

BIGTREE TECH

Eddy V1.0

User Manual



Revision Log

Version	Date	Revisions
v1.00	April 19th, 2024	Initial Version
v1.01	April 25th, 2024	1. Add BOOT button identification 2. Add describe of restart Klipper

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1. Product Information

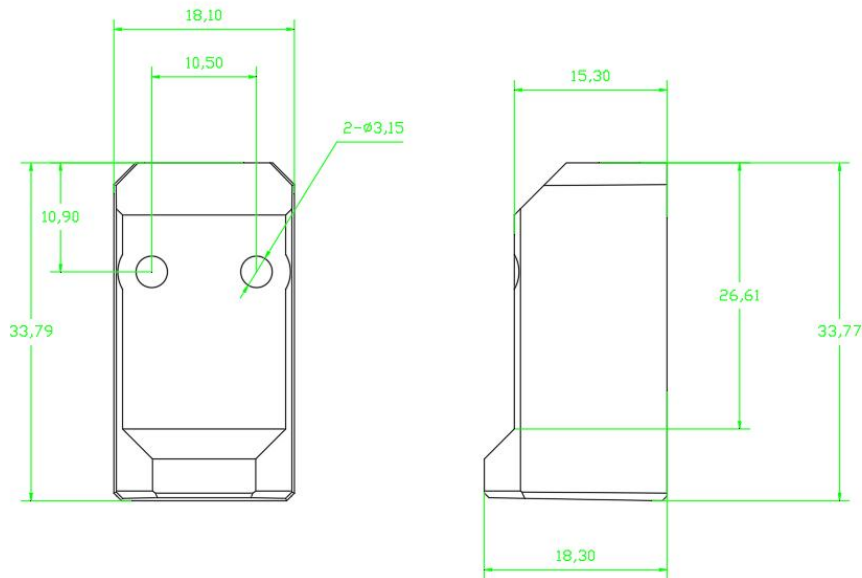
Name	Eddy
Weight	6g
Voltage	5V
Static Current	30mA
Operating Current	30mA
Cable Length	2.5 m (USB Version), 15 cm (Coil Version)
Connection	USB: 4-pin, 1.5mm pitch Coil: 4-2.54mm DuPont female header, one end with ZH1 5mm 4P connector
Operating Temperature	≤60°C Ambient
Standard Error	5μm
Compatible Models	All FDM printers using the Klipper firmware.

2. Feature Highlights

- Compact size and lightweight;
- Equipped with temperature compensation;
- Highly efficient leveling;
- Broad application, strong compatibility;
- High precision, strong stability;
- Non-contact operation.

3. Product dimensions and interfaces

3.1. Dimensional drawing



Note: When installing Eddy, ensure the bottom is at least 1-2 mm above the nozzle.

3.2. BOOT button instructions



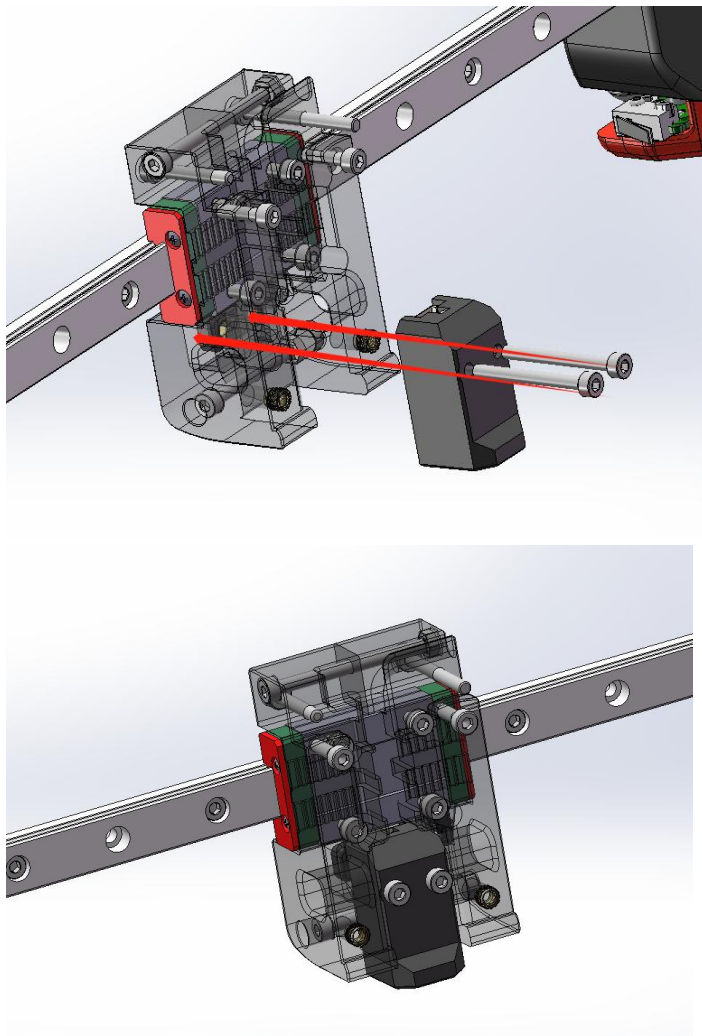
Note: Only Eddy V1.0 has BOOT function, and the buttons on Eddy Coil V1.0 have no function.

4. Installation Guide

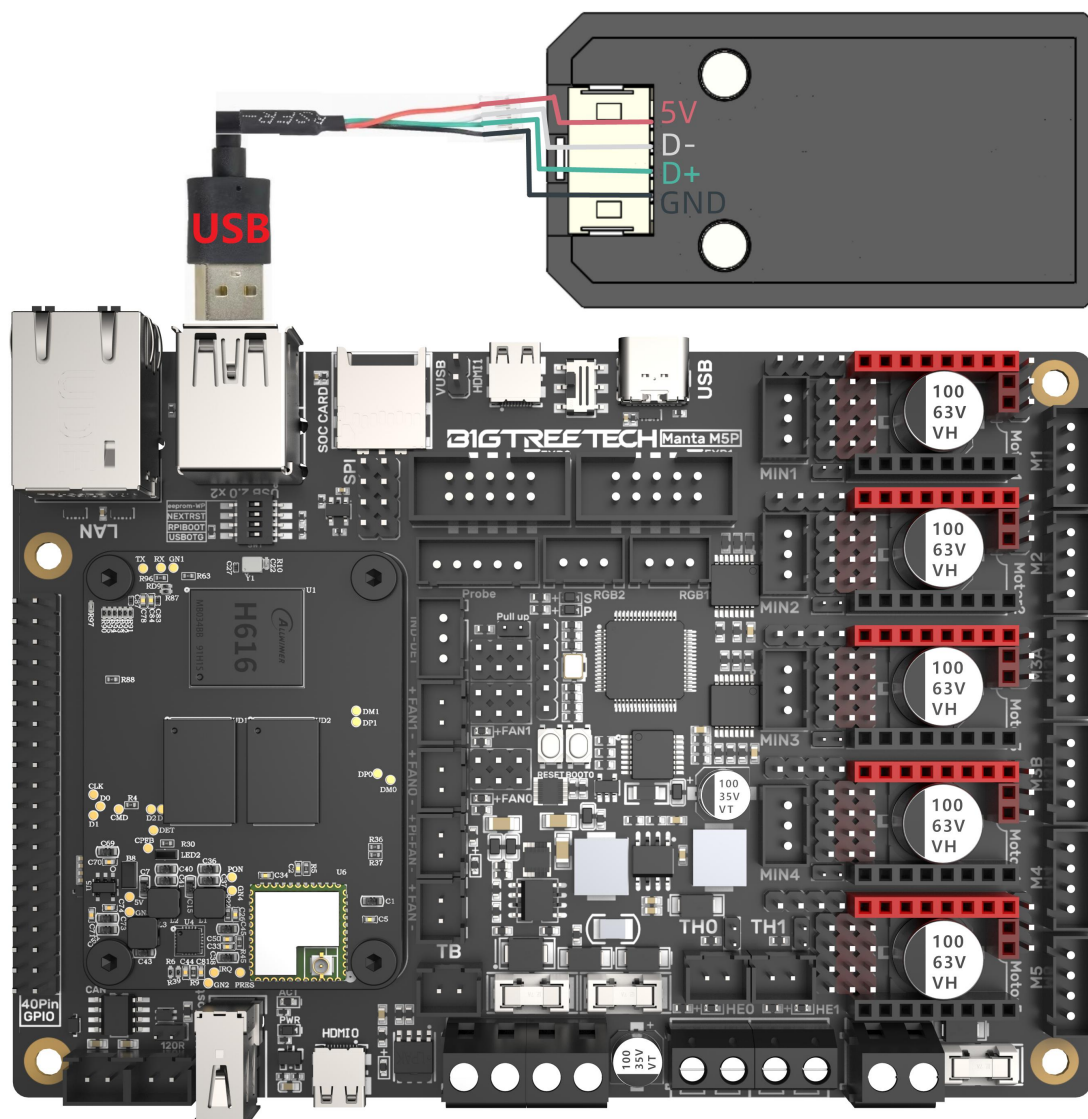
4.1. Example using Voron 2.4

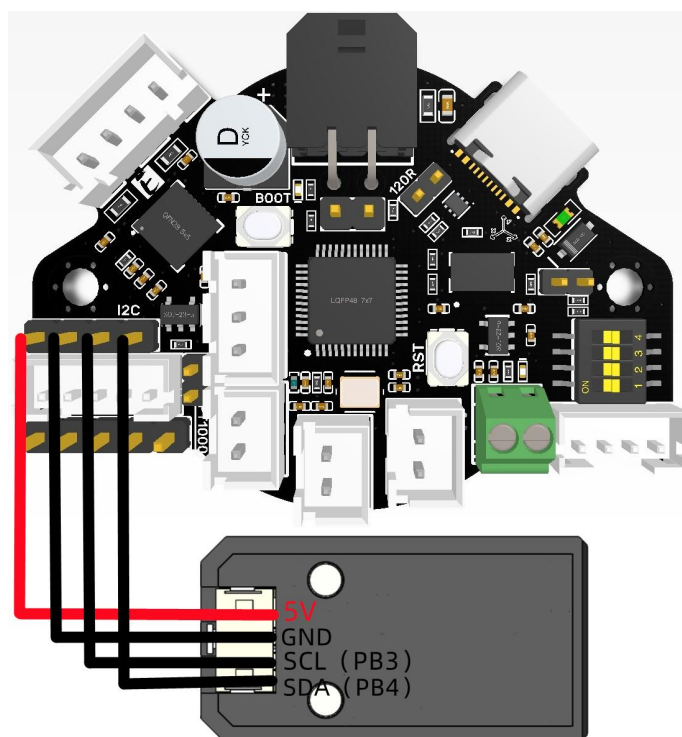
Installation replaces the original PL-08N position.

Use two M3*25 screws (included in the package) to secure the Eddy to the X Carriage as shown in the diagram.

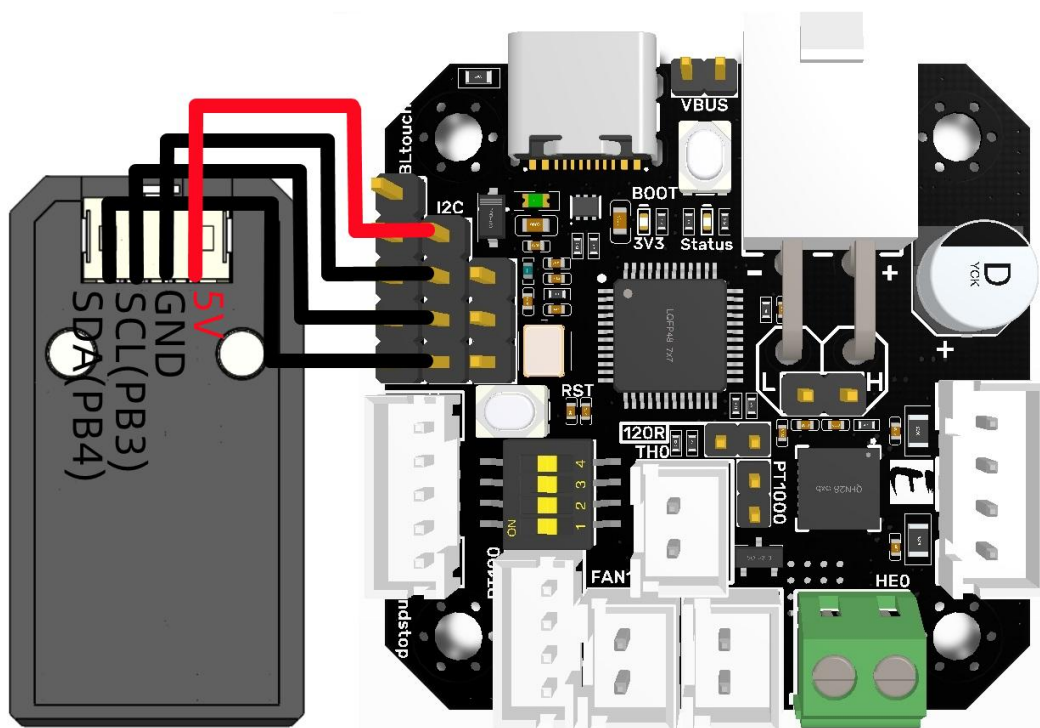


4.2. Eddy + Manta M5P





4.5. Eddy Coil + EBB42 V1.2



5. Firmware

5.1. Important Notes

When Eddy performs temperature compensation, the heated bed temperature can be high. Please be cautious to avoid burns.

5.2. Compiling Firmware

The USB version requires firmware update, while the coil version needs firmware update based on the module or motherboard it is attached to.

1. After SSH connects to Raspberry Pi, enter the following in the command line:

```
cd ~/klipper/
```

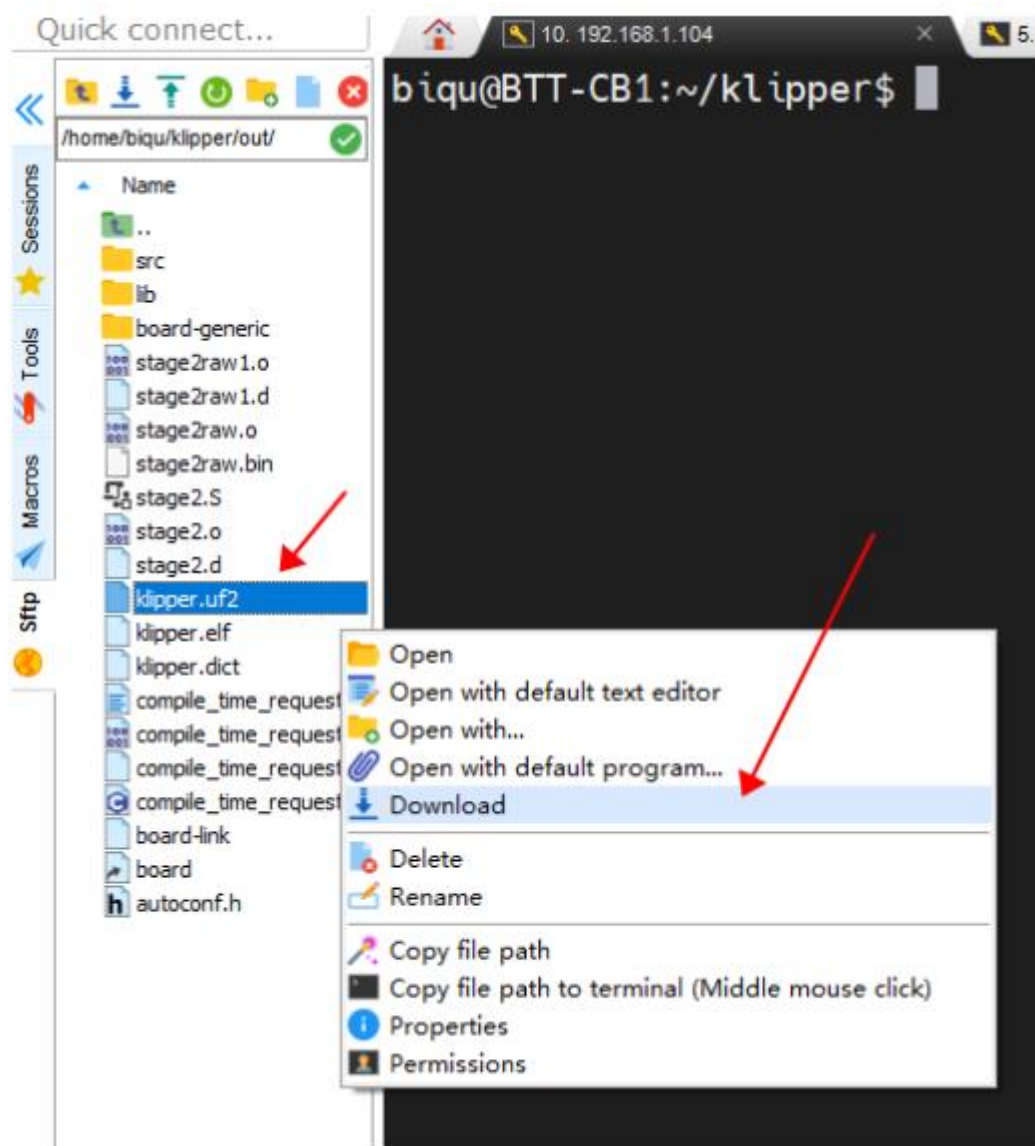
```
make menuconfig
```

Compile the firmware using the configuration below (if these options are not available, update the Klipper firmware source code to the latest version).

```
(Top)
Klipper Firmware Configuration
[*] Enable extra low-level configuration options
  Micro-controller Architecture (Raspberry Pi RP2040) --->
  Bootloader offset (No bootloader) --->
  Flash chip (W25Q080 with CLKDIV 2) --->
  Communication interface (USB) --->
  USB ids --->
() GPIO pins to set at micro-controller startup
[Space/Enter] Toggle/enter    [?] Help    [/] Search
[Q] Quit (prompts for save)    [ESC] Leave menu
```

2. After configuring, enter 'q' to exit the configuration interface. When asked to save configuration, select 'Yes'.

3. Enter `make` to compile the firmware. When make is completed, the required `klipper.uf2` firmware will be generated in the `home/pi/klipper/out` folder and can be directly downloaded to the computer on the left side of the SSH software.



5.3. Firmware Update via DFU

1. Hold down the **Boot** button, then connect the power supply to enter DFU mode.



2. In the SSH terminal command line, enter **lsusb** to query the DFU device ID.

```
pi@fluidpi: ~$ lsusb
Bus 001 Device 005: ID 2e8a:0003 Raspberry Pi RP2 Boot
Bus 001 Device 004: ID 1d50:6061 OpenMoko, Inc. Geschwister Schneider CAN adapter
Bus 001 Device 003: ID 0424:0c00 Microchip Technology, Inc. ( formerly SMSC ) SMC9512/9514 Fast Ethernet Adapter

Bus 001 Device 002: ID 0424:9514 Microchip Technology, Inc. ( formerly SMSC ) SMC9514 Hub
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
pi@fluidpi: ~$
```

3. Enter **cd klipper** to navigate to the klipper directory, then enter

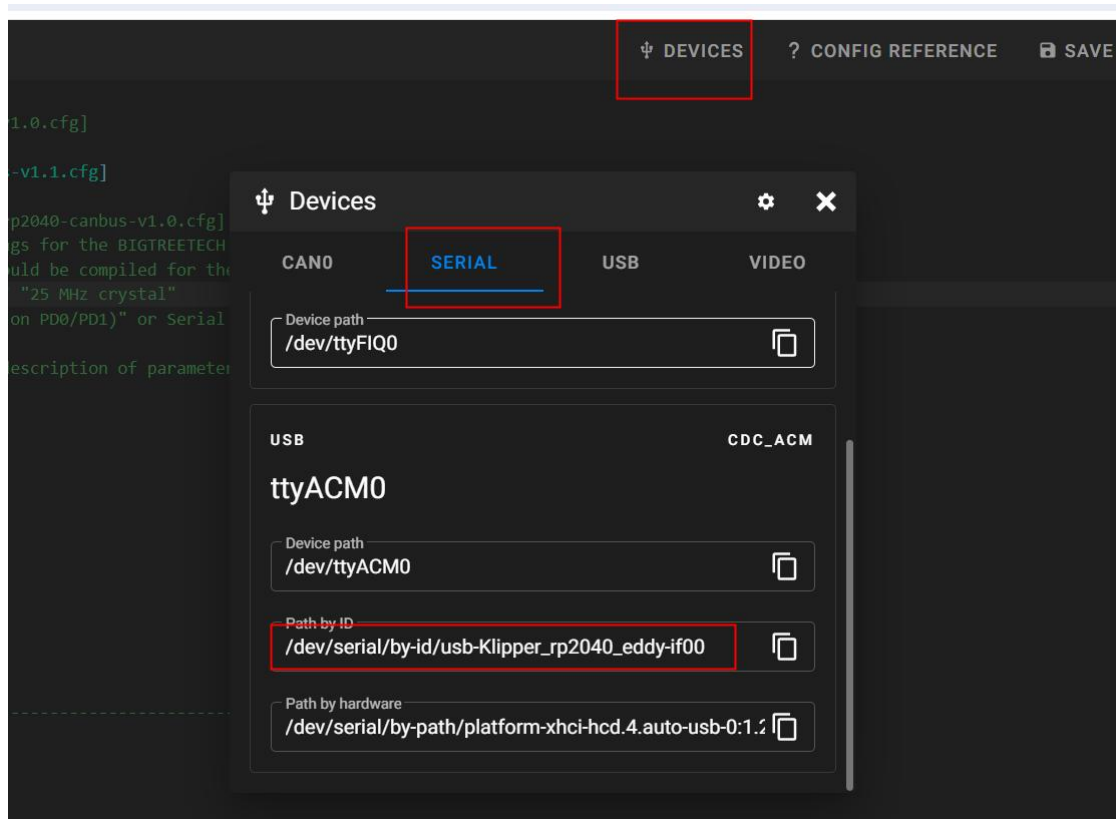
make flash FLASH_DEVICE=2e8a:0003

to start flashing the firmware (note: replace **2e8a:0003** with the actual device ID obtained in the previous step).

4. After flashing, enter **ls /dev/serial/by-id/***, in the command line to query the USB communication ID. You can then update this ID in the Klipper configuration file under the serial section.

After completing the steps above, the USB communication should be functioning normally.

You can also search for the USB communication ID directly in Mainsail.



5.4 Klipper

5.4.1 (USB) MAIN Configuration

1. Execute the following commands in the SSH terminal:

```
cd ~/klipper/
git remote add eddy https://github.com/bigtreetech/klipper
git fetch eddy
git checkout eddy/eddy
```

And then execute the following command to restart Klipper

```
sudo systemctl restart klipper
```

2. Configure eddy in printer.cfg:

```
[mcu eddy]
```

```
serial: /dev/serial/by-id/ (the actual ID found using the above method or in Mainsail)
```

```
[temperature_sensor btt_eddy_mcu]
```

```
sensor_type: temperature_mcu
```

```
sensor_mcu: eddy
```

```
min_temp: 10
max_temp: 100

[probe_eddy_current btt_eddy]
sensor_type: ldc1612
z_offset: 1.0 # Simply avoid setting it to 0.
i2c_mcu: eddy
i2c_bus: i2c0f
x_offset: 0 # Set according to the actual offset relative to the nozzle
y_offset: 20 # Set according to the actual offset relative to the nozzle
data_rate: 500

[temperature_probe btt_eddy]
sensor_type: Generic 3950
sensor_pin: eddy:gpio26
horizontal_move_z: 2

[bed_mesh]
speed: 300
horizontal_move_z: 2
mesh_min: 50, 40
mesh_max: 220, 200
# probe_count: 5,5
probe_count: 9, 9
algorithm: bicubic

[safe_z_home]
home_xy_position:150,150
speed: 200
z_hop: 10
z_hop_speed: 25
```

5.4.2. (coil) MAIN Configuration

1. Execute the following commands in the SSH terminal

```
cd ~/klipper/
git remote add eddy https://github.com/bigtreetech/klipper
git fetch eddy
git checkout eddy/eddy
```

And then execute the following command to restart Klipper

```
sudo systemctl restart klipper
```

2. Configure eddy in printer.cfg:

```
[mcu eddy]
```

```
serial: /dev/serial/by-id/usb-Klipper_stm32g0b1xx_3D0047001150425539393020-if00
```

```
[temperature_sensor btt_eddy_mcu]
```

```
sensor_type: temperature_mcu
```

```
sensor_mcu: eddy
```

```
min_temp: 10
```

```
max_temp: 100
```

```
[probe_eddy_current btt_eddy]
```

```
sensor_type: ldc1612
```

```
z_offset: 1.0 # Simply avoid setting it to 0.
```

```
i2c_mcu: eddy
```

```
i2c_bus: i2c3_PB3_PB4 # Write according to the actual I2C port pins of the motherboard or expansion module in use.
```

```
x_offset: 40 # Set according to the actual offset relative to the nozzle
```

```
y_offset: -30 # Set according to the actual offset relative to the nozzle
```

```
data_rate: 500
```

```
[bed_mesh]
```

```
speed: 300
```

```
horizontal_move_z: 5
```

```
mesh_min: 60, 10
```

```
mesh_max: 220, 190
```

```
# probe_count: 5,5
```

```
probe_count: 9, 9
```

```
algorithm: bicubic
```

```
[safe_z_home]
```

```
home_xy_position:150,150
```

```
speed: 200
```

```
z_hop: 10
```

```
z_hop_speed: 25
```

5.4.3 bed_mesh

```
speed: 50
```

```
# The speed (in mm/s) of non-scanning moves during the calibration
```

```
horizontal_move_z: 5
```

```
# The height (in mm) that the head should be commanded to move to just prior to start the scanning operation.
```


mesh_min: 10, 10

Defines the minimum X, Y coordinate of the mesh for rectangular beds. This coordinate is relative to the EDDY's location. This will be the first scanning point, nearest to the origin. This parameter must be provided for rectangular beds.

mesh_max: 220, 220

Defines the maximum X, Y coordinate of the mesh for rectangular beds. Adheres to the same principle as mesh_min, however this will be the furthest point scanning from the bed's origin. This parameter must be provided for rectangular beds.

probe_count: 5, 5

For rectangular beds, this is a comma separate pair of integer values X, Y defining the number of points to probe along each axis. A single value is also valid, in which case that value will be applied to both axes.

Refer to https://www.klipper3d.org/Config_Reference.html#bed_mesh

For the [bed_mesh], set horizontal_move_z to 2 to keep Eddy as close as possible to the bed during scanning.

5.5 Temperature Compensation

1. After completing the above configuration, the first step is to calibrate the drive current of Eddy:

Eddy Drive Current Calibration

Place Eddy approximately 20mm above the bed.

Execute `LDC_CALIBRATE_DRIVE_CURRENT CHIP=btt_eddy` to automatically acquire the drive current, then use `SAVE_CONFIG` to save the parameters.

2. Eddy Frequency and Z-Axis Height Relationship Calibration

Home X and Y axes with `G28 X Y`.

Move the nozzle to the center of the bed with `G0 X150 Y150 F6000` (ensure there is no height map activated during this step).

Start the manual Z-offset calibration with

`PROBE_EDDY_CURRENT_CALIBRATE CHIP=btt_eddy`. Once calibration is completed, use `SAVE_CONFIG` to save the settings as shown.

```
09:23 SAVE_CONFIG
```

```
09:23 probe_eddy_current: stddev=144.727 in 3998 queries
The SAVE_CONFIG command will update the printer config file
and restart the printer.
```

```
09:22 ACCEPT
```

For Voron printers, perform a Quick Gantry Leveling (QGL) to ensure the gantry is level and prevent the nozzle from rubbing against the heated bed during the subsequent mesh scan. Once this is done, you can home all axes with `home all`, and then conduct a quick bed mesh scan using the following command: `BED_MESH_CALIBRATE METHOD=scan SCAN_MODE=rapid`

After completing the scan, save the settings using `SAVE_CONFIG`.

3. Temperature Compensation (Eddy coil without temperature compensation)



(1) Home All Axes: Use `home all` to home all axes.

(2) Set Idle Timeout: Execute `SET_IDLE_TIMEOUT TIMEOUT=36000`. This increases the idle timeout to prevent the machine from timing out during the heating process.

(3) Record the ambient temperature of the BTT eddy sensor.

Set a maximum temperature for the heated bed and set a typical temperature for the tool head.

Wait for the BTT eddy temperature to stabilize at this set maximum temperature and record it.

	Extruder	off	25.2°C	0 °C ▼
	Heater Bed	off	25.1°C	0 °C ▼
	Btt Eddy		36.2°C	
	Btt Eddy Mcu		39.2°C	

The recorded maximum BTT eddy temperature serves as the target temperature for subsequent operations. Ensure that the target temperature

does not exceed this maximum, ideally being one or two degrees lower to maintain safe and effective operation.

(4) After returning to room temperature, execute `PROBE_DRIFT_CALIBRATE PROBE=btt_eddy TARGET=50 STEP=5`. Here, "TARGET=50" refers to reaching a target temperature of 50°C, and "STEP=5" indicates that each node's temperature increment is 5°C.

Be cautious: the maximum temperature of the heated bed can be very high. Take care to avoid burns.

For example, if the current temperature is 30°C and the target temperature is 50°C, the total temperature range would be $50-30=20^{\circ}\text{C}$, with each node representing a 5°C increment. Therefore, there will be a sampling of $20 / 5 = 4$ nodes.

Executing the above command will immediately prompt for manual Z-offset calibration. Then manually heat the bed and nozzle, waiting for the temperature to rise. Wait for the temperature of the BTT Eddy to rise. The BTT Eddy will prompt for another manual Z-offset calibration at the next node, which is 35°C. Then it will prompt for another manual Z-offset calibration at the next node, which is 40°C, and so on.

Note: In the example above, the temperature at the second node is 35°C. However, manual Z-offset calibration takes time, and the temperature may still be rising. If the calibration is completed when the actual temperature is 36°C, then the temperature for the next node will be increased by one degree, which is 41°C.

Should you require further resources for this product, you can find them at [GitHub](https://github.com/bigtreotech/). If you cannot find what you need, you may contact our after-sales support (service005@biqu3d.com).

If you encounter any other problems during use or have suggestions or feedback, please contact us. Thank you for choosing BIGTREETECH products.