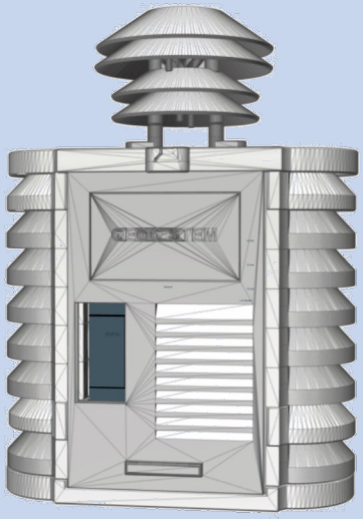
Instruction Manual

DIY Weather Station

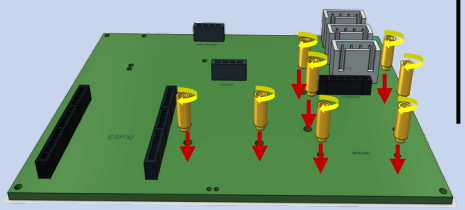
HKAGE Model v2.3



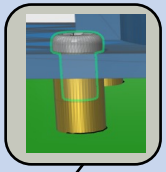
1 Circuit Board Assembly

1x 8x

1



1x 2x M2 (5mm) 1x



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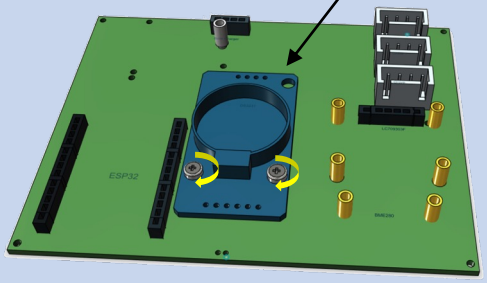
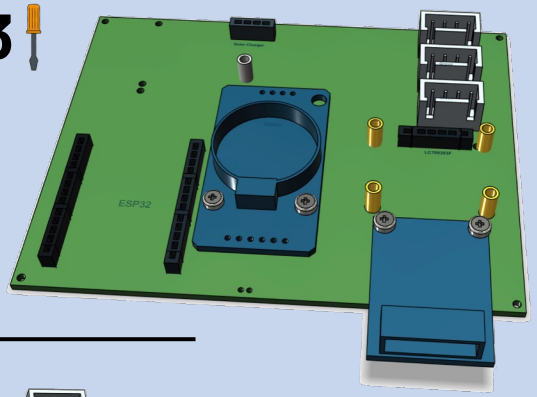


1x M2 (5mm) 2x

3



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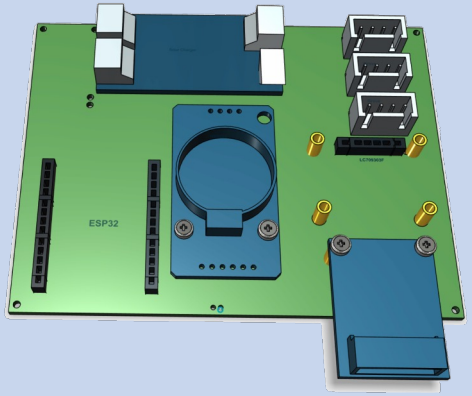
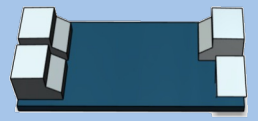
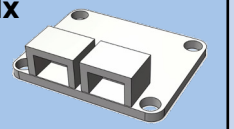


1x

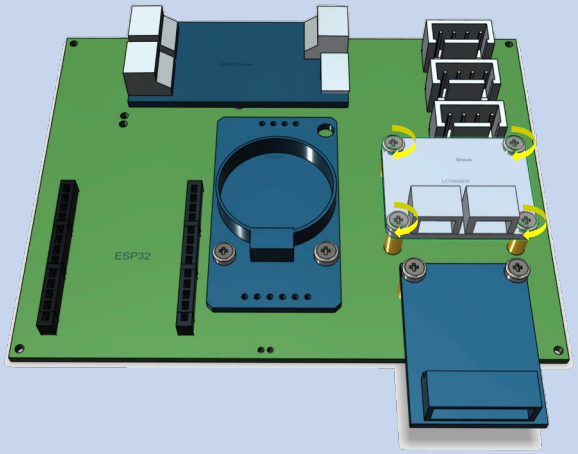


5

1x



M2 (5mm) 4x



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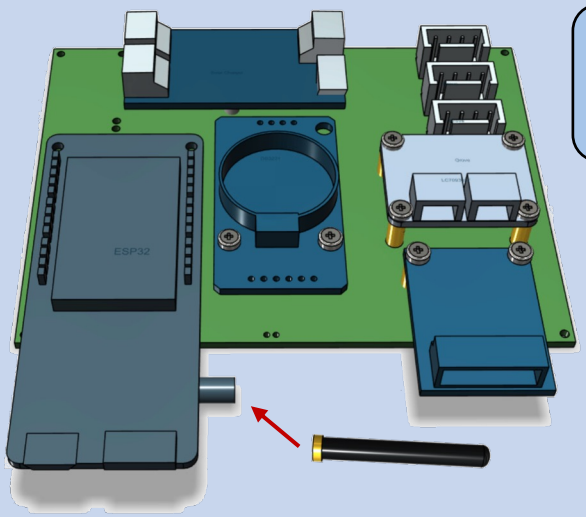

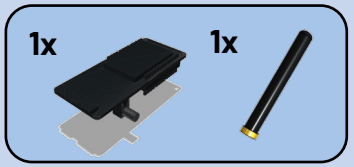

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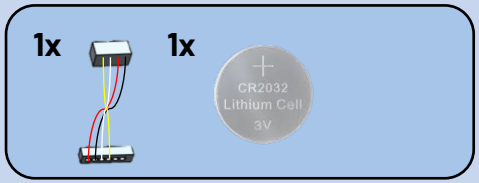
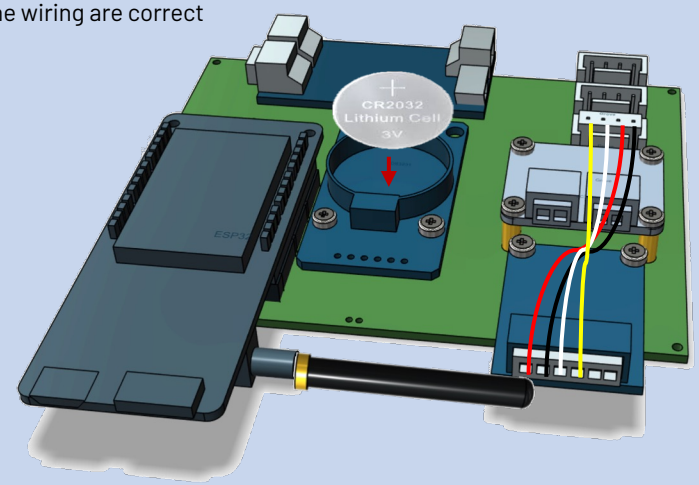


⚠ Please check if the wiring are correct



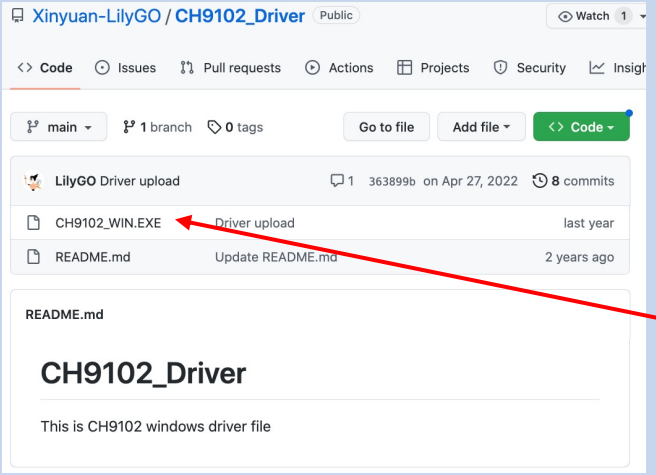
Sensors Testing & Programming

Arduino IDE and Libraries installation

QR code to the software downloading page

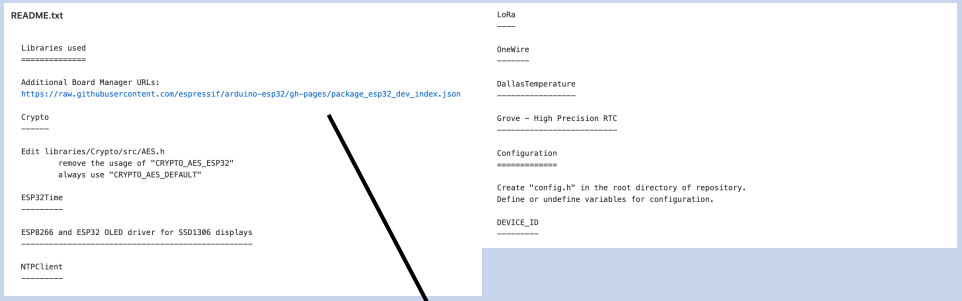
Please download with link: https://www.arduino.cc/en/software

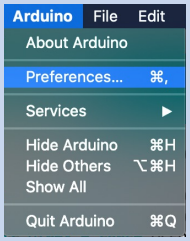
1 **Install Microcontroller Chip Driver:**
CH9102 **https://github.com/Xinyuan-LilyGO/CH9102_Driver**

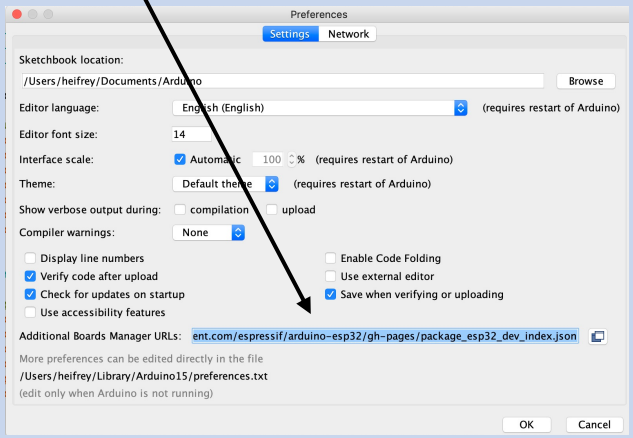


Download CH9102 driver by clicking here

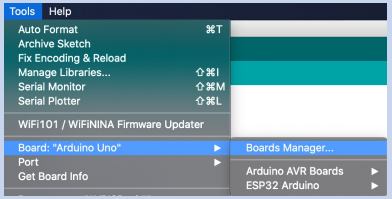
2 Install Board Libraries with refer to Co-WIN GitHub site:
https://github.com/Cowin2020/LoRa4

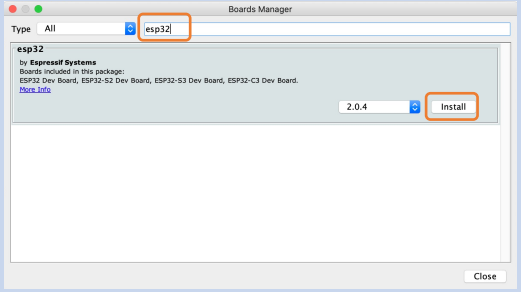




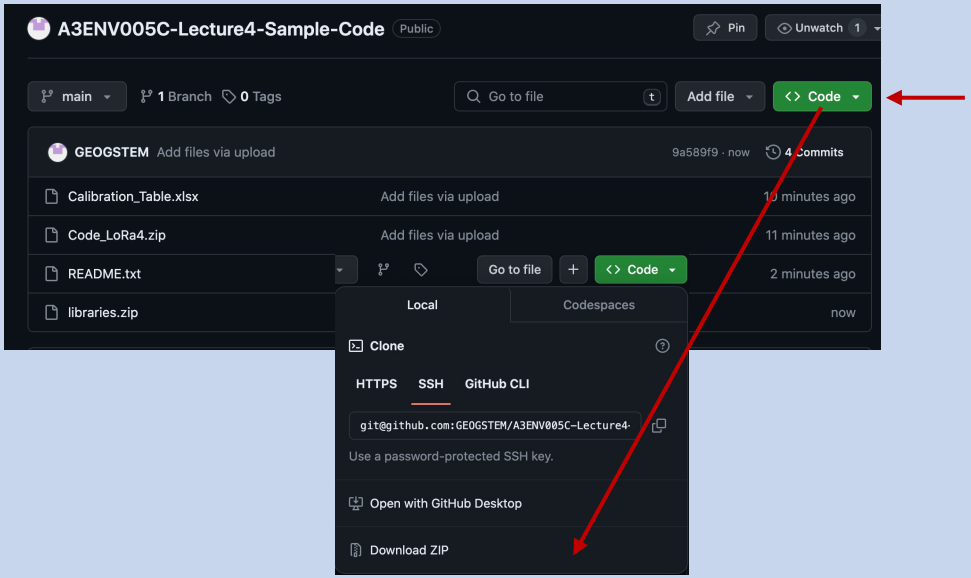


3 Download "ESP32" from "Boards Manager"

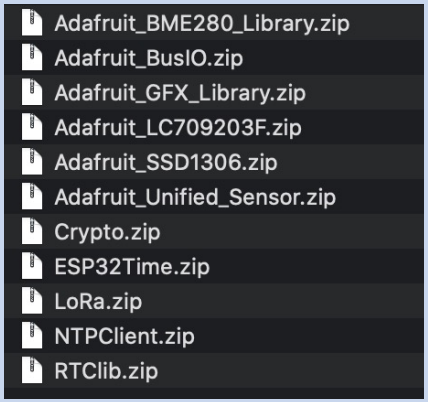


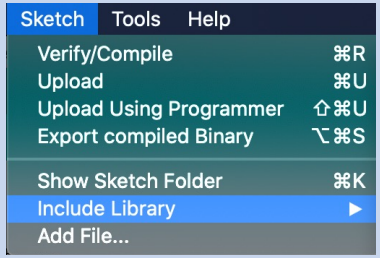


4 Download the material package at GeogSTEM GitHub site:
https://github.com/GEOGSTEM/LoRaWeatherStation



5 Unzip the library.zip files in libraries and copy those folders to ~/Arduino/libraries

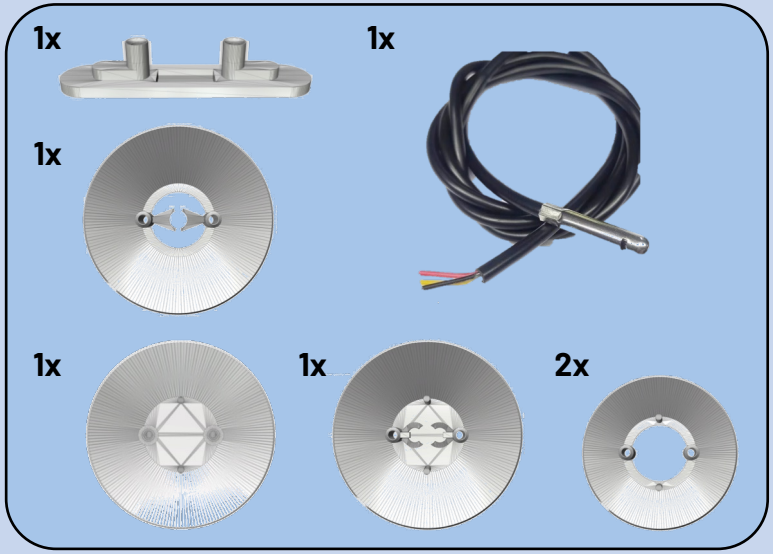


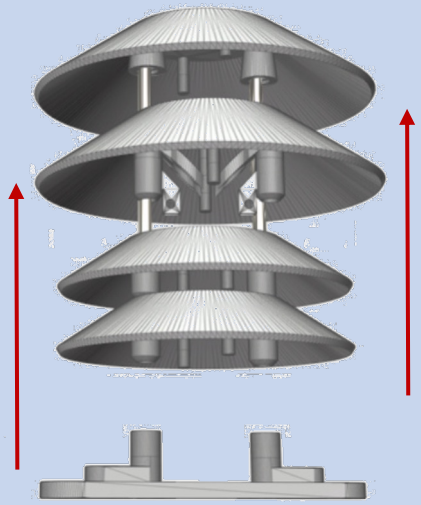


⚠ You can see all the imported sensor libraries under "Include Library" after the completion

Enclosure Building

1





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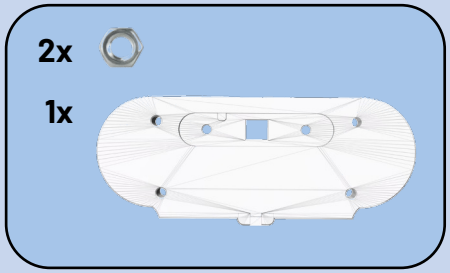

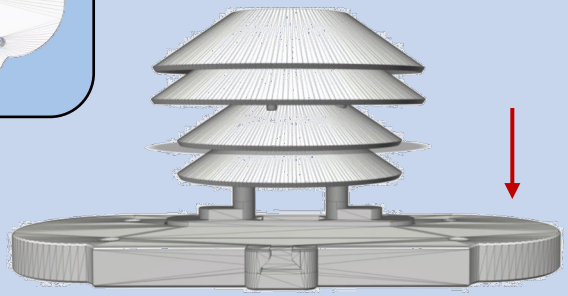

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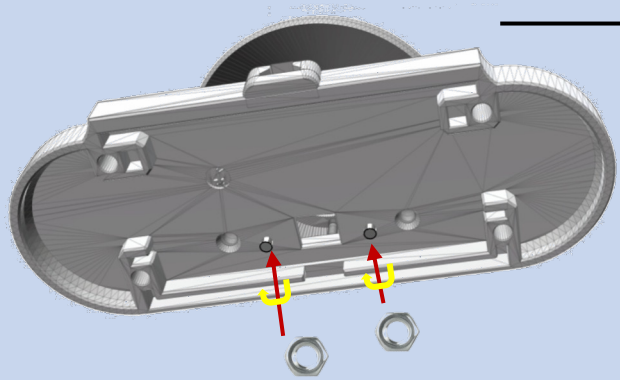

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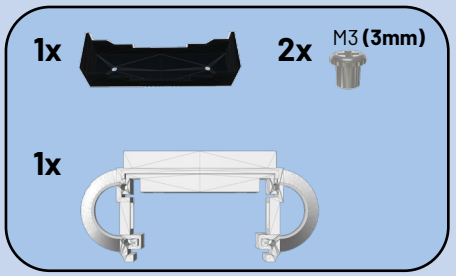
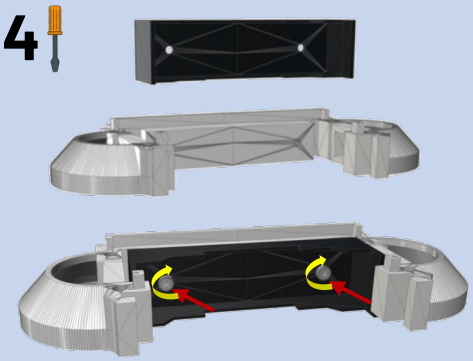
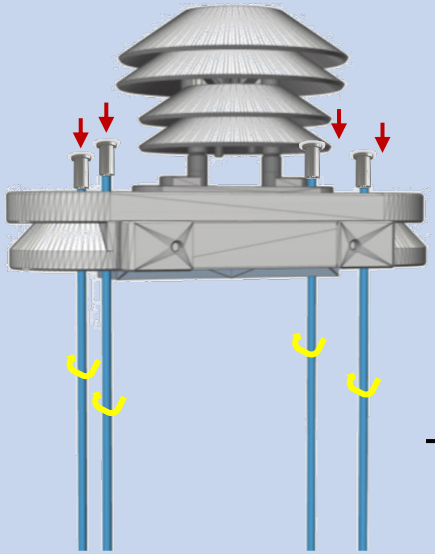




5

4x

4x



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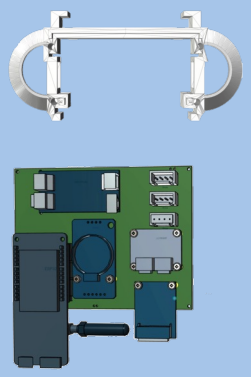
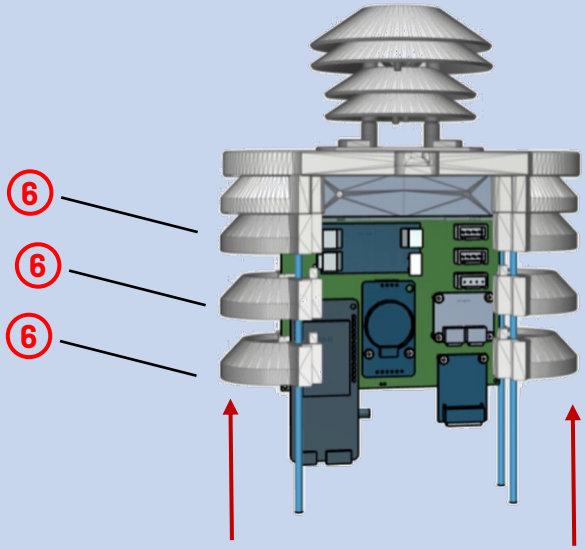
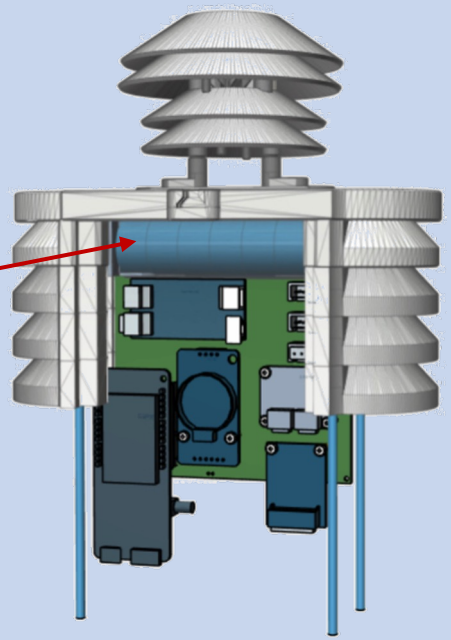




1x

7

PAY ATTENTION
to the "**+**" and "**-**" pole
of the battery, placing
in wrong direction may
lead to fire or explosion !!!



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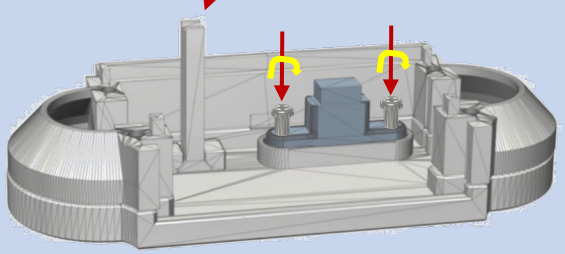
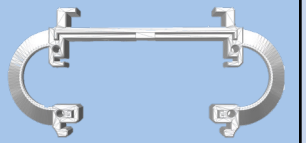


1x

1x 6



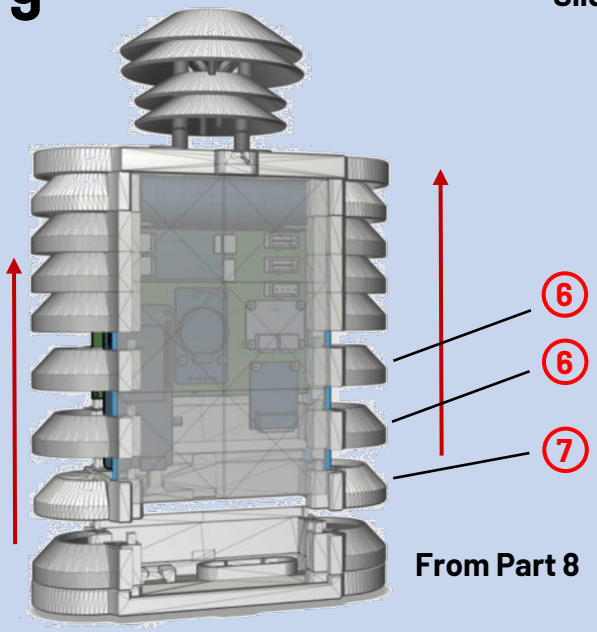
1x

1x

2x

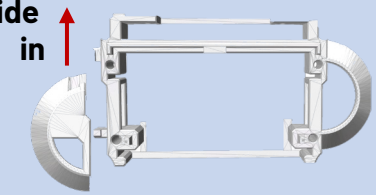
M3 **(8mm)**

9



From Part 8

Slide in



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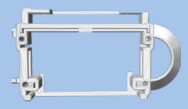

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10

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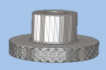
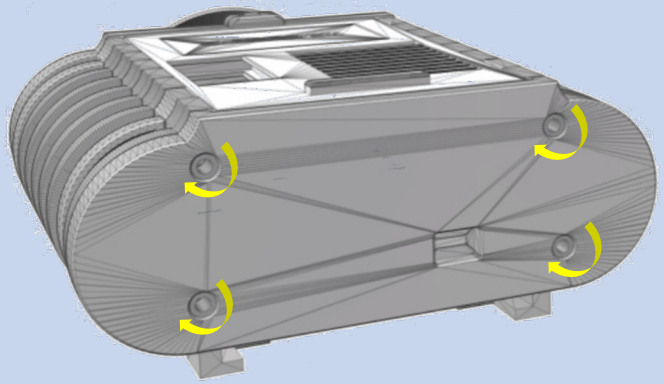
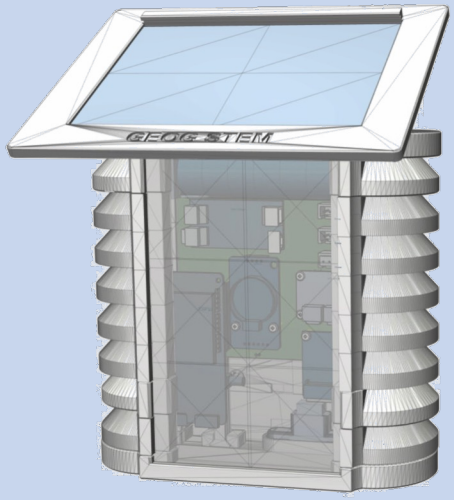
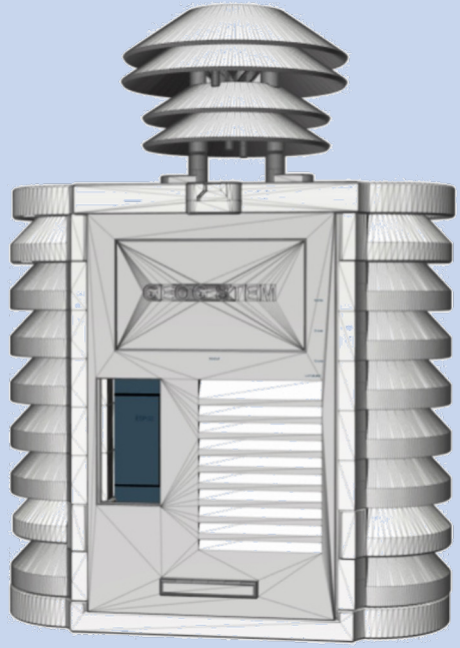




Clear Glass Version

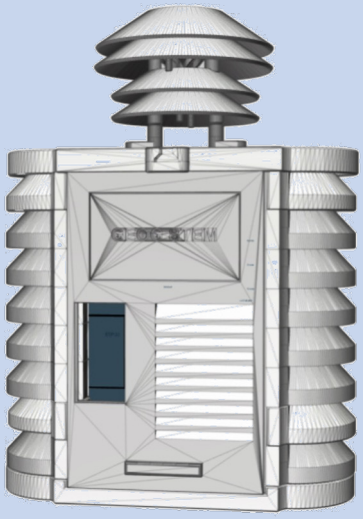


Radiation Shield Version

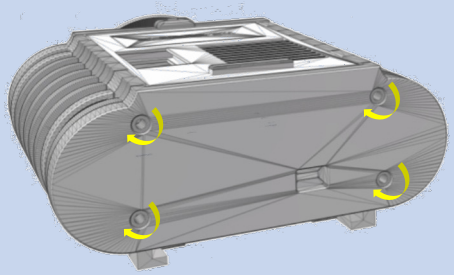


Devices Operation

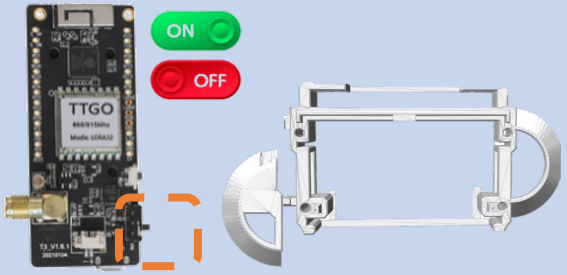
Sensors

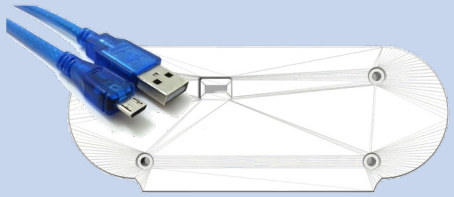


⚠ For outdoor measurement, please remove the sensor cover to enable more wind ventilation to the sensor



⚠ To turn on/off the sensor, please kindly remove the hemispheric cover and switch the button on the microcontroller board





⚠ You can charge the sensors directly by plugging in the micro-USB cable to the sensor

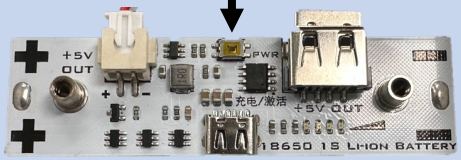
Gateway Receiver

Gateway receiver is used to collect data from different sensors with LoRa wireless communication network, and send those data to our server with Internet connection.

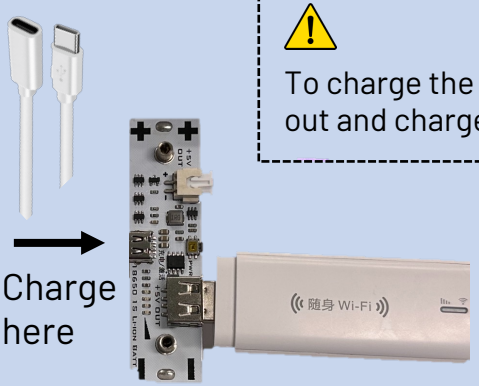
⚠ To turn on the gateway, please remove the cover and press the button once.

To turn off, quickly press twice

Press to On/Off



⚠ To charge the battery, please take this board out and charge with white Type-C cable



Data Visualization

Data visualization portal was setup as:
http://103.254.119.82:18080/

You may login to view & download data
Account Name: hkage
Password: HKAGE@2024

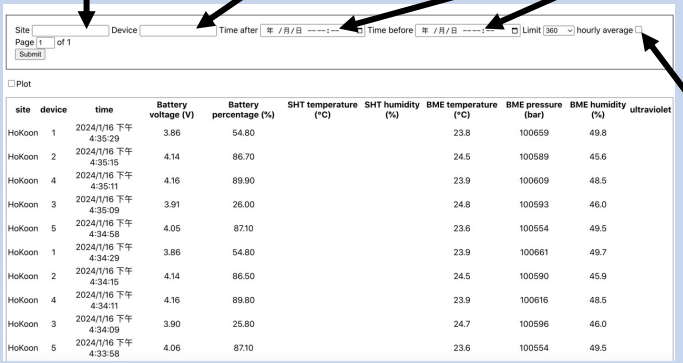
1 Login page

2 Select data by filtering (Site/Device/Time/Limit)

Site: HKAGE

Device Number: (i.e. 1)

Filtered Timestamp

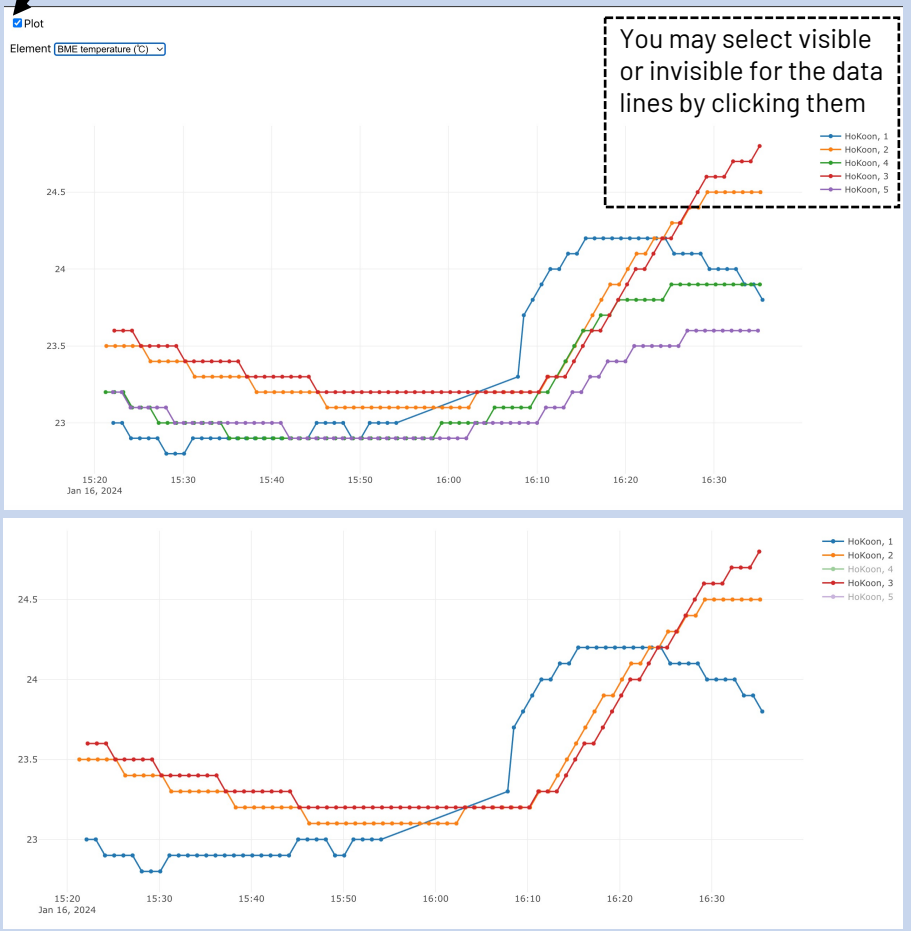


site	device	time	Battery voltage (V)	Battery percentage (%)	SHT temperature (°C)	SHT humidity (%)	BME temperature (°C)	BME pressure (bar)	BME humidity (%)	ultraviolet
HoKoon	1	2024/1/16 下午 4:35:29	3.86	54.80			23.8	100659	49.8	
HoKoon	2	2024/1/16 下午 4:35:15	4.14	86.70			24.5	100589	45.6	
HoKoon	4	2024/1/16 下午 4:35:11	4.16	89.90			23.9	100609	48.5	
HoKoon	3	2024/1/16 下午 4:35:09	3.91	26.00			24.8	100593	46.0	
HoKoon	5	2024/1/16 下午 4:34:58	4.05	87.10			23.6	100554	49.5	
HoKoon	1	2024/1/16 下午 4:34:29	3.86	54.80			23.9	100661	49.7	
HoKoon	2	2024/1/16 下午 4:34:15	4.14	86.50			24.5	100590	45.9	
HoKoon	4	2024/1/16 下午 4:34:11	4.16	89.80			23.9	100616	48.5	
HoKoon	3	2024/1/16 下午 4:34:09	3.90	25.80			24.7	100596	46.0	
HoKoon	5	2024/1/16 下午 4:33:58	4.06	87.10			23.6	100554	49.5	

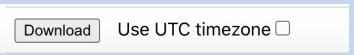
You may apply hourly averaging by clicking this box, the webpage will automatically calculate the average

3 Plotting sensors data

Click the "Plot" box to show time series data



4 Download data from portal



You may download the data directly by clicking the "Download" button at the lower left corner at the portal.

To download data with UTC time zone format, please tick the box

eog STEM

Sensors Calibration

1 Co-location Measurement

Detect and log air temperature, relative humidity and air pressure with 5 GeogSTEM Sensor & Professional Sensor (i.e. Kestrel / HOBO / Davis , etc.)

2 Linear Regression

Use Professional Sensor as reference, as:

y = GeogSTEM Sensor Measured Values
x = Professional Sensor Measured Values

Use Excel to plot a x-y plot on GeogSTEM Sensor and Professional Sensor's readings

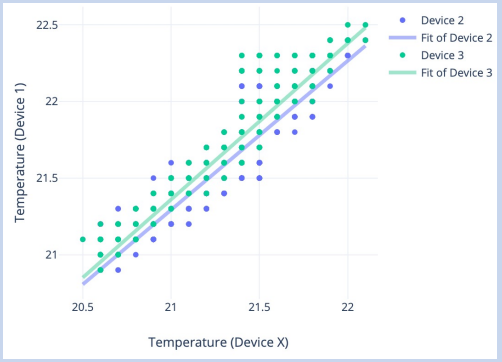
3 Find equations for each sensor

y = calibrated value of GeogSTEM sensor
x = raw value of GeogSTEM sensor
m = slope found from x-y plot
c = intercept from x-y plot

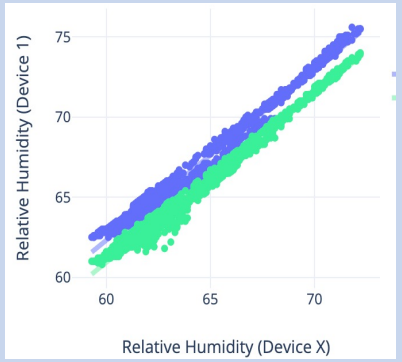
4 Data Post-processing

After fieldwork studies, you may use Excel Equation to easily adjust the measured data

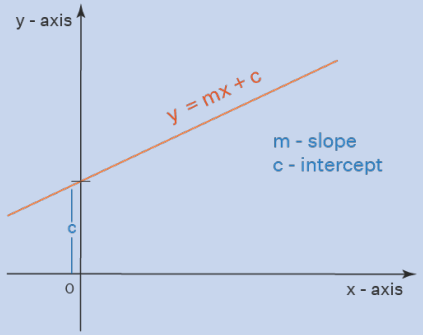
Air Temperature



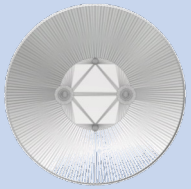
Relative Humidity

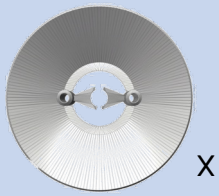


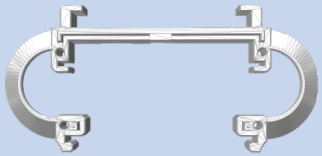
Slope Intercept Form: y = mx + c

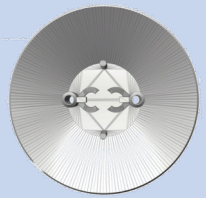


Plastic Components:


x1


x1


x6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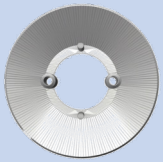
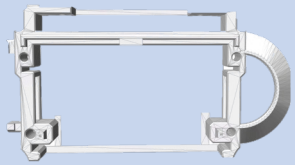
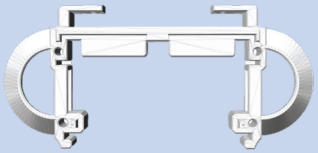
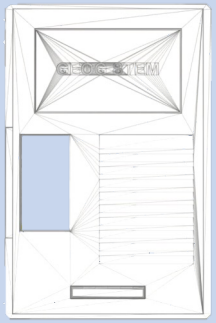

x2


x1

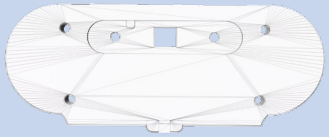

x1


x1

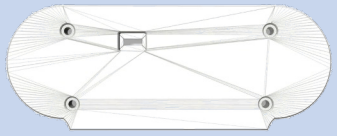

x1


x1


x1


x1

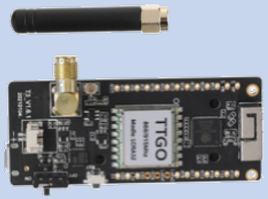

x1


x1

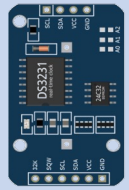
Wire Components :


x1

Electronic Components :


x1


x1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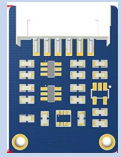
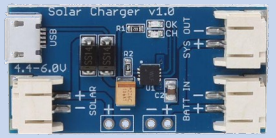
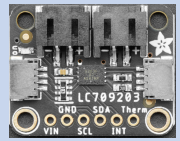

x1


x1


x1


x1


x1

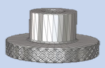
Screw Components :


x4

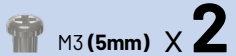

x2


M2 (3mm) x6

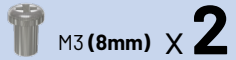

x8


x4


x4


M3 (5mm) x2


x1


M3 (8mm) x2


x2