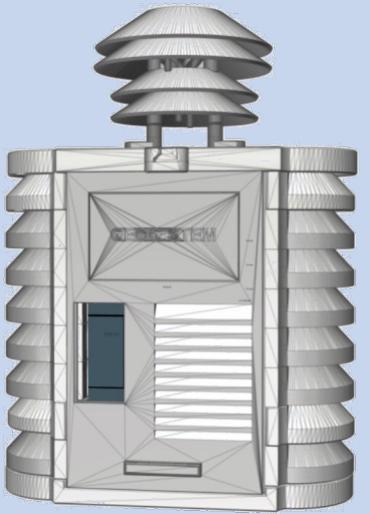


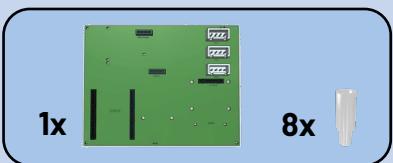


Instruction Manual

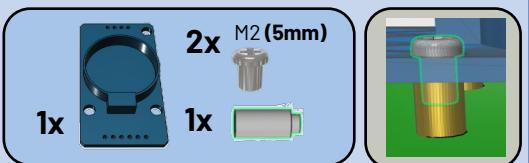
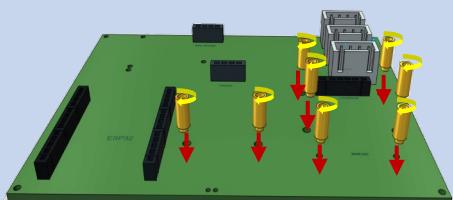
DIY Weather Station HKAGE Model v2.3



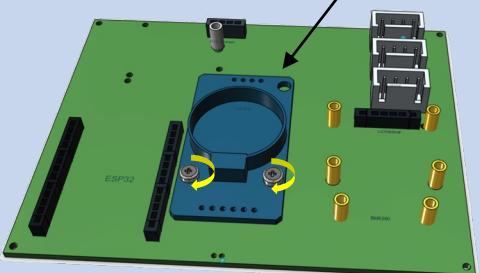
Circuit Board Assembly



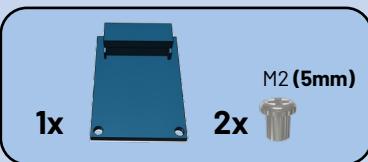
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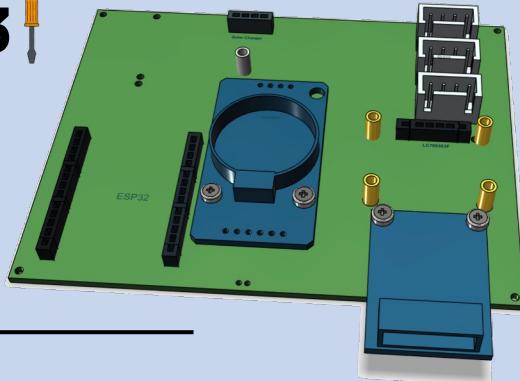
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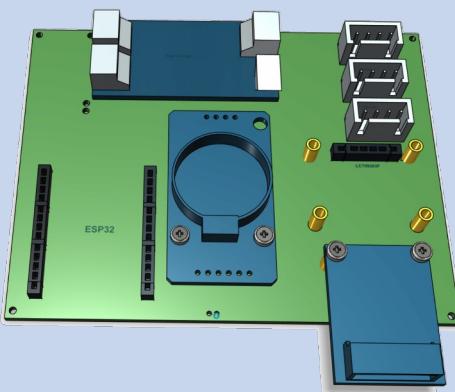
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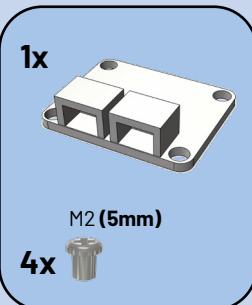
3



4

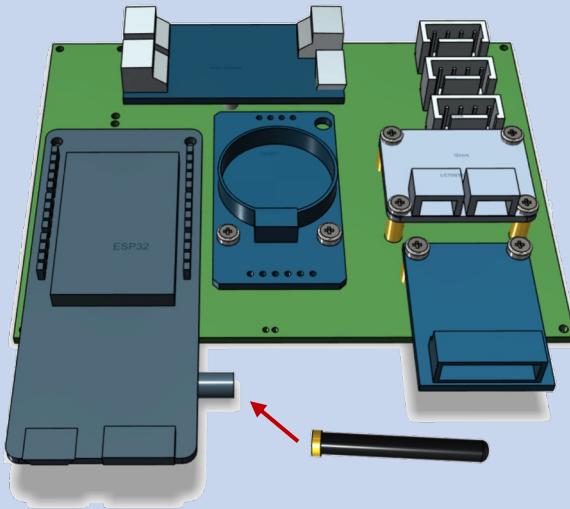


5



2

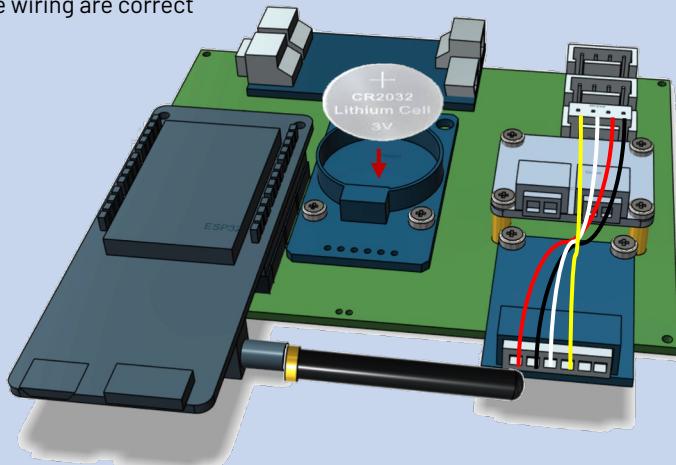
6



7



Please check if the wiring are correct



3

Sensors Testing & Programming

Arduino IDE and Libraries installation

Arduino IDE 2.0.4

The new major release of the Arduino IDE is faster and even more powerful! In addition to a more modern editor and a more responsive interface it features autocompletion, code navigation, and even a live debugger.

For more details, please refer to the [Arduino IDE 2.0 documentation](#).

Nightly builds with the latest bugfixes are available through the section below.

SOURCE CODE
The Arduino IDE 2.0 is open source and its source code is hosted on [GitHub](#).

DOWNLOAD OPTIONS

Windows	Win 10 and newer, 64 bits
Windows	MSI installer
Windows	ZIP file
Linux	Appimage 64 bits (X86-64)
Linux	ZIP file 64 bits (X86-64)
macOS	Intel, 10.14: "Mojave" or newer, 64 bits
macOS	Apple Silicon, 11: "Big Sur" or newer, 64 bits

[Release Notes](#)



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

Xinyuan-LilyGO / CH9102_Driver Public

[Code](#) [Issues](#) [Pull requests](#) [Actions](#) [Projects](#) [Security](#) [Insights](#)

[main](#) [1 branch](#) [0 tags](#) [Go to file](#) [Add file](#) [Code](#)

LilyGO Driver upload	363899b on Apr 27, 2022	8 commits
CH9102_WIN.EXE	Driver upload	last year
README.md	Update README.md	2 years ago

[README.md](#)

CH9102_Driver

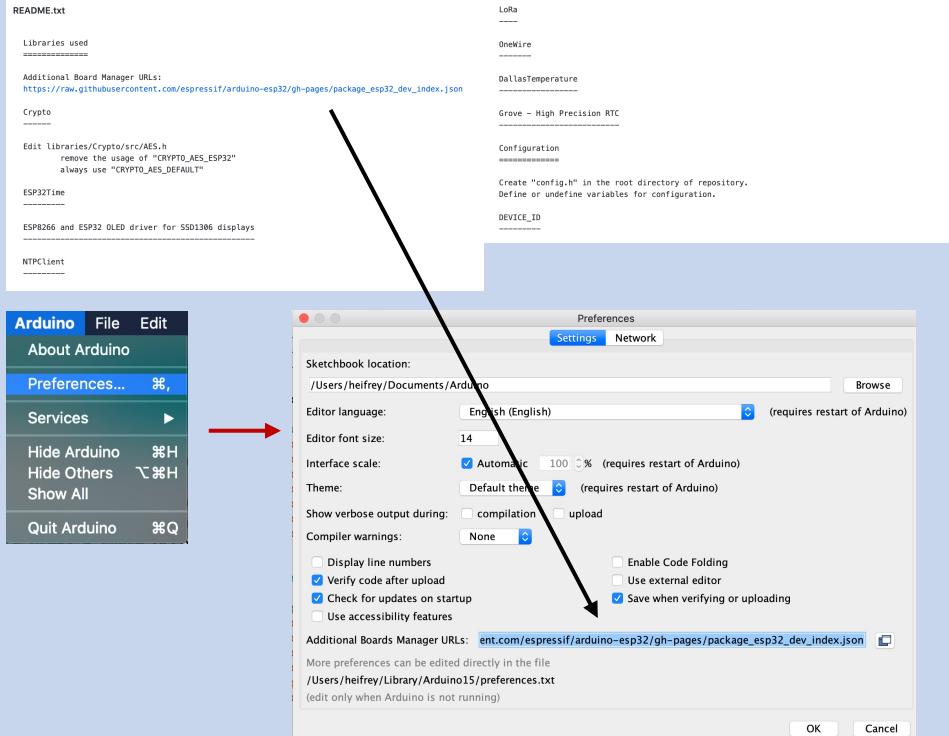
This is CH9102 windows driver file

Download
CH9102 driver
by clicking here

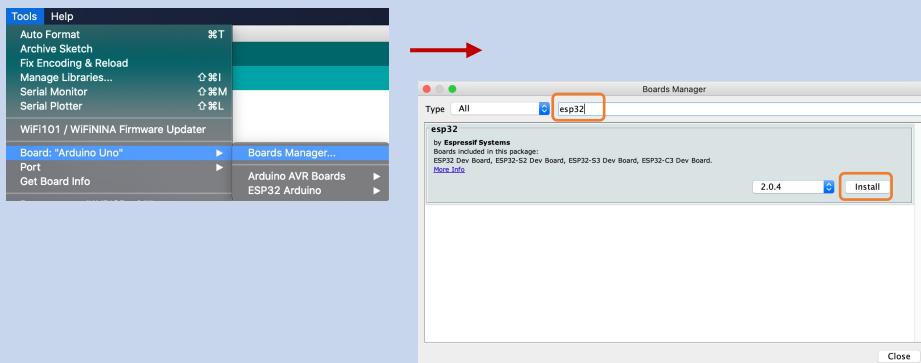
4

2 Install Board Libraries with refer to Co-WIN GitHub site:

<https://github.com/Cowin2020/LoRa4>



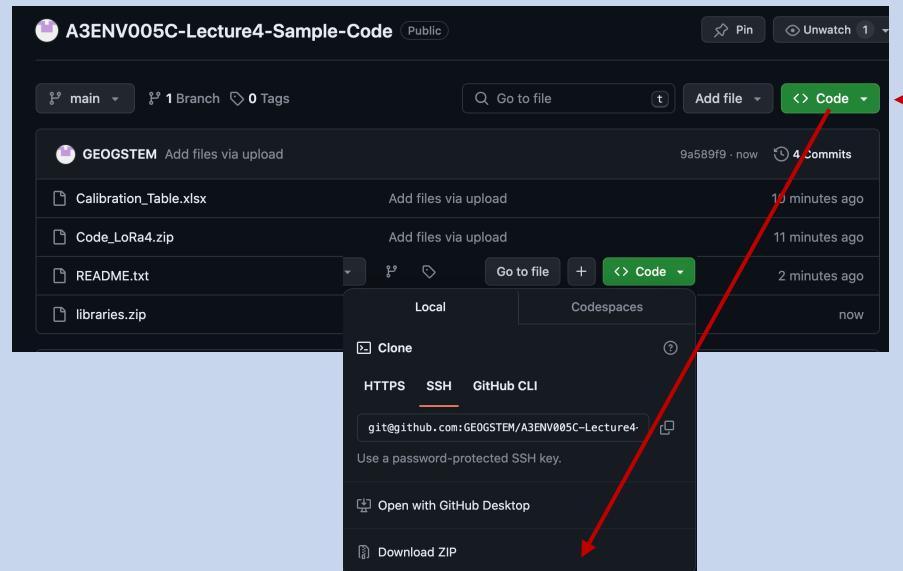
3 Download "ESP32" from "Boards Manager"



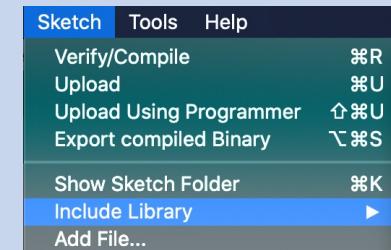
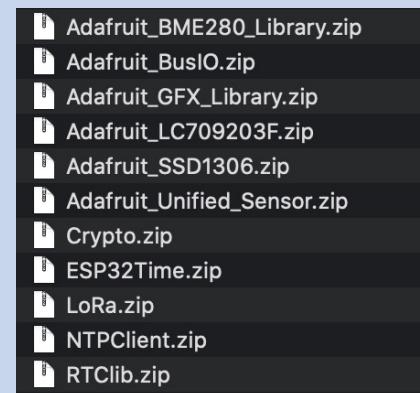
5

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

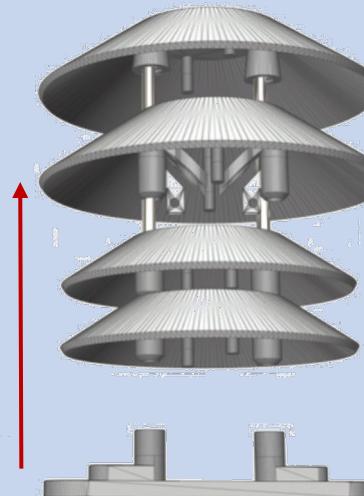
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2

Enclosure Building

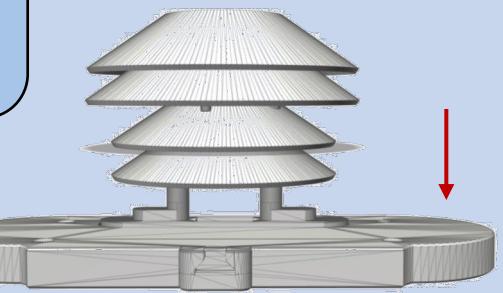
1



2

2x

1x

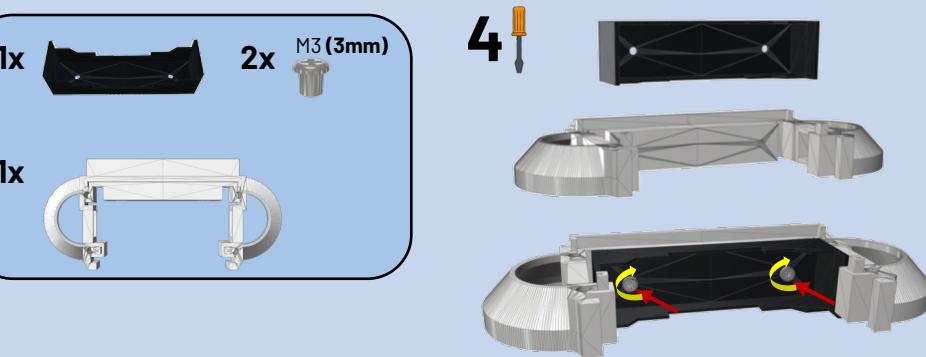


3

1x

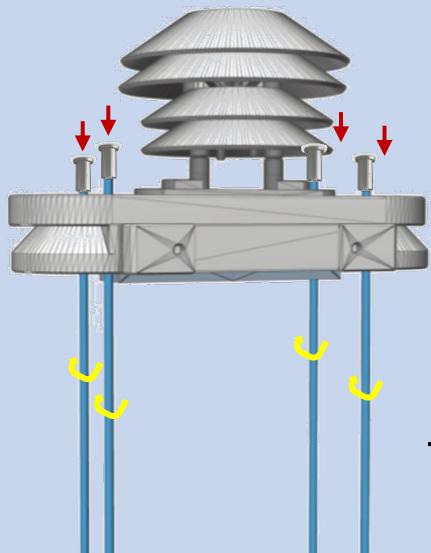
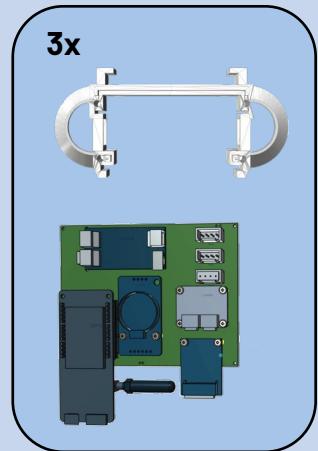
2x M3 (3mm)

1x

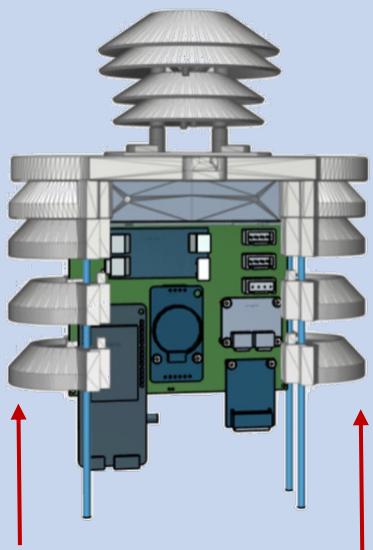


7

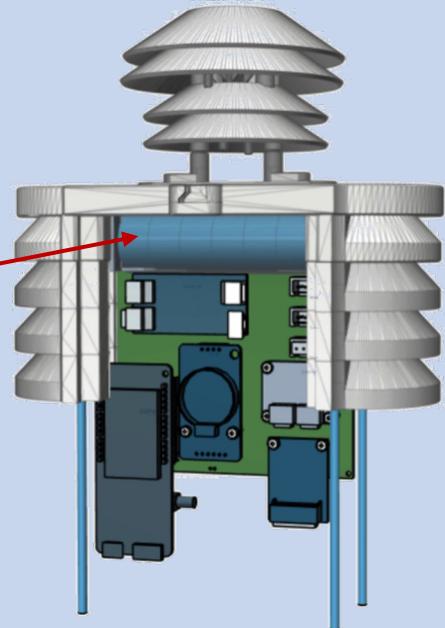
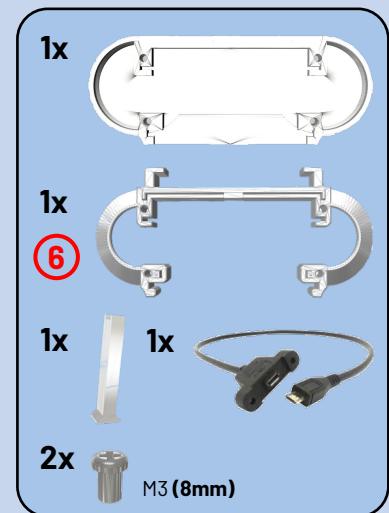
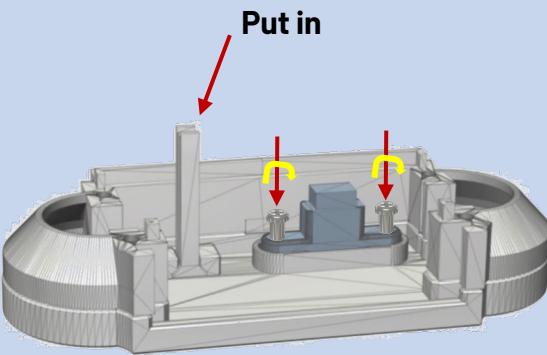
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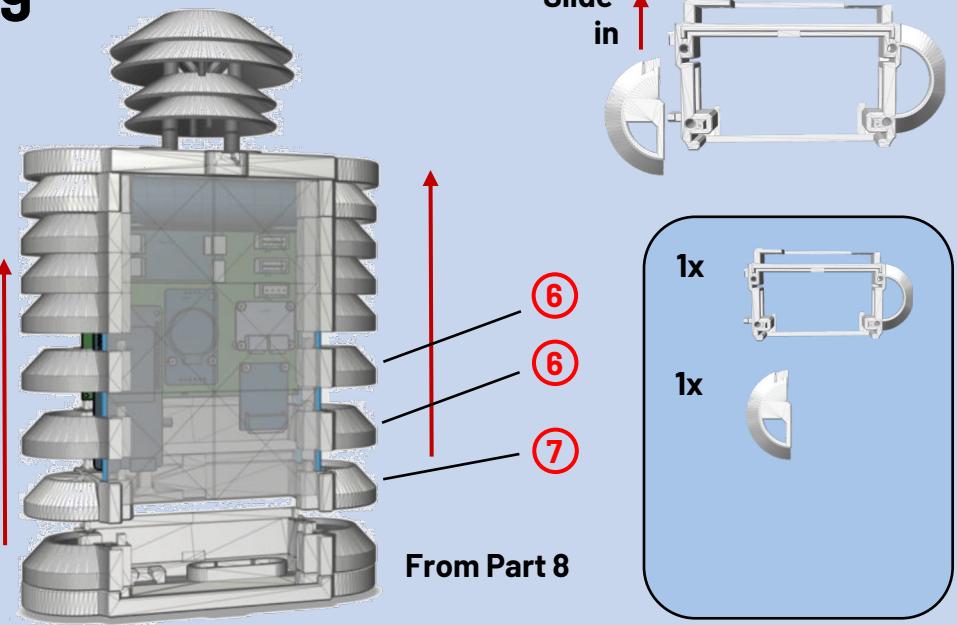
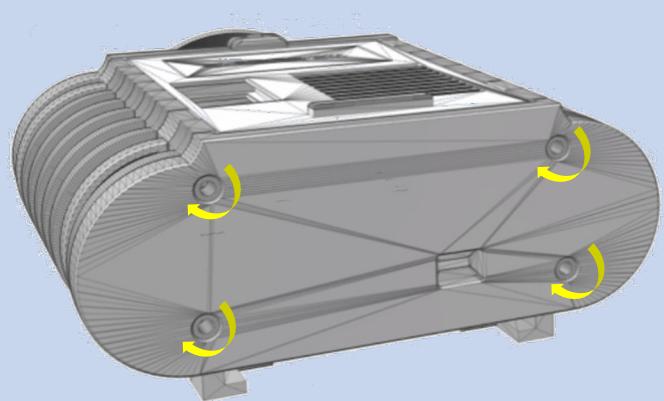
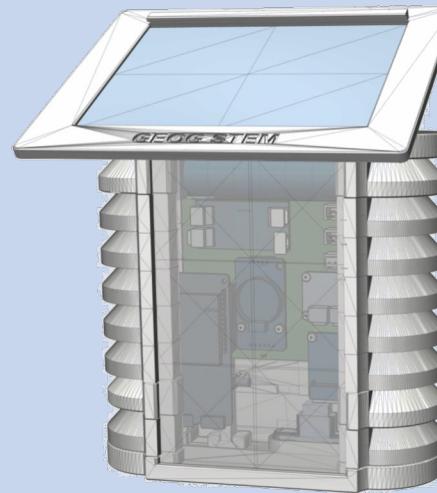
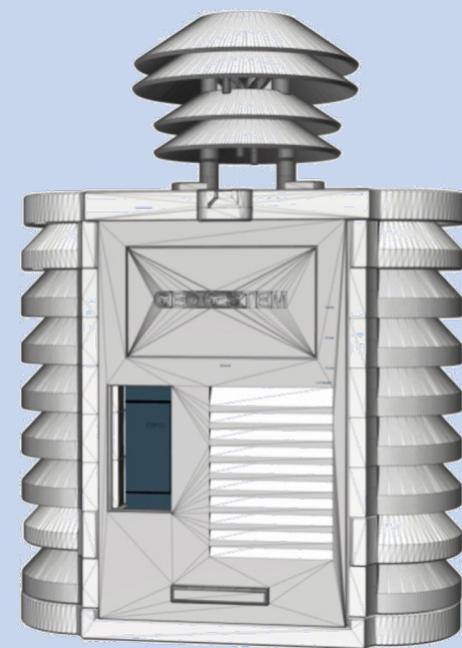
5**6**

⑥⁶
⑥⁶
⑥⁶

**9**

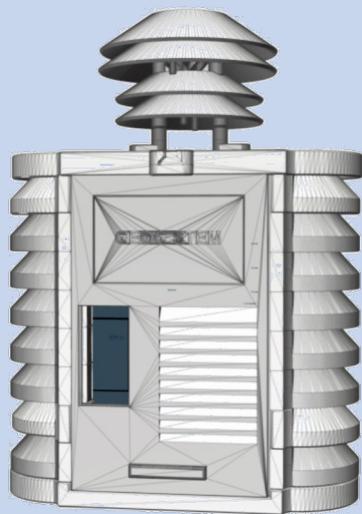
PAY ATTENTION
to the "+" and "-" pole
of the battery, placing
in wrong direction may
lead to fire or explosion !!!

7**8****10**

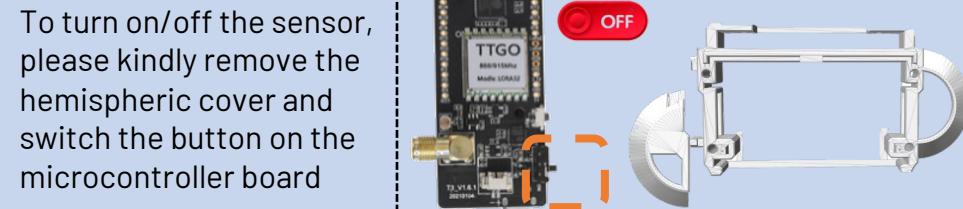
9**10****Clear Glass Version****Radiation Shield Version****11****12**

Devices Operation

Sensors



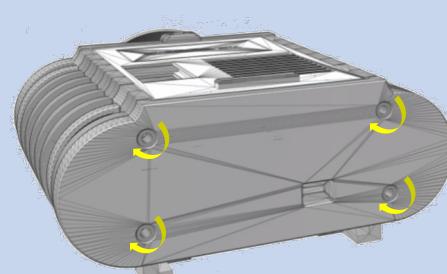
⚠️ To turn on/off the sensor, please kindly remove the hemispheric cover and switch the button on the microcontroller board



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



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

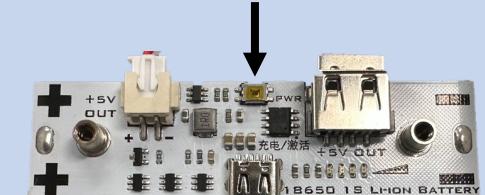


Gateway Receiver

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.



Press to On/Off



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

To turn off, quickly press twice



Charge here



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



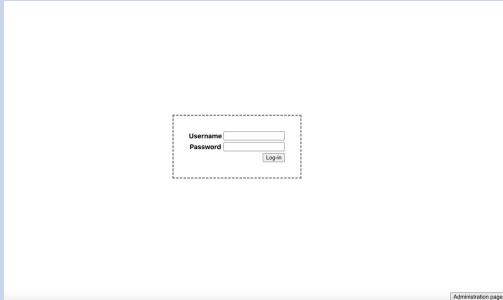
Data Visualization

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	Page	of 1	Plot
Site	Device	1	1	
Time after	年 / 月 / 日	---	---	
Time before	年 / 月 / 日	---	---	
Limit	360	hourly average		<input type="checkbox"/>
Submit				

site	device	time	Battery voltage (V)	Battery percentage (%)	SHT temperature (°C)	SHT humidity (%)	BME temperature (°C)	BME pressure (bar)	BME humidity (%)	ultraviolet
HokKoon	1	2024/16 下午 4:35:29	3.86	54.80	23.8	100659	49.8			
HokKoon	2	2024/16 下午 4:35:30	4.14	86.70	24.5	100589	45.6			
HokKoon	4	2024/16 下午 4:35:31	4.16	89.90	23.9	100609	48.5			
HokKoon	3	2024/16 下午 4:35:09	3.91	26.00	24.8	100593	46.0			
HokKoon	5	2024/16 下午 4:34:39	4.05	87.10	23.6	100554	49.5			
HokKoon	1	2024/16 下午 4:34:39	3.86	54.80	23.9	100661	49.7			
HokKoon	2	2024/16 下午 4:34:15	4.14	86.50	24.5	100590	45.9			
HokKoon	4	2024/16 下午 4:34:15	4.16	89.80	23.9	100616	48.5			
HokKoon	3	2024/16 下午 4:34:09	3.90	25.80	24.7	100596	46.0			
HokKoon	5	2024/16 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

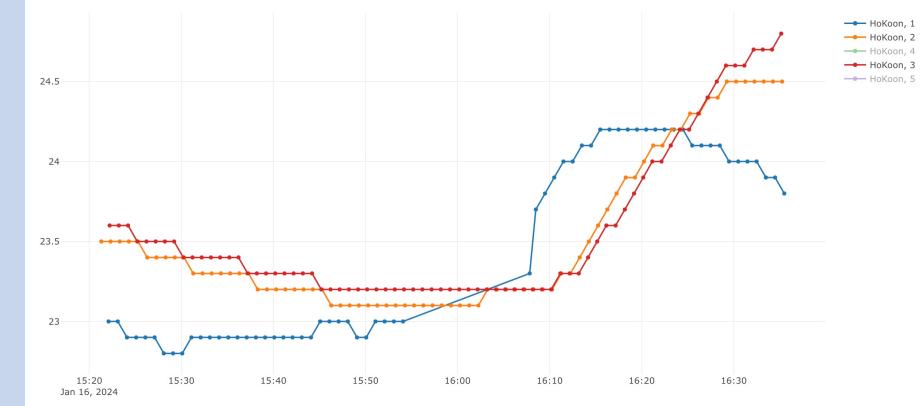
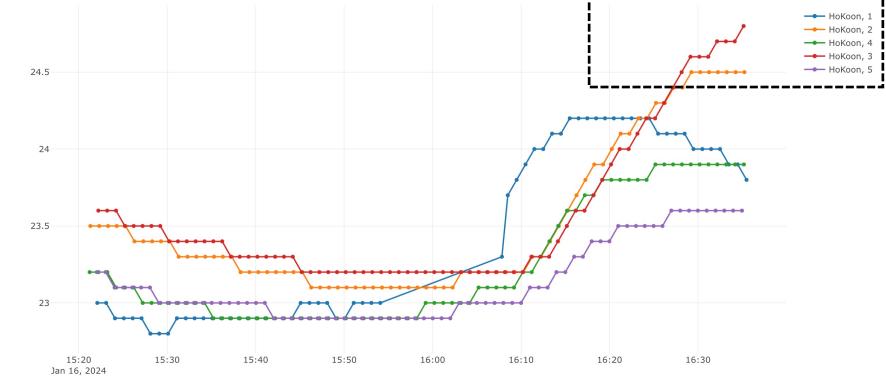
3 Plotting sensors data

Click the "Plot" box to show time series data

Plot

Element BME temperature (°C)

You may select visible or invisible for the data lines by clicking them



4 Download data from portal

Use UTC timezone

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



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

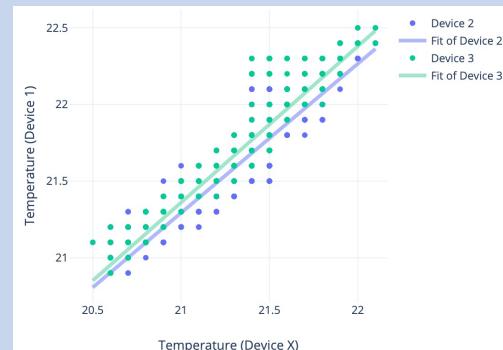
m = slope found from x-y plot

c = intercept from x-y plot

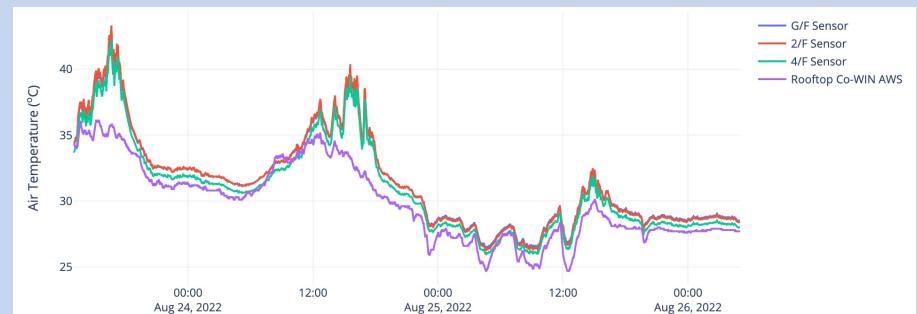
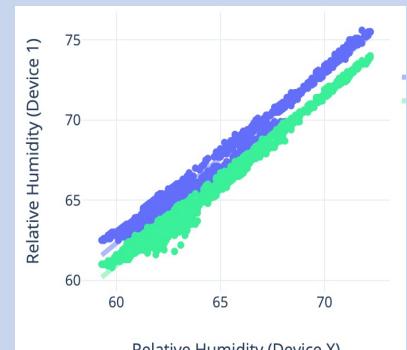
4 Data Post-processing

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

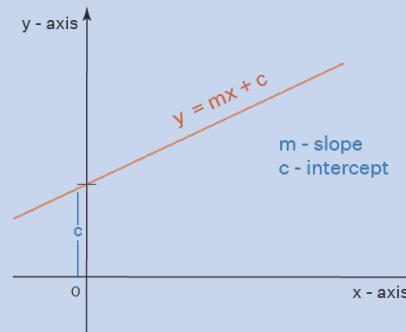
Air Temperature



Relative Humidity

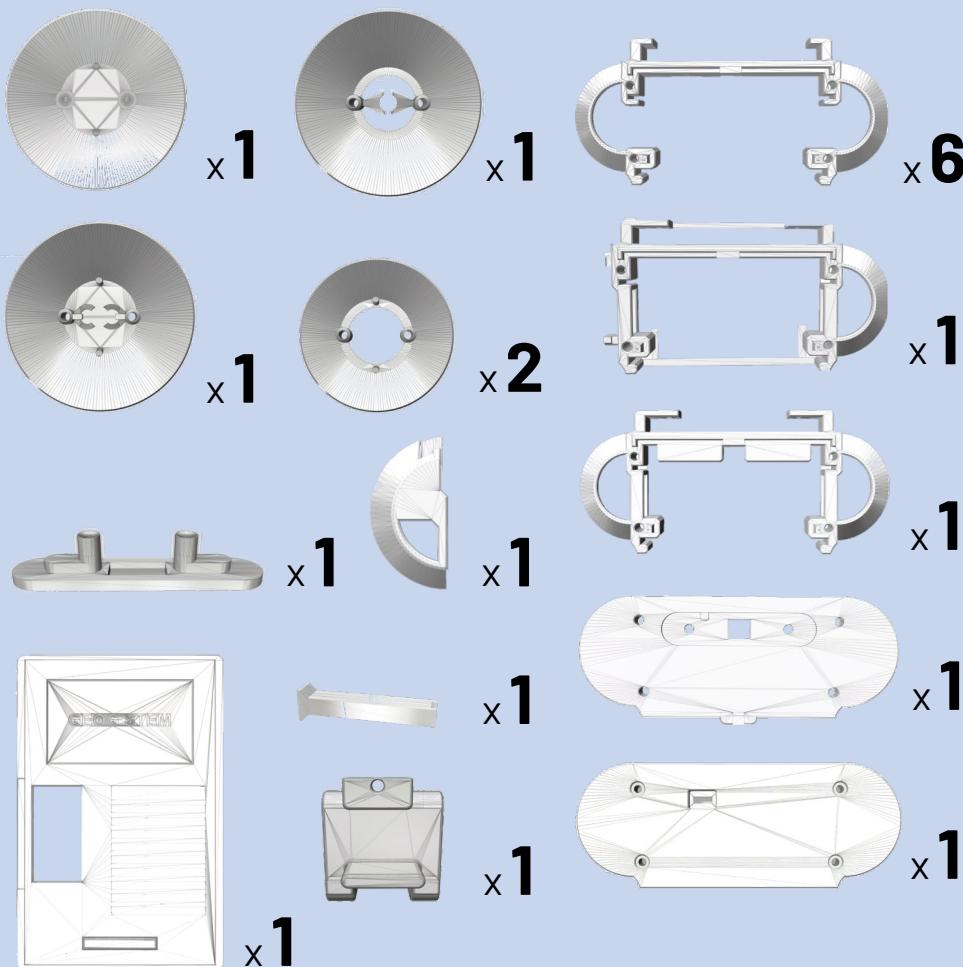


Slope Intercept Form: $y = mx + c$

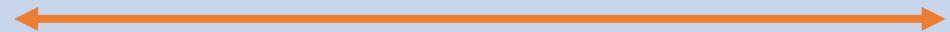




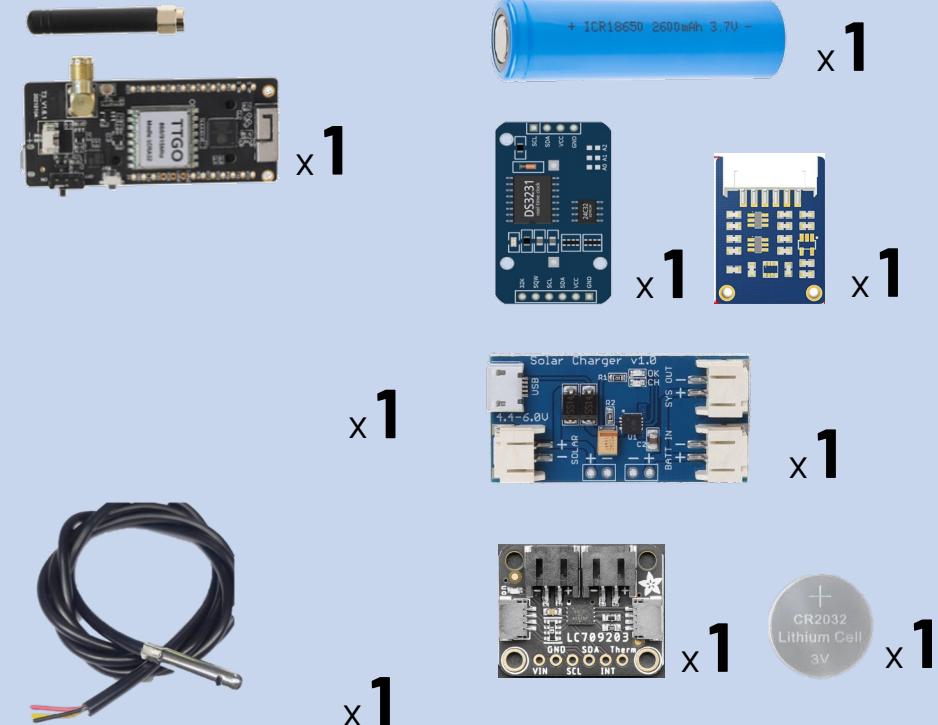
Plastic Components:



Wire Components :



Electronic Components :



Screw Components :

