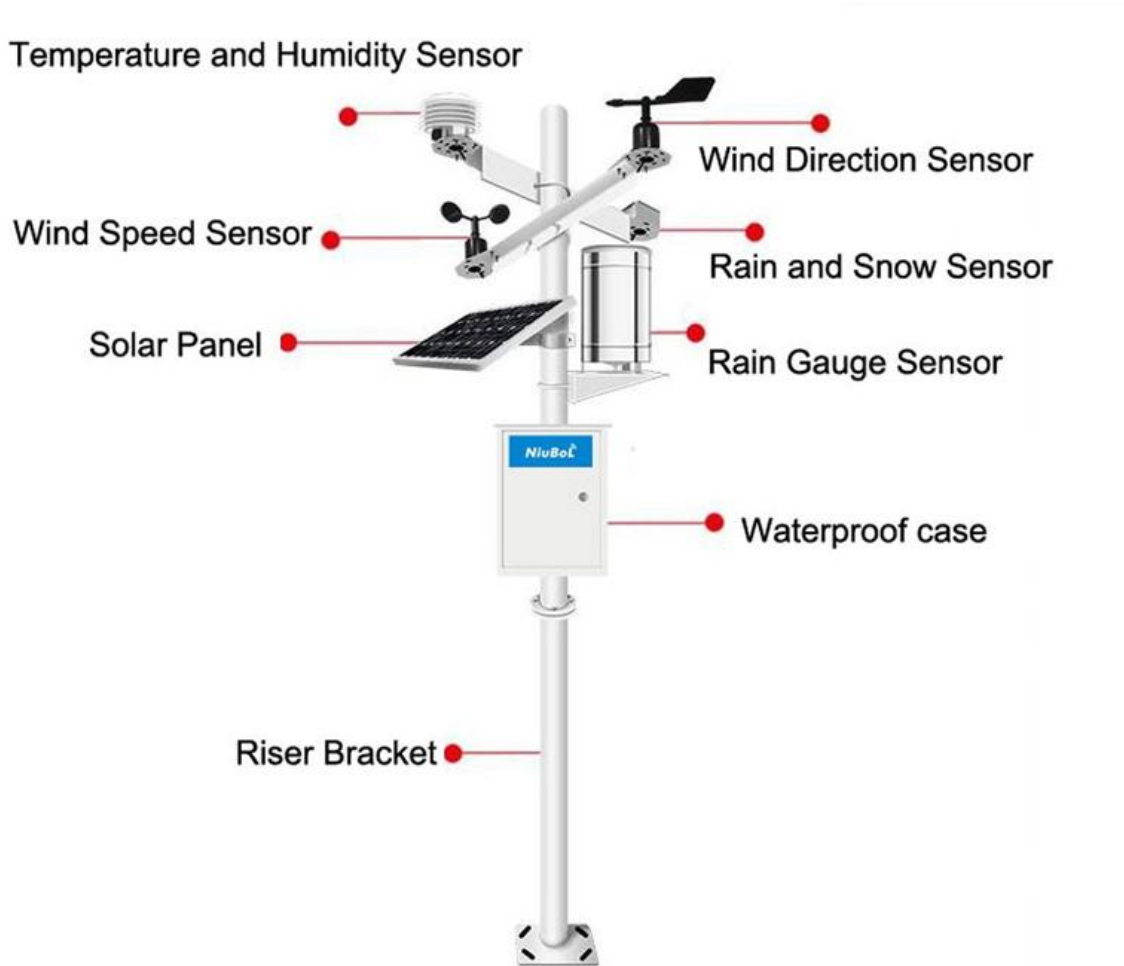


# Weather Environmental Monitoring Station Installation Instructions



Changsha Zoko Link Technology Co., Ltd

## I. Product Introduction

Environmental monitoring station is a kind of unattended meteorological collection system integrating meteorological data collection, storage, transmission and management, which has a wide range of uses in industrial and agricultural production, scenic spots, cities, campuses, forests, highways, oceans, transportation, forestry, environmental protection and other professional fields.

The collector can collect a variety of meteorological sensor parameters, while monitoring wind speed, wind direction, atmospheric temperature, atmospheric humidity, atmospheric pressure, rainfall, soil temperature, soil moisture, total radiation, illuminance and many other meteorological elements. The meteorological data collector has the functions of regular meteorological data collection, meteorological data storage, meteorological data reporting and standard communication. The system has built-in FLASH memory chip to store meteorological data, and a variety of communication interfaces can be convenient to establish a wired communication connection with the computer, or according to the different conditions of the site, you can choose GPRS/3G/4G, Ethernet and other modes of communication.

The environmental monitoring system continues to play an important role in precision monitoring, accurate early warning, scientific scheduling, flood control and disaster relief.

## II. Basic configuration

Collector: environmental data collector

Sensor: wind speed, wind direction, atmospheric temperature, atmospheric humidity, barometric pressure, soil temperature, soil humidity, total radiation, illuminance and other sensors (customers can choose according to the actual needs).

Communication mode: RS232, RS485, GPRS (wireless), Ethernet.

Power supply system: DC 12V, AC 220V, solar battery.

Installation parts (optional): lightweight shutter box, field protection box, pole, all kinds of adapted cables.

### III. System parameters (optional)

The following table is a variety of environmental monitoring system equipment parameter table, the user according to the actual purchase of equipment to consult:

Product Name	Parameter
Wind direction sensor	Range: 0~360°; Resolution: 1°; Accuracy: ±3°.
Wind Speed Sensor	Range: 0~70m/s; Resolution: 0.1m/s; Accuracy: ±(0.3+0.03V)m/s
Rainfall Sensor	Range: 0~4mm/min resolution 0.2mm; Accuracy: ±4% rainfall intensity
Soil Temperature, Moisture, Salt, Conductivity Sensor	Soil temperature range:-50~80°C; Resolution:0.1°C; Accuracy:±0.5°C. Soil moisture range: 0~100%; Resolution: 0.1% Accuracy: ±3 Soil salinity range: 0-5500mg/L; resolution: 1mg/L Soil conductivity range: 0-10000us/cm; resolution: 1us/cm; accuracy: 1us/cm
Sunshine Hour Sensor	Range: 0-24h, resolution: 0.1h
Solar Radiation Sensor	Range: 0~1500W/m2; Resolution: 1W/m2; Accuracy: ±5

Solar Radiation Sensor	Range: 0-2000W/m <sup>2</sup> ; Resolution: 1W/m <sup>2</sup> ; Accuracy: ±5%.
UV Radiation Sensor	Range: 0-400W/m <sup>2</sup> ; Resolution: 1W/m <sup>2</sup> ; Accuracy: ±2W/ m <sup>2</sup>
Photosynthetic Radiation Sensor	Range: 0-2000W/m <sup>2</sup> ; Resolution: 1W/m <sup>2</sup> ; Accuracy: ±3
PH Sensor	Range: 0-14; Resolution: 0.01; Accuracy: 0.1
Atmospheric Temperature, Humidity, Barometric Pressure and Illumination Sensor	Temperature range: -50~100°C; Resolution: 0.1°C; Accuracy: ±0.5°C. Humidity range: 0~100%RH; Resolution: 0.1%RH; Accuracy: ±5%RH Barometric pressure range: 10-1100hpa; Resolution: 0.1hPa; accuracy: ±0.3 hPa Illumination range: 0-200000Lux; Resolution: 1Lux; Accuracy: ±3%.
Soil NPK Sensor	NPK Range: 1-1999mg/L; Resolution: 1mg/L; Accuracy: ±2% F.s.
CO2 Sensor	Range: 0-2000ppm; Resolution: 1ppm; Accuracy: ±40ppm+2%F-S



<p>PM2.5/PM10 Sensor</p>	<p>PM2.5 range: 0-1000ug/m<sup>3</sup>; resolution: 1ug/m<sup>3</sup>; Accuracy: ±10ug/m<sup>3</sup></p>
<p>Data Acquisition Instrument</p>	<p>PM10 range: 0-2000ug/m<sup>3</sup>; resolution: 1ug/m<sup>3</sup>; Accuracy: ±10ug/m<sup>3</sup></p>
<p>Mounting Bracket</p>	<p>Multi-channel data acquisition instrument with 232 and 485 interfaces; Power supply: 220V AC/12V DC coexistence.</p>
<p>Protective Boxes</p>	<p>Galvanized steel pipe with pre-buried parts</p>
<p>Lightning protection</p>	<p>For installing the collector or power supply system</p>

#### Four, Equipment installation instructions

##### 1、Tools required for installation:

- (1) No. 8 wrench: 1 pcs;
- (2) No. 10 wrench: 1 pcs;
- (3) No. 13 wrench: 2 pcs;
- (4) No. 14 wrench: 1 pcs;
- (5) 8-10 inch adjustable wrench: 1 pcs;
- (6) Diagonal pliers: 1 pair;
- (7) Wire strippers: 1 pcs;
- (8) Phillips screwdrivers: 1 pcs;
- (9) one-piece screwdriver : 1 pcs;
- (10) one-piece screwdriver: 2.5 \* 75, 1 pcs;
- (11) Electrical tape: 1 roll;
- (12) Multimeter: 1 set.

##### 2, Installation location selection requirements:

- (1) Weather station installation weather station in the installation requires installation in a flat and open environment, strong air circulation, sunlight without blocking. And it is required that there is no source of influence within 10m, such as strong magnetic environment.
- (2) The installation site of the weather station is required to have a stable network signal, the data transmission of the weather station is often dependent on the wireless network remote transmission, a good network signal can ensure that the data transmission is timely and stable.
- (3) The installation site should be able to ensure safety, you can set up fences and so on to reduce the interference of strangers and animals.

##### 3, installation considerations:

- (1) Mechanical wind sensor: Installation of wind sensors need to watch the sensor label, the fixed south arrow pointing to the fixed south of the white point to point to the geographic location of the due south.

(2) Ultrasonic wind speed and direction sensor: observe the top of the sensor, there is a triangular arrow, the installation of the triangular arrow needs to point to the geographic location of the north.

(3) Rain sensor: rain sensor installation needs to rain sensor along the side of the lower edge to find three screws, the screws will be removed after the rain barrel and rain sensor can be separated, after the removal of the rain sensor can be seen after the bucket is a rubber band fixed to do the rain sensor, the removal of rubber bands, and then the rain barrel to restore, with screws can be fixed.

(4) Total radiation sensor: total radiation sensor is installed, the sensor will be removed from the top cover, revealing the sensor glass cover can be.

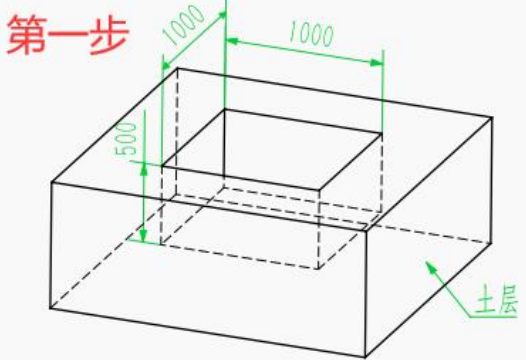
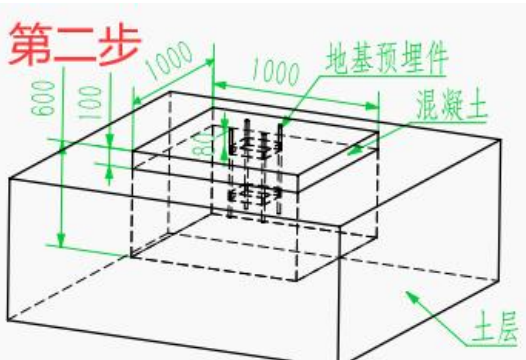
(5) Soil PH sensor (glass electrode type): When the sensor is shipped from the factory, there is a transparent protective cover at the probe position, when using it, please remove the transparent protective cover first, fix the black filtering groove with the sensor, and then wrap the filtering mesh in the filtering groove, so that the sensor can be buried in the soil, and then pour in the right amount of water.

(6) GPRS module: GPRS module connected to the collector, in addition to the power supply to the GPRS module, you also need to use the white communication cable to connect the GPRS module and the collector.

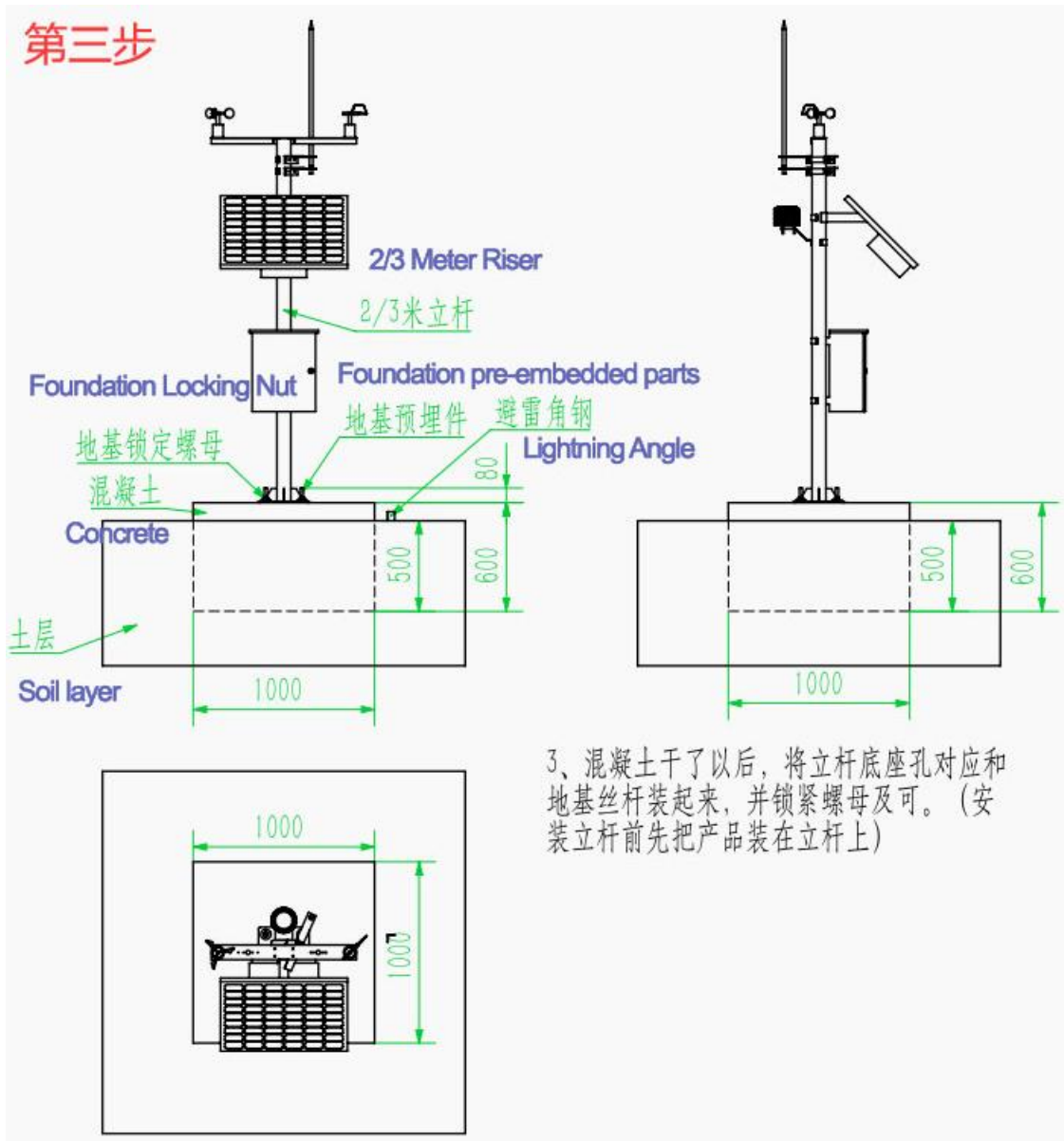
**\*\*\*Note:** Before installing the equipment, please find the complete set of equipment according to the goods list number, and then according to the labeling information on the outer box of each set of equipment to find the packing list in the last box of goods, according to the packing list to check the list of goods, such as the number of goods found to be incorrect, please contact the manufacturer in a timely manner.

4. Cement foundation making:

Please find the foundation pre-embedded parts according to the packing list first;

 <p><b>第一步</b></p> <p>1、在土层挖一个1000*1000*500深的坑。</p>	 <p><b>第二步</b></p> <p>2、用混凝土浇筑一个1000*1000*600的地基，浇筑时放入地基预埋件。地基丝要求露出80mm以上，并用塑料包裹丝杆，防止混凝土溅到丝杆上后期螺丝难拧上去。</p>
<p>1. Dig a pit 1000*1000*500 deep in the soil.</p>	<p>2, With concrete pouring a 1000 * 1000 * 600 foundation pouring into the foundation embedded parts. Foundation screws required to expose more than 80mm, and plastic wrapped screws to prevent concrete splash to the screws on the late screws difficult to screw up.</p>





3, After the concrete is dry, the riser base hole corresponds to and foundation screw installed, and lock nut and can. (Install the product on the riser before installing the riser).

5. Installation of wind speed, wind direction and total radiation sensors:

Find the wind speed, wind direction and total radiation sensor mounting cross arm according to the packing list, as shown below:



The cross arm is equipped with mounting screws for wind speed, wind direction and total radiation sensors, first remove the corresponding screws, corresponding to the mounting position as shown below:



The result after installation is shown below:



Finally, install the cross arm on the top of the riser and lock it in place with the screws, see the picture below:

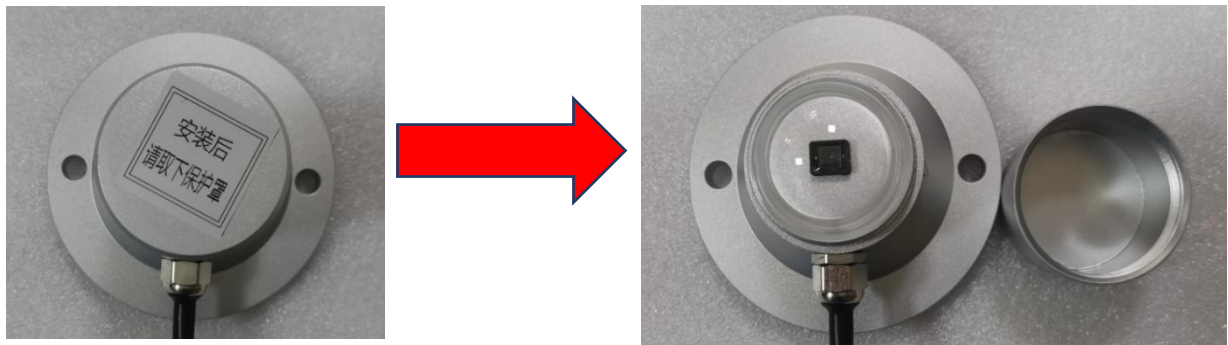


**\*\*\* Notes:**

(1) The wind direction sensor needs to be installed in an oriented manner: the downward arrow indicated on the label of the sensor points to the white fixed south point (as shown in the figure below), which needs to be aligned with the actual geographic position in the due south direction.

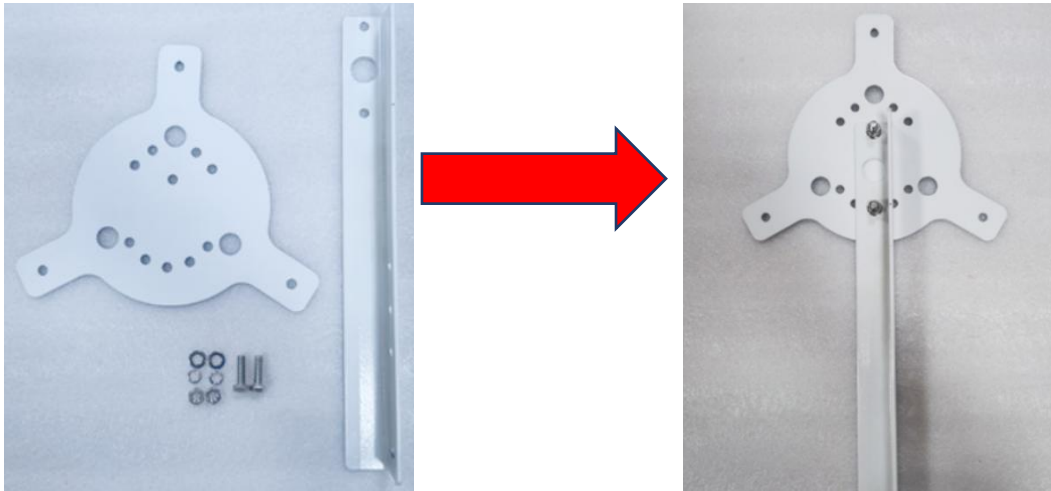


(2) Once the total radiation sensor is installed, the protective cover needs to be removed.

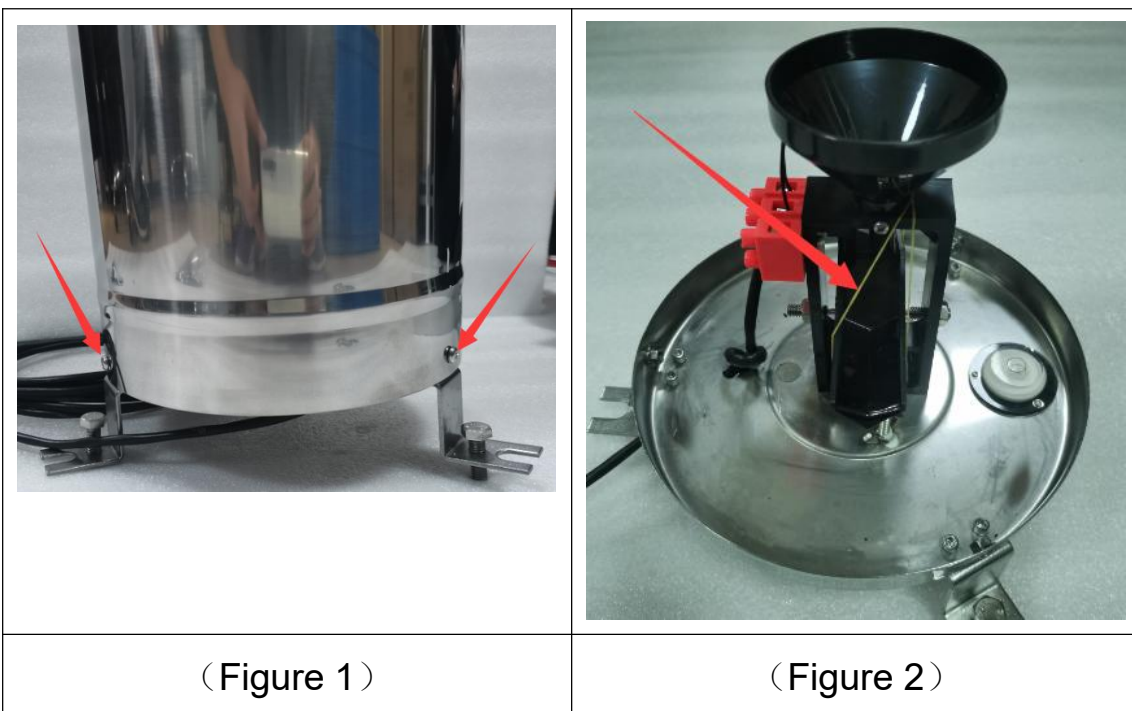



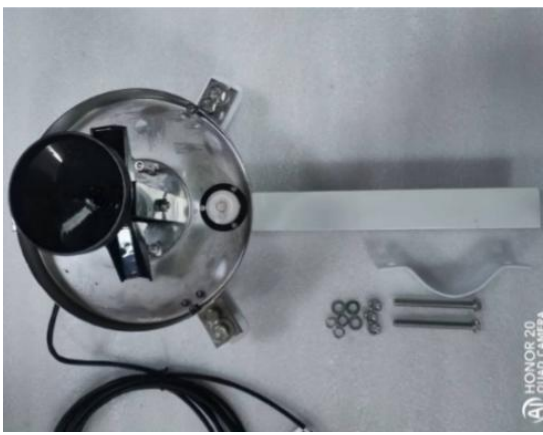
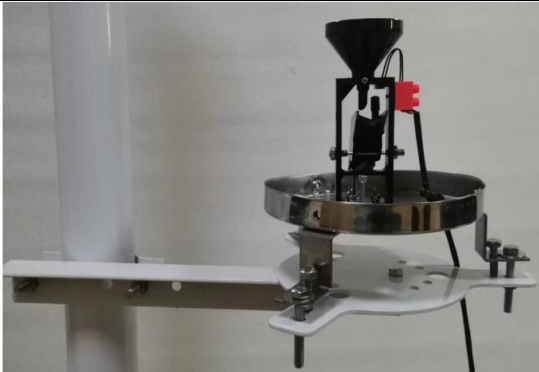

## 6. Rain sensor installation:

(1) Please find the rain sensor mounting cross arm according to the packing list, as shown below, and mount the rain cross arm and the rain disc:



(2) remove the rubber band used to fix the bucket: remove the three screws on the bottom side of the outer barrel, the base and the outer barrel apart (Figure 1); removed from the base can be seen on the bucket is fixed by the rubber band, the rubber band will be removed, so that the bucket can be left and right flip (Figure 2):

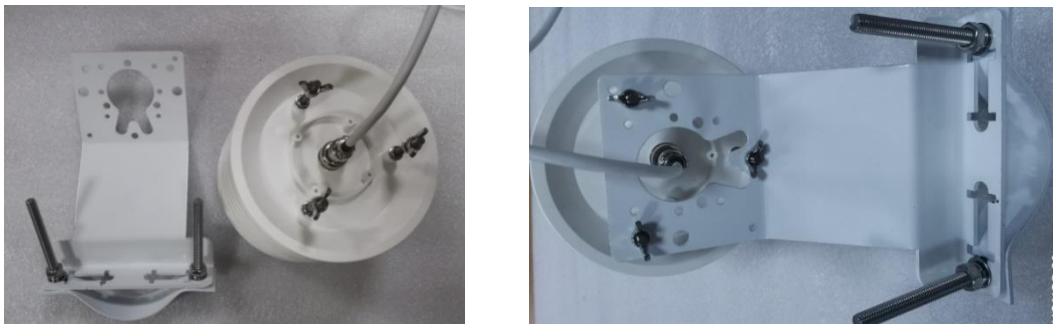


	
<p>( Figure 3 )</p>	<p>( Figure 4 )</p>
	
<p>( Figure 5 )</p>	<p>( Figure 6 )</p>

(3) Install the base and disk together (as Figure 3, Figure 4), then the rainfall cross arm with hoop fixed on the pole (as Figure 5), and finally the outer barrel and base assembled together, screws fixed (as Figure 6), that is, the installation is complete.

7, small shutter box installation:

(1) Install the small louver box with the supporting small bracket as follows:



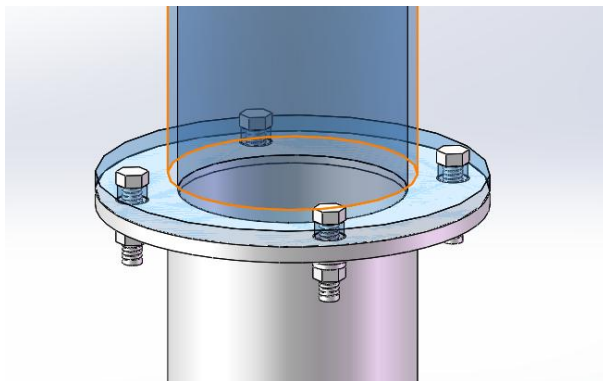


(2) Secure the mounted mini louver box to the mounting riser with a hoop as shown below:



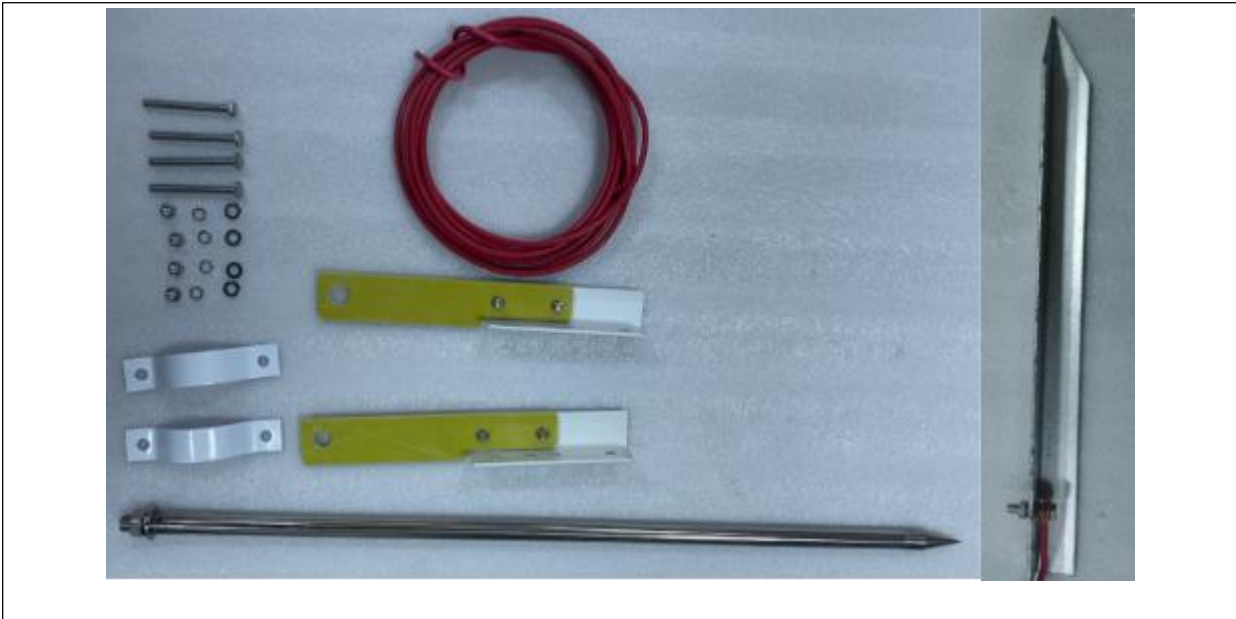
8, 3 meters bracket upper and lower rod assembly:

Find the upper and lower rods of the 3-meter bracket, the upper rod 1.8 meters, the lower rod 1.2 meters, assembled as shown below, the screws can be locked.



9, lightning rod installation (optional):

According to the packing list to find the lightning device installation of accessories required: lightning rod, lightning wire, lightning angle, lightning rod mounting cross arm, mounting screws and hoop.



\*Pass the lightning rod through the mounting holes on the fixed parts, and screw the threaded rod head of the lightning rod into the screw holes under the fixed parts. screw holes, connect the lightning cable and the lightning angle steel, the connection is as follows;

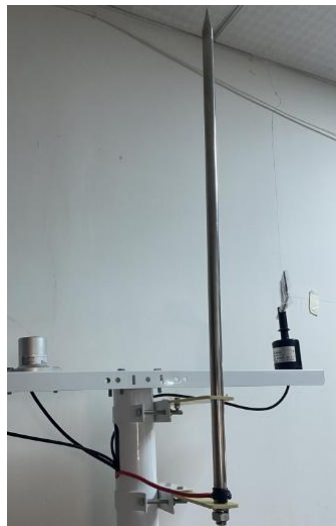
		
<p>Lightning rod 1</p>	<p>Lightning rod 2</p>	<p>Lightning angle</p>

(2) The upper and lower parts of the lightning arm are fixed with the lightning arm with nuts and bolts respectively.

Good. Attach the front assembly to the pole, adjust the position, and then install according to the diagram;

(3) Fix the lightning rod on the lightning rod mounting piece, use the hoop to fix the

lightning rod mounting piece on the vertical pole, as shown below; then drive the lightning angle into the soil, the top of the lightning angle is more than 600mm from the ground.



#### 10, LED screen installation (optional):

According to the packing list, find the LED screen and LED screen mounting hoop, the LED screen with matching hoop mounted on the pole (as shown below);

Note: LED screen outlet facing down, LED screen power supply conventional AC220V mains, please check the power supply line labeling logo.



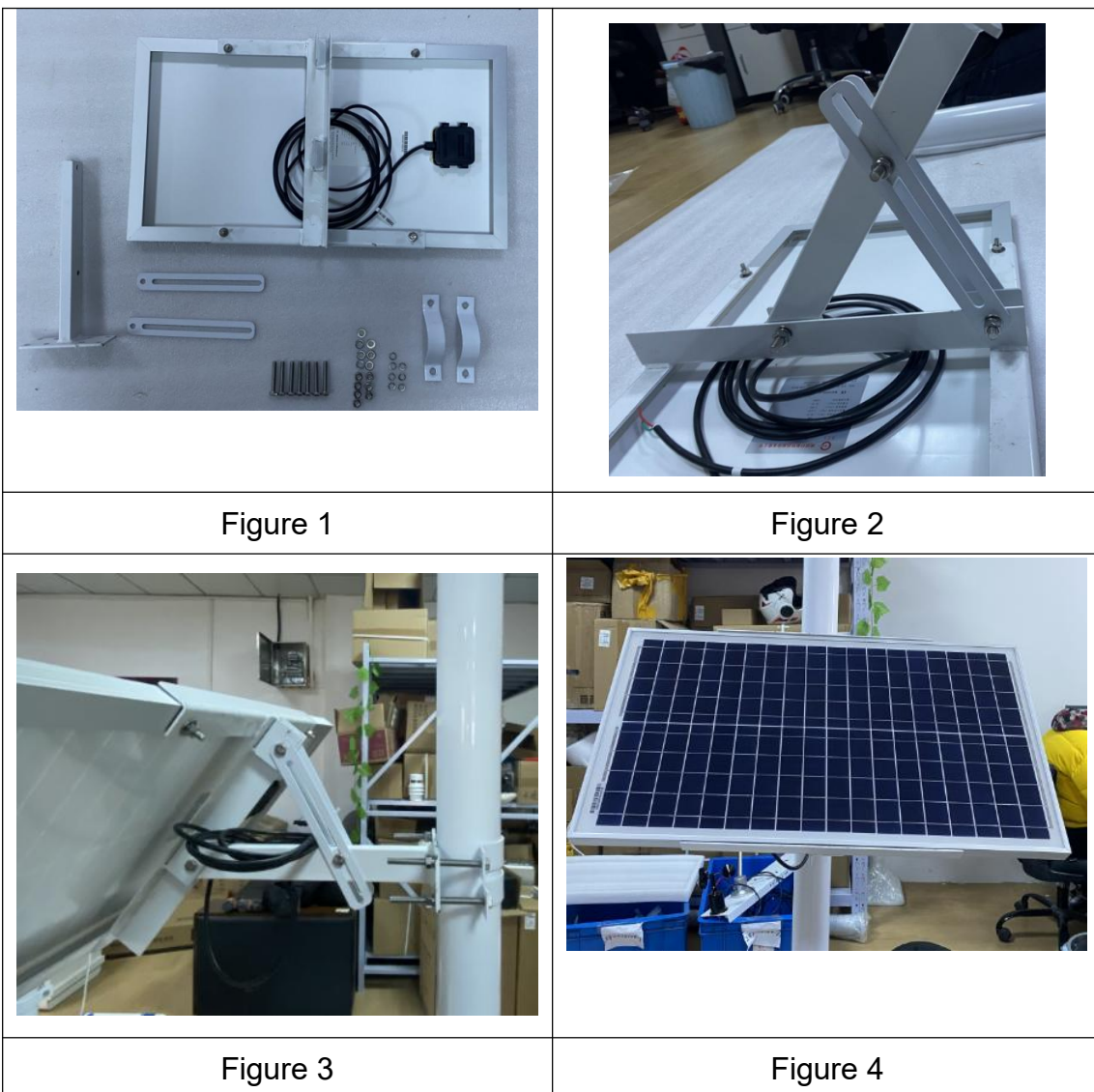


## 11. Solar panel installation:

### (1) (Split) solar power system installation:

According to the packing list, find the solar panel and solar panel mounting bracket screw clamps (as shown in Figure 1); install the solar panel bracket on the back of the solar panel (as shown in Figure 2); and then install the bracket on top of the riser (as shown in Figure 3).

**\*\*\*Note:** The surface of the solar panel should face south after installation.



(2) (All-in-one) solar power system installation:

According to the packing list, find the one-piece solar power system, take out the cross arm, and mount the mounting cross arm on the back of the solar panel with 4 screws (Figure 1 and Figure 2 below);

Remove the mounting hoop screws, set them onto the mounting riser and lock the screws tightly (Figure 3 below);

Installation of the power supply system switch on, switch 1 press down is on, 0 press down is off (Figure 4, Figure 5 below).

**\*\*\*Note:** After the solar panel is installed, face the panel to the south (Figure 6). Once the switch is turned on, plug the power supply socket into the collector power supply port.



Figure 1



Figure 2



Figure 3



Figure 4



Figure 5  
Power supply interface: 12V



Figure 6

## 12、Protection box installation and internal wiring:

According to the packing list, find the protective box and the corresponding mounting hoop screws (as shown below), and mount the protective box on the uprights.



## Protection box internal wiring I: (collector without display)

The internal wiring diagram of the protection box is as follows:



(1) For the environmental data collector, hereinafter referred to as the collector, with screws fixed in the protective box backplane, this collector GPRS communication module is built-in, fixed only one end of the antenna needs to be connected to the collector, the other end is placed on the top of the protective box can be outside.

(2) For the sensor terminals, each terminal is labeled with a function definition, check the sensor line line labeling, the same definition of the line group can be accessed, 485 communication power supply interface is only two groups, more than one group of sensors can be accessed in parallel.

(3) For the battery, the output has two wires, please pay attention to check the line labeling positive and negative poles, need to be accessed to (5) solar controller.

(4) For dual power supply box, there are two output interfaces and two input interfaces, one of the input interface for the 2-core wire, line labeled with positive and negative poles, need to be accessed to (5) solar energy controller; the other input interface can be accessed into the (6) power adapter. The other input connector can



be connected to the (6) power adapter. The two outputs can be connected to the (1) collector by choosing one.

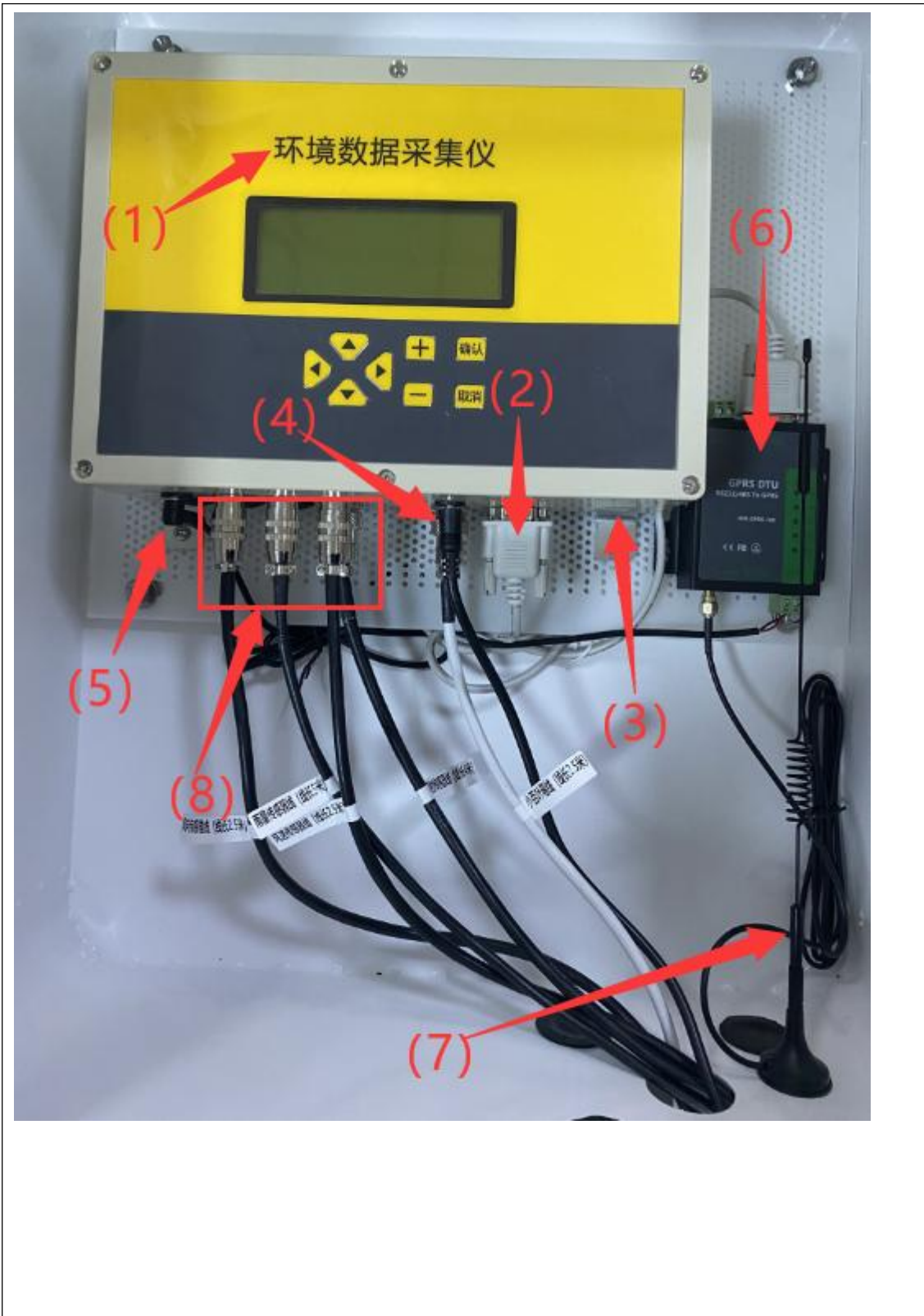
(5) For the solar controller, you need to connect the battery, dual power supply box, solar panels. (Note: the order of access: dual power supply box, battery, solar panels, pay attention to the positive and negative poles of the line;)



(6) For the power adapter, one end connected to the 220V utility, the other end connected to the dual power supply box input interface (there is no utility, only solar energy, this device can not be connected).

Protection box internal wiring II: collector with display

The internal wiring diagram of the protection box is as follows:



(1) For the environmental data acquisition instrument (hereinafter referred to as the collector), using self-tapping screws to collect the instrument hanging angle fixed on

the back plate of the protective box, that is, the installation is complete;

(2) 232 communication interface for the collector;

(3) 485 communication interface for the collector;

(This device on the 232 communication interface and 485 communication interface to use the same communication board, use only one of the communication methods can be selected to connect.)

(4) For the collector power supply input interface, conventional collector power supply for DC12V, the use of utility power, will be configured with 220V to 12V power adapter;

(5) 12V output interface, can provide power supply for GPRS communication module;

(6) For the GPRS communication module, power supply can be (5) at the 12V output to its power supply, and then use the white communication line and collector 232 communication interface connection, the (7) antenna connected;

(7) Is the antenna of GPRS communication module, after connecting with the module, place the antenna on the top outside of the protective box;

(8) For the sensor interface, check the interface label, sensor wire label and aircraft plug pin insertion.

Other customized sensor installation, please consult the manufacturer's technical support to guide the installation.

## **V. Introduction to Cloud Platform Operation**

To implement a cloud platform based on the MQTT protocol for receiving and processing data from sensor data loggers, you can consider using a variety of existing cloud services and solutions. The following is a simplified step-by-step guide to help you build such a system:

### **1. Select a cloud platform**

First, you need to choose a cloud platform that supports the MQTT protocol:

1.1 Use your own cloud platform: If you already own and manage your own cloud platform infrastructure, you can deploy the MQTT agent and other necessary

services directly on your platform.

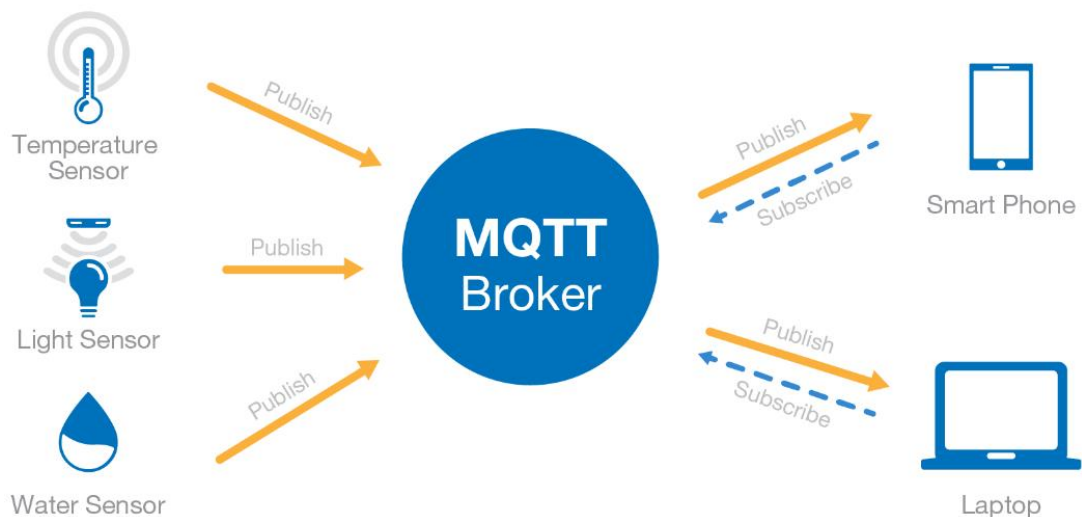
1.2 Or choose a commercial cloud platform: If you don't want to or can't maintain your own cloud platform, you can also opt for commercial cloud services such as AWS IoT Core, Azure IoT Hub, Google Cloud IoT Core, etc. Some popular choices include.

**AWS IoT Core:** an IoT service provided by Amazon that supports the MQTT protocol and is easy to integrate with other AWS services (e.g. DynamoDB, S3, Lambda, etc.).

**Azure IoT Hub:** IoT messaging center provided by Microsoft, also supports MQTT protocol and seamlessly integrates with other Azure services.

**Google Cloud IoT :** Google's IoT service that also supports MQTT and can be used in conjunction with other Google Cloud services (e.g. BigQuery, Cloud Functions, etc.).

**AliCloud IoT Suite:** AliCloud IoT is also a good choice, supports MQTT protocol and provides rich IoT solutions.



## 2. Configuring the MQTT proxy

Most of the cloud platforms you choose will provide you with MQTT proxy services. You need to create an MQTT topic (Topic) on your cloud platform and configure the security authentication (e.g. using TLS/SSL encryption and authentication certificate).



### 3. Setting up the Data Logger

The data logger (or sensor gateway, as it is called) needs to be configured as an MQTT client, capable of connecting to your MQTT agent and publishing data to the specified Topic. This typically involves the following steps:

**Configure network connectivity:** Ensure that the data logger is able to access the Internet and connect to the IP address and port of the MQTT agent.

**Configure the MQTT client:** Set the parameters of the MQTT client, such as the server address, port, username, and password (if secure authentication is used).

**Write code:** Write or modify code on the data logger so that it can capture sensor data and publish it to the cloud platform via the MQTT protocol.

### 4. Data Processing and Storage

Once the data is sent to the cloud platform, you can use the cloud platform's features or integrate other cloud services to process and store the data. Example:

**Real-time data processing:** Use serverless computing services such as AWS Lambda, Azure Functions, Google Cloud Functions, etc. to process real-time data.

**Data Storage:** Store data in databases such as AWS DynamoDB, Azure Cosmos DB, Google Cloud Firestore, etc.

**Data Analytics:** Perform in-depth analysis of stored data using data analytics services on cloud platforms (e.g. AWS Redshift, Google BigQuery, etc.).

[overview](#) [control](#) [video](#)

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## 5. Data Visualization

To view and analyze data more intuitively, you can use the dashboard tools provided by the cloud platform or integrate third-party data visualization services (e.g. Grafana, Kibana, Tableau, etc.).

## 6. Security and Monitoring

Ensure that your system has appropriate security measures in place, such as using TLS/SSL encryption, regularly updating security patches for devices and software, and implementing access control policies. Also, monitor the operational status of your system to ensure that data is transmitted and processed in a timely and accurate manner.

## 7. Maintenance and Updates

**Regular updates:** Keep your MQTT proxy and other cloud service components updated to the latest versions to fix known security vulnerabilities and improve performance.

**Backup and Restore:** Back up your data and configurations on a regular basis so that you can quickly restore your service if needed.

By following these steps, you can build a cloud platform system based on the MQTT protocol for receiving and processing data from sensor data loggers.