overstretch wires. Use extension cables if needed.

Attention 1: certain components require a fixed sequence for plugging in multiple connectors !!

Attention 2: certain components require an anti-spark connector to connect to high voltage !!

## Connecting the Motor

Connect the 3 phase wires and the hall sensor JST connector to the controller.

Tie down the phase wires on the tie warp anchor.

## Final assembly

### Bumpers

As advised with every bumper installation: first insert all screws sufficiently. Then tighten them all one-by-one.

Use 2x M5x16 countersunk screws (or 2x M5x20 depending on the bumper thickness) to fix the bumper to the Floatboxx, through the rails in the front. Be sure to place the screws straight in the thread and not angled!! **If the bumper does not allow a straight position of the screw, make the holes in the plastic bumper larger! This is needed for some BANG Bumpers.**

Use 2x #10-32 standard screws to fix the 2 rear holes of the bumper to the rails

### Lid

If everything is fixed, there are no loose ends and no loose components left, the lid can be closed. Screw until metal-to-metal but with max. torque for M3 to 1,5 Nm = 1,1 lbf.ft

Connect and install the footpad.

## VEESC tool

The Little Focer placed with the capacitors to the rear requires a 180° yaw offset in IMU settings.

