

CR-10 at it's max!

# Franken-10

A CR-10 Dual Extruder Mod



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# Introduction

## Intention

I wanted to upgrade my awesome Creality CR-10 3D Printer to make it work with dual axis - but without building it completely up from the ground. Also I want to keep the upgrades **cheap**, so everyone can easily join this journey.

## Benefits

- Using existing CR-10 Frame (**no drilling**, etc.)
- TMC2130 upgrade
- Silent printing (thanks to TMC2130)
- Sensorless homing on X and Y
- Filament-Runout Sensor (using existing endstops)
- 32 Bit Mainboard
- 2 independent extruders (fast switching, no purge-block)
- Auto bed-leveling and Mesh-Correction
- basing on newest Marlin Firmware (V2.1.x)

## Sources

All sources can be found on GitHub:

- Franken-10 related stuff: <https://github.com/sensenmann/Franken-10>
- Github fork: <https://github.com/sensenmann/Franken-10-Marlin>

## About the author

I'm a Software Developer, located in Vienna / Austria. In the year 2018 I've started 3D printing, and the CR-10 was my first 3D printer. After learning a lot about 3D printers, I've also bought an Ender 3 and a Prusa i3 MK3S (later with MMU2S).

My CR-10 has an enormous buildplate, but it was lacking a lot of features of the Prusa i3, so I didn't use it anymore for a long time.

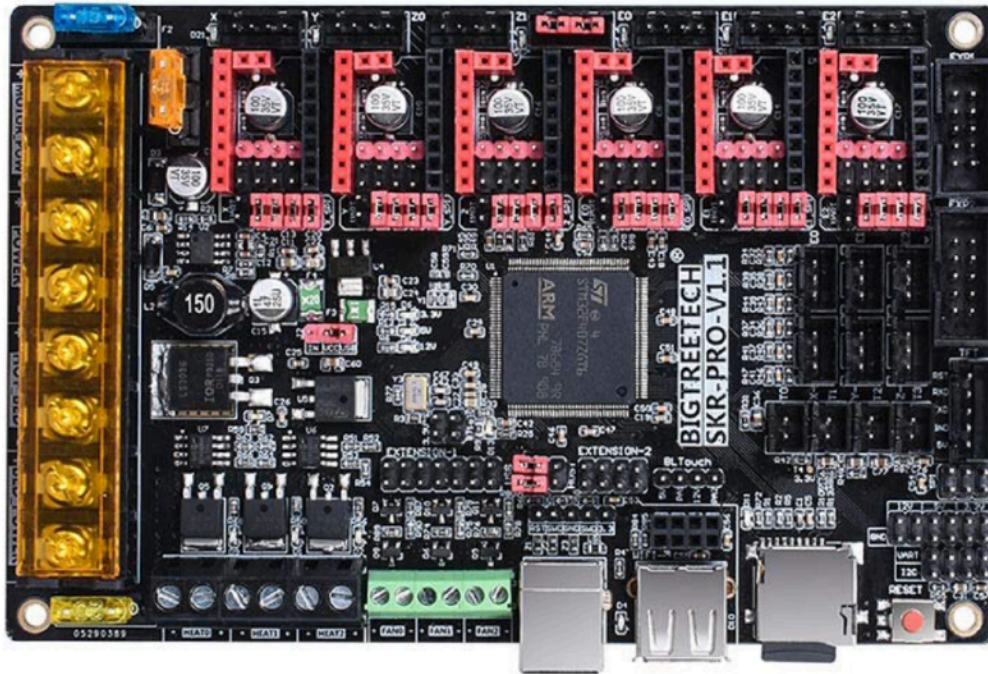
Mid 2019 I've started to start the Franken-10 project, because I wanted to use my CR-10 again - with all the nice features of the Prusa i3.

English isn't my native language, so please be kind if there are some typos.

## Changed / Updated Parts

### Mainboard

The stock CR-10 mainboard get's replaced with the BigTreeTech SKR Pro, which supports 6 stepper motors.

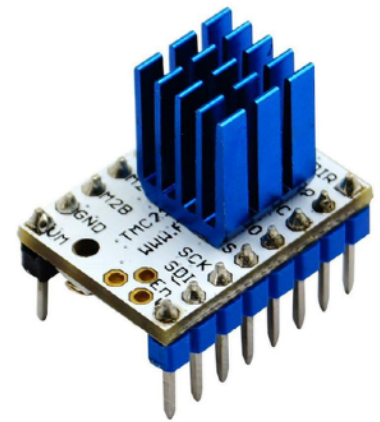


- X1 (Left Extruder)
- X2 (Right Extruder)
- Y-Axis
- Z-Axis (2 plugs for 2 z-axis motors)
- E1 (Left Extruder)
- E2 (Right Extruder)

### Stepper Motor Drivers

We update to TMC2130 stepper-motor drivers to get quiet and reliable prints.

The TMC2130 also allows sensorless homing on X and Y axis, so we can reuse the stock-endstops as filament sensors.



### LCD-Display with SD-Card Slot

Unfortunately we can't use the Micro-SD-Card Slot of the SKR-Mainboard, so we need a new LCD Display with integrated SD-Card Slot.



**The good news:** We now can use big SD-Cards instead of the tiny Micro-SD-Cards.

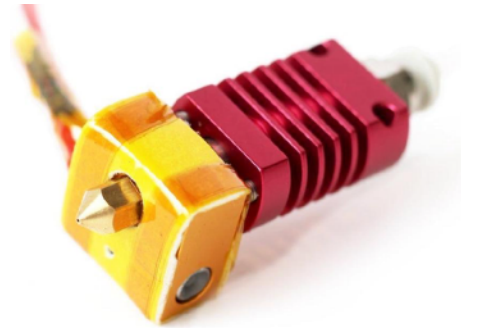
## Additional Stepper Motors

We need 2 additional stepper-motors. One motor for the 2nd hotend on the x-axis and one motor as the extruder for this new hotend.



## 2nd Hotend

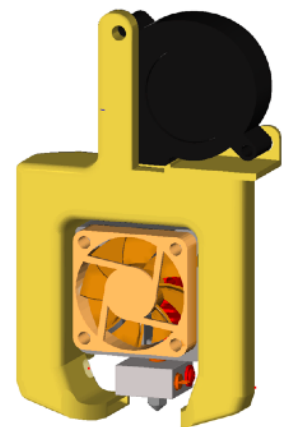
Of course we need a second Hotend for our dual hotend setup. I've chosen the same hotend, as the CR-10 already uses (MK8). An upgrade to E3D Volcano is not part of this instruction at the moment, but is of course possible.



## Petsfang-Cooler and 5015 fans

For optimal cooling we upgrade our Hotends to Petsfang-Cooler with 5015 fans and Noctua 40x40x10 fans.

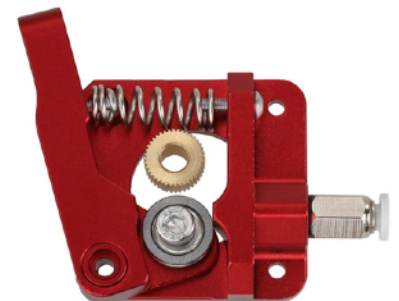
Original part from <https://www.thingiverse.com/thing:2759439>



## Aluminium Bowden Extruder

I've always hated the stock CR-10 plastic extruder, so I'm upgrading to all metal extruders. We need of course two of this.

Tip: Buy one left- and one right-handed.





## Auto Bed-Leveling with inductive Sensor

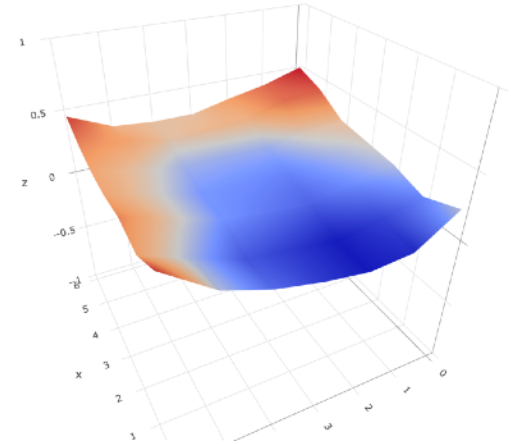
For Homing the Z-Axis and for leveling the bed, I'm using an inductive sensor. This sensor only detects metal, so you need one, which can measure far enough to detect your steelbed - or use an metallic build plate (which I recommend).



The firmware takes a lot of measuring-points and generate a mesh of your print bed.

This mesh will be reconsidered while printing, so you don't have to level your bed again.

Also uneven build-plates are no problem anymore.



## Dual Z-Axis Upgrade

With our modifications we generate a lot of weight on our Z-Axis. So I recommend upgrading to a dual z-axis setup.

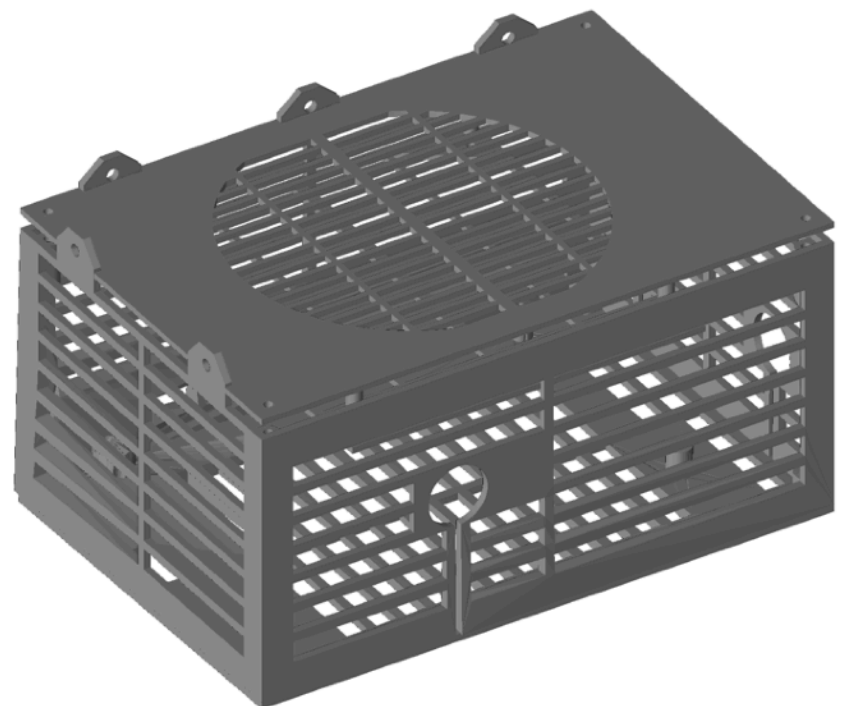
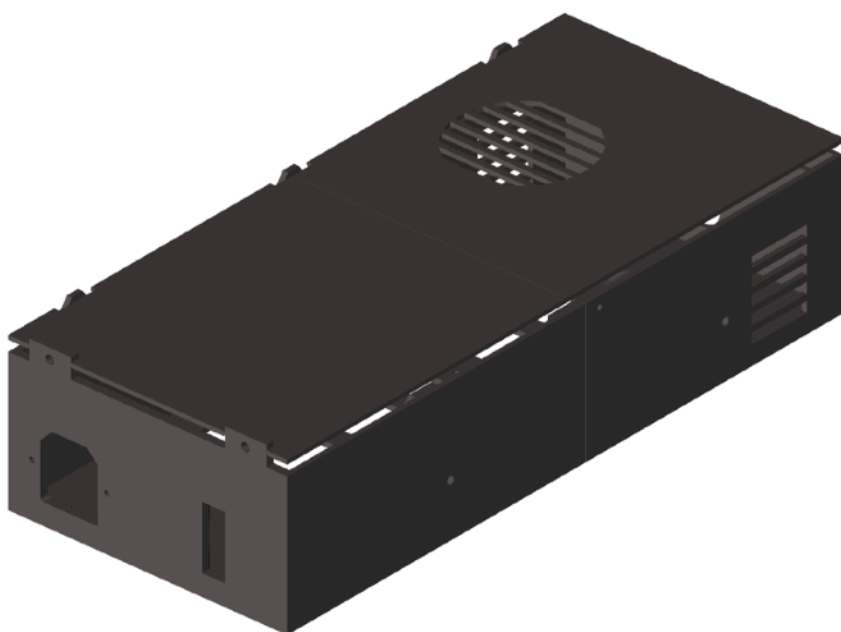
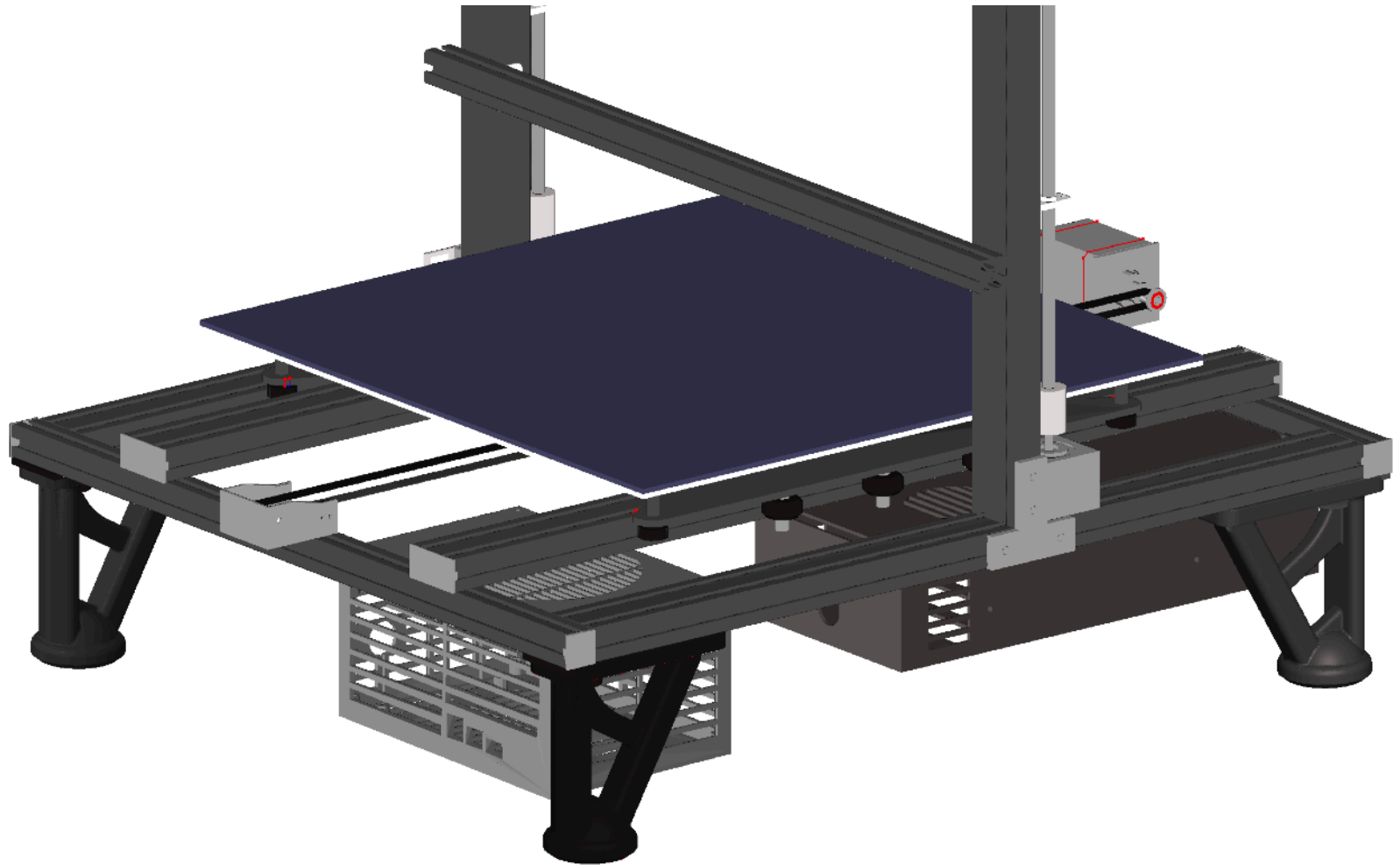
The 2nd z-motor can easily plugged in into the SKR Pro mainboard.

For perfect results, we use a timing belt to sync these two Z-rod.



## Control-Box

The existing Control-Box is way too small for our new mainboard. Also the stock-fans are extremely cheap and loud. The Control-Box will be replaced by two new enclosures, which can be mounted on the bottom of the CR-10.





## Untouched Parts

This parts do not be changed or modified:

- PSU
- Heated Bed
- The whole CR-10 Frame

## Parts we don't need anymore

The following parts aren't needed anymore, because they are upgraded / replaced:

- Stock Display (we need a LCD with SD-Card-Slot)
- Control-Box (we need more space for our board)
- Stock-Fan
- Extruder-Carriage
- Stock Timing-Belt (we need two longer ones)

## Preparations

### Buy the needed parts

Buy all the parts, listed on the GitHub page:

<https://github.com/sensenmann/Franken-10#needed-parts>

### Print the needed parts

3D print all the parts listed on the GitHub page:

[https://github.com/sensenmann/Franken-10/tree/master/3D%20Models/Needed%20Parts%20\(Print%20this!\)](https://github.com/sensenmann/Franken-10/tree/master/3D%20Models/Needed%20Parts%20(Print%20this!))