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## Wireless Liquid Level Sensor

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## User Manual

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## 1. Introduction

RA0711\_R72611\_RA0711Y is a Class A type device based on the LoRaWAN open protocol.

RA0711\_R72611\_RA0711Y can be connected to the liquid level sensor and report the value collected by the sensor to the corresponding gateway.

### LoRa Wireless Technology:

LoRa is a wireless communication technology dedicated to long distance and low power consumption. Compared with other communication methods, LoRa spread spectrum modulation method greatly increases to expand the communication distance. Widely used in long-distance, low-data wireless communications. For example, automatic meter reading, building automation equipment, wireless security systems, industrial monitoring. Main features include small size, low power consumption, transmission distance, anti-interference ability and so on.

### LoRaWAN:

LoRaWAN uses LoRa technology to define end-to-end standard specifications to ensure interoperability between devices and gateways from different manufacturers.

## 2. Appearance



Fig.1. RA0711

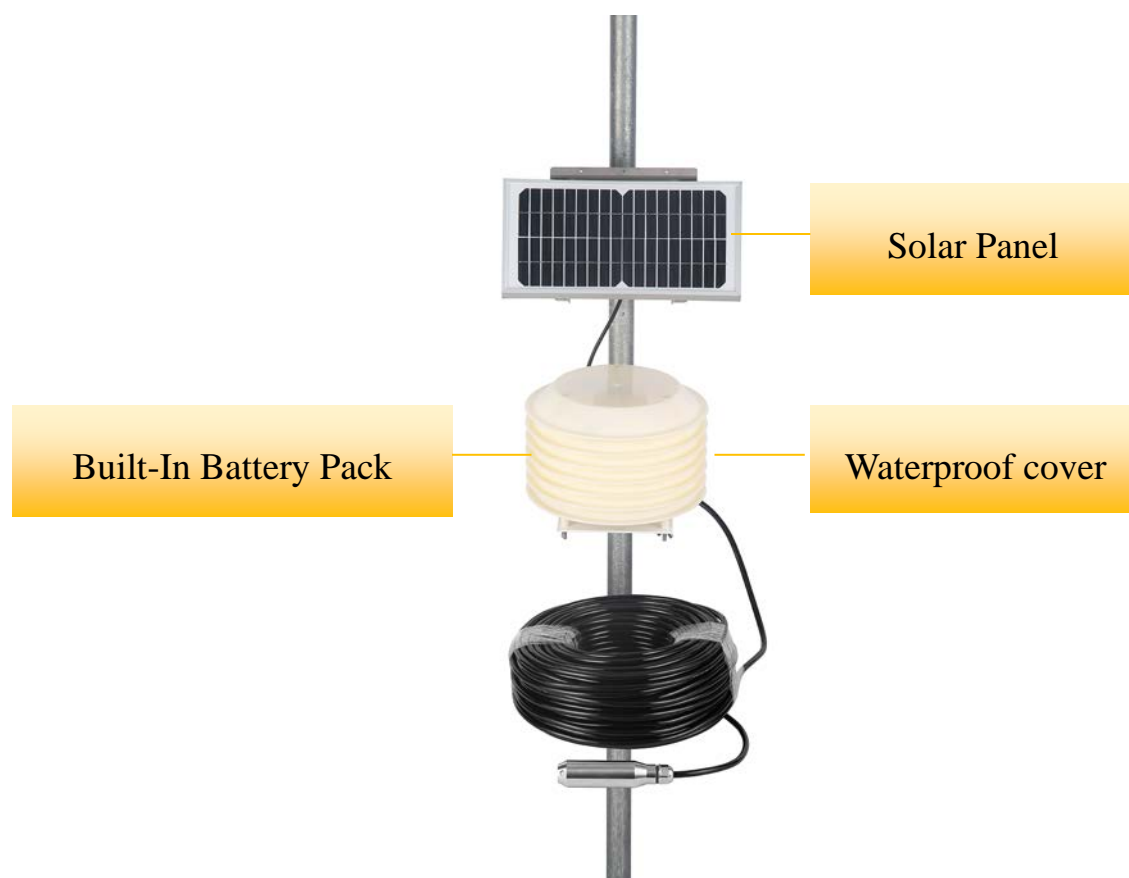


Fig.2. R72611



Fig.3. RA0711Y

### 3. Main Features

- Compatible with LoRaWAN
- RA0711 & RA0711Y apply DC 12V adapter
- R72611 applies solar and rechargeable lithium batteries
- Simple operation and setting
- Liquid Level detection
- Adopt SX1276 wireless communication module

## 4. Set up Instruction

### On/Off

Power on	RA0711 and RA0711Y are connected to the DC 12V adapter for power-on; R72611 applies solar and rechargeable lithium batteries.
Turn on	Power on to turn on.
Restore to factory setting	Press and hold the function key for 5 seconds till green indicator flashes for 20 times.
Power off	Remove power
Note:	<ol style="list-style-type: none"> <li>1. Engineering test modes require the burning engineering test software.</li> <li>2. On/off interval is suggested to be about 10 seconds to avoid the interference of capacitor inductance and other energy storage components.</li> </ol>

### Network Joining

Never joined the network (Or at factory setting )	<p>Turn on the device to search the network to join.</p> <p>The green indicator stays on for 5 seconds: success</p> <p>The green indicator remains off: fail</p>
Had joined the network (Not at factory setting.)	<p>Turn on the device to search the previous network to join.</p> <p>The green indicator stays on for 5 seconds: success</p> <p>The green indicator remains off: fail</p>
Fail to join the network (when the device is on)	Suggest to check the device verification information on the gateway or consult your platform server provider.

### Function Key

Press and hold for 5 seconds	<p>Restore to factory setting / Turn off</p> <p>The green indicator flashes for 20 times: success</p> <p>The green indicator remains off: fail</p>
Press once	<p>The device is in the network: the green indicator flashes once and the device sends a data report</p> <p>The device is not in the network: green indicator remains off</p>

### Low Voltage Threshold (R72611)

Low Voltage Threshold	10.5 V
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\* RA0711\_R72611\_RA0711Y has a network information memory function saving function when power-down. This function is turned off by default, that is, it will be re-joined every time it is powered back on. This function can be turned on by the ResumeNetOnOff command.

At this time, each time the power is rewritten, the last network joining information will be recorded (including saving the network address information assigned to it, etc., if you want to join a new network, you need to perform a factory resetting operation first.)It will not be re-joined the previous network.

## 5. Data Report

The device will immediately send a version packet report along with an uplink packet including liquid level and voltage values.

The device sends data in the default configuration before any configuration is done.

### Default setting:

Report MaxTime:

RA0711\_ RA0711Y is 180s

RA72611 is 1800s

\* Value must be greater than  $ReportMinTime \geq ReportType\ count * ReportMinTime + 10$  , unit: second

Report MinTime: 30s ( US915, AU915, KR920, AS923, IN865 )

120s ( EU868 )

ReportType count = 1

\* If RA07 / R726 series device ReportType Count >1,

For example, when ReportType Count=2, two data packets will be sent every periodic report, and the sending interval of the two data packets will be ReportMinTime.

When RA0711 ReportType Count = 1, MinTime configuration is invalid.

Note:

(1) The device report interval will be programmed base on the default firmware which may vary.

(2) The interval between two reports must be the Maxtime

(3) ReportChange is not supported by RA0711\_R72611\_RA0711Y (Invalid configuration)

(4) Report cycle will be based on ReportMaxTime period when sending data packet (beginning to the end of the first data as a period).

(5) Data packet: liquid level value

(6) It would take about 35 seconds for the liquid level sensor to sample and process the collected liquid level value after being powered

(7) The device also supports Cayenne's TxPeriod cycle configuration instructions. Therefore, the device can also perform a report according to the cycle time of the TxPeriod value; and whether the report period is ReportMaxTime or TxPeriod will be depending on which cycle time is configured last time;

(8) It would take about 35 seconds for the liquid level sensor to sample and process the collected liquid level value if you were to manually trigger the device by pressing the button, please be patient.

Please refer Netvox LoRaWAN Application Command document and Netvox Lora Command Resolver

<http://cmddoc.netvoxcloud.com/cmddoc> to resolve uplink data.

## Tips

### 1. Battery Voltage:

(a) The voltage value is bit 0 ~ bit 6, bit 7=0 is normal voltage, and bit 7=1 is low voltage.

Battery=0xE9, binary=1110 1001, if bit 7= 1, it means low voltage.

The actual voltage is 0110 1001 = 0x69 = 105, 105\*0.1v =10.5v.

(b) If the battery is equal to 0x00, it means that the device is powered by a DC power supply.

### 2. Version Packet:

When Report Type=0x00 is the version packet, such as 0105000A0B202005200000, the firmware version is 2020.05.20

### 3. Data Packet:

(a) When Report Type=0x0A is data packet.

(b) When NetvoxPayLoadData field=0xFFFF, it means that RA0711/ R72611/RA0711Y does not support the connected device or sensor.

## 5.1 Example of ReportDataCmd

FPort: 0x06

Bytes	1	1	1	Var(Fix=8 Bytes)
	Version	DeviceType	ReportType	NetvoxPayLoadData

**Version**– 1 byte –0x01—the Version of NetvoxLoRaWAN Application Command Version

**DeviceType**– 1 byte – Device Type of Device

The devicetype is listed in Netvox LoRaWAN Application Devicetype doc

**ReportType** – 1 byte –the presentation of the NetvoxPayLoadData, according the devicetype

**NetvoxPayLoadData**– Fixed bytes (Fixed =8bytes)

Device	Device Type	Report Type	NetvoxPayLoadData				
RA07Series	0x05	0x00	SoftwareVersion (1Byte) Eg.0x0A—V1.0	HardwareVersion (1Byte)	DateCode (4Bytes, eg0x20170503)	Reserved (2Bytes, fixed 0x00)	
R726Series	0x09	0x0A	Battery (1Byte, unit:0.1V)	Soil_VWC (2Bytes,unit:0.01%)	Soil_Temperature (Signed 2Bytes,unit:0.01°C)	WaterLevel (2Bytes,unit:1cm)	Soil_EC (1Byte, unit:0.1dS/m)
RA07xxY Series	0x0D						

**(1) Example of RA0711 Uplink: 01050A00FFFFFFFF00C8FF**

1<sup>st</sup> byte (01): Version

2<sup>nd</sup> byte (05): DeviceType 0x05 — RA07 Series

3<sup>rd</sup> byte (0A): ReportType

4<sup>th</sup> byte (00): DC power supply

5<sup>th</sup> 6<sup>th</sup> byte (FFFF): Soil VWC—N/A

7<sup>th</sup> 8<sup>th</sup> byte (FFFF): Soil Temperature—N/A

9<sup>th</sup> byte (00C8): Water Level—200cm, C8(Hex)=200(Dec) 200\*1cm=200cm

11<sup>th</sup> byte (FF): Reserved—N/A

**(2) Example of R72611 Uplink: 01090A78FFFFFFFF012CFF**

1<sup>st</sup> byte (01): Version

2<sup>nd</sup> byte (09): DeviceType 0x09 — R726 Series

3<sup>rd</sup> byte (0A): ReportType

4<sup>th</sup> byte (78): Battery—12V, 78(Hex)=120(Dec) 120\*0.1v=12v

5<sup>th</sup> 6<sup>th</sup> byte (FFFF): Soil VWC—N/A

7<sup>th</sup> 8<sup>th</sup> byte (FFFF): Soil Temperature—N/A

9<sup>th</sup> byte (012C): Water Level—300cm, 12C(Hex)=300(Dec) 300\*1cm=300cm

11<sup>th</sup> byte (FF): Reserved—N/A

**(3) Example of RA0711Y Uplink: 010D0A00FFFFFFFF0190FF**

1<sup>st</sup> byte (01): Version

2<sup>nd</sup> byte (0D): DeviceType 0x0D — RA07xxY Series

3<sup>rd</sup> byte (0A): ReportType

4<sup>th</sup> byte (00): DC power supply

5<sup>th</sup> 6<sup>th</sup> byte (FFFF): Soil VWC—N/A

7<sup>th</sup> 8<sup>th</sup> byte (FFFF): Soil Temperature—N/A

9<sup>th</sup> byte (0190): Water Level—400cm, 190(Hex)=400(Dec) 400\*1cm=400cm

11<sup>th</sup> byte (FF): Reserved—N/A



## 5.2 Example of ConfigureCmd

FPort: 0x07

Bytes	1	1	Var (Fix =9 Bytes)
	CmdID	DeviceType	NetvoxPayLoadData

**CmdID**– 1 byte

**DeviceType**– 1 byte – Device Type of Device

**NetvoxPayLoadData**– var bytes (Max=9bytes)

Description	Device	CmdID	DeviceType	NetvoxPayLoadData		
Config ReportReq	RA07 Series R726 Series RA07xxY Series	0x01	0x05 0x09 0x0D	MinTime (2bytes Unit:s)	MaxTime (2bytes Unit:s)	Reserved (5Bytes,Fixed 0x00)
Config ReportRsp		0x81		Status (0x00_success)	Reserved (8Bytes,Fixed 0x00)	
ReadConfig ReportReq		0x02		Reserved (9Bytes,Fixed 0x00)		
ReadConfig ReportRsp		0x82		MinTime (2bytes Unit:s)	MaxTime (2bytes Unit:s)	Reserved (5Bytes,Fixed 0x00)

(1) Configure RA0711 device parameters MinTime = 30 s, MaxTime = 240 s ( 240 > 30\*1+10)

Note:

1. The ReportMaxTime should be greater than (ReportType count \*ReportMinTime+10; Unit: seconds).
2. The report data of RA0711 is the level value. ReportType count = 1; The MinTime configuration is useless. Therefore, please configure the MinTime to 30s. (The MinTime of EU868 cannot be less than 120s.)

Downlink : 0105001E00780000000000

Device returns:

810500000000000000000000 (configuration successful)

810501000000000000000000 (configuration failed)

(2) Read RA0711 device parameters

Downlink: 0205000000000000000000

Device returns:

8205001E00780000000000 (device current parameter)

### 5.3 Example of GlobalCalibrateCmd

Port:0x0E

Description	CmdID	SensorType	PayLoad(Fix =9 Bytes)				
SetGlobal CalibrateReq	0x01	DistanceSensor  0x36	Channel(1Byte) 0_Channel1, 1_Channel2,etc	Multiplier (2bytes,Unsigned)	Divisor (2bytes,Unsigned)	DeltValue (2bytes,Signed)	Reserved (2Bytes,Fixed 0x00)
SetGlobal CalibrateRsp	0x81		Channel(1Byte) 0_Channel1, 1_Channel2,etc	Status (1Byte,0x00_success)		Reserved (7Bytes,Fixed 0x00)	
GetGlobal CalibrateReq	0x02		Channel (1Byte,0_Channel1,1_Channel2,etc)		Reserved (8Bytes,Fixed 0x00)		
GetGlobal CalibrateRsp	0x82		Channel(1Byte) 0_Channel1, 1_Channel2,etc	Multiplier (2bytes,Unsigned)	Divisor (2bytes,Unsigned)	DeltValue (2bytes,Signed)	Reserved (2Bytes,Fixed 0x00)
ClearGlobal CalibrateReq	0x03	Reserved (10Bytes,Fixed 0x00)					
ClearGlobal CalibrateRsp	0x83	Status (1Byte,0x00_success)			Reserved (9Bytes,Fixed 0x00)		

#### (1) Set the distance calibration

If RA0711 detects distance is 490cm and the actual distance is 500cm, it means the calibration we want to make is +10cm.

SensorType =0x36, Channel 1= 00, Multiplier = 000A, Divisor = 0001, DeltValue=0001

Downlink: 013600000A000100010000

Response: 813600000000000000000000 (Configuration success)

#### (2) Check whether the setting in (1) calibration

Downlink:023600000000000000000000

Response: 823600000A000100010000 (Current configuration)

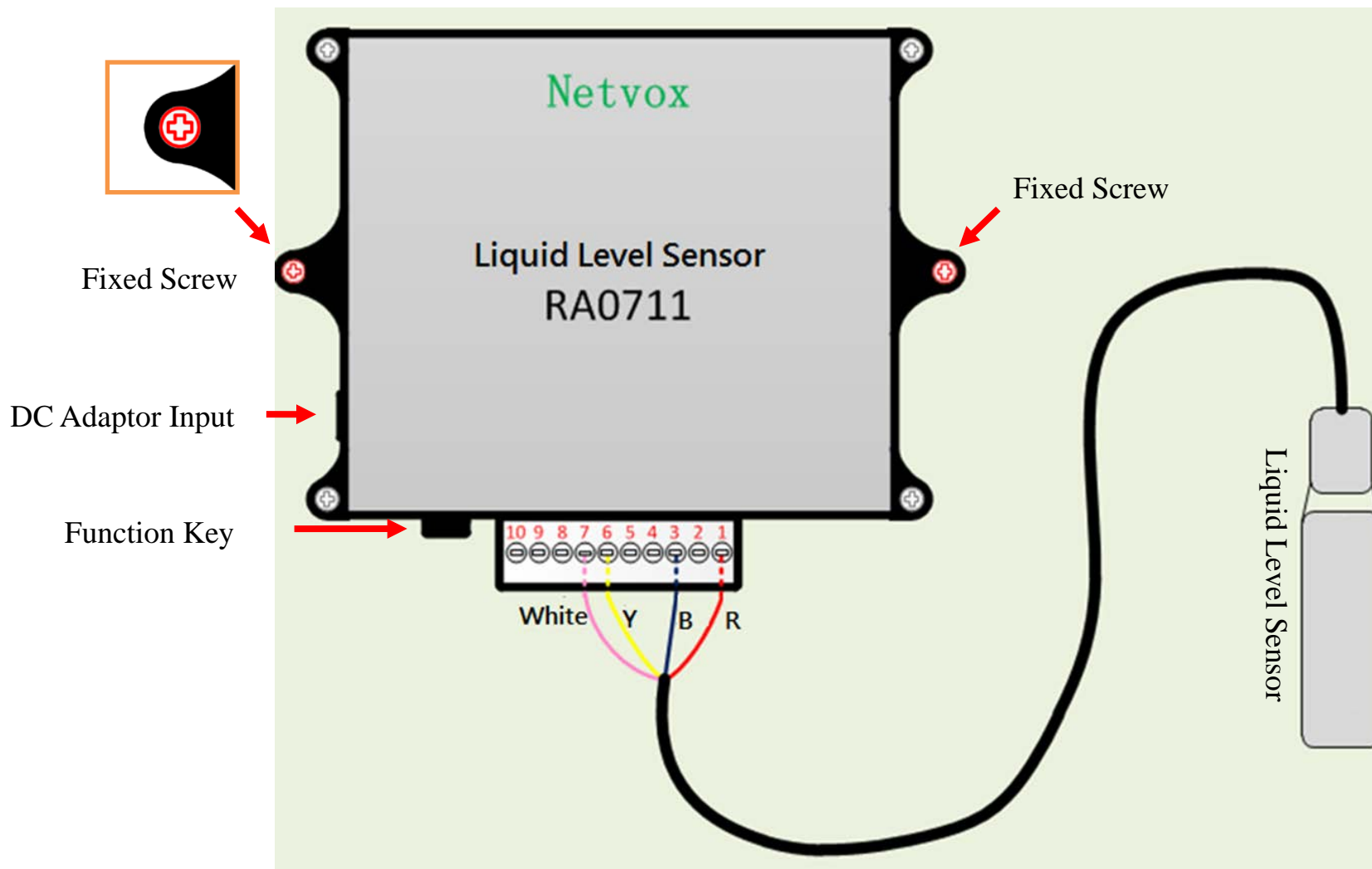
## 6. Installation

### 6.1 Installation Steps and Precautions

1. **The RA0711** is fixed with screws (purchased by users) to secure the unit to the surface of a wall or other object.

Note:

Do not install the device in a metal enclosure or other electrical equipment around it to avoid affecting the wireless transmission of the device.



2. **The R72611** product is waterproof. After the network-joining is completed, please leave it outdoors.

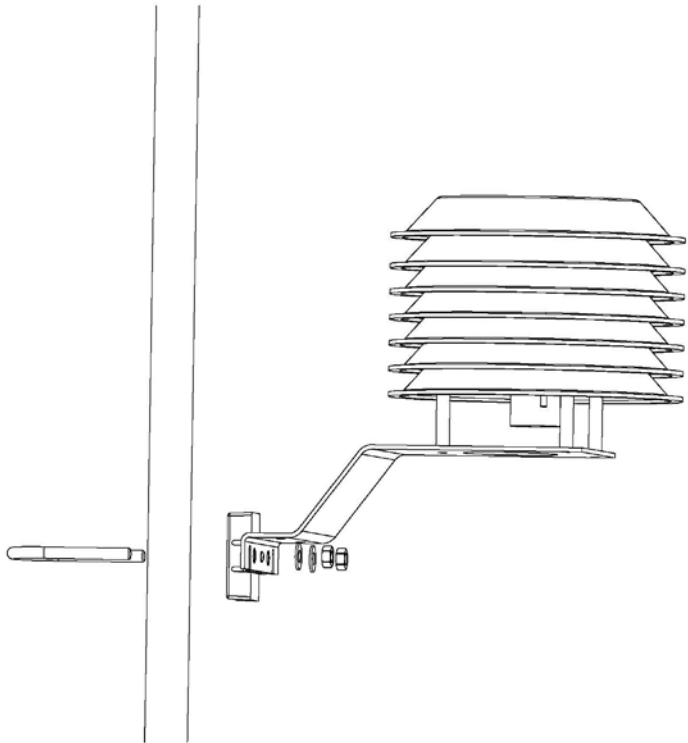
(1) In the position to be installed, loosen the U-shaped screw of the bottom of the R72611 and the mating washer nut, and fix the U-shaped screw through the appropriate size cylinder on the R72611 fixed strut piece. Install the washer nut in order, lock the nut till R72611 body is stable and does not shake.

(2) At the upper side of the fixed position of R72611, loosen the two U-shaped screws on the side of the solar panel and the mating washer nut.

Fix the U-shaped screw through the appropriate size cylinder on the main bracket of the solar panel, and install the gasket in sequence. Lock nut till the solar panel is stable and does not shake.

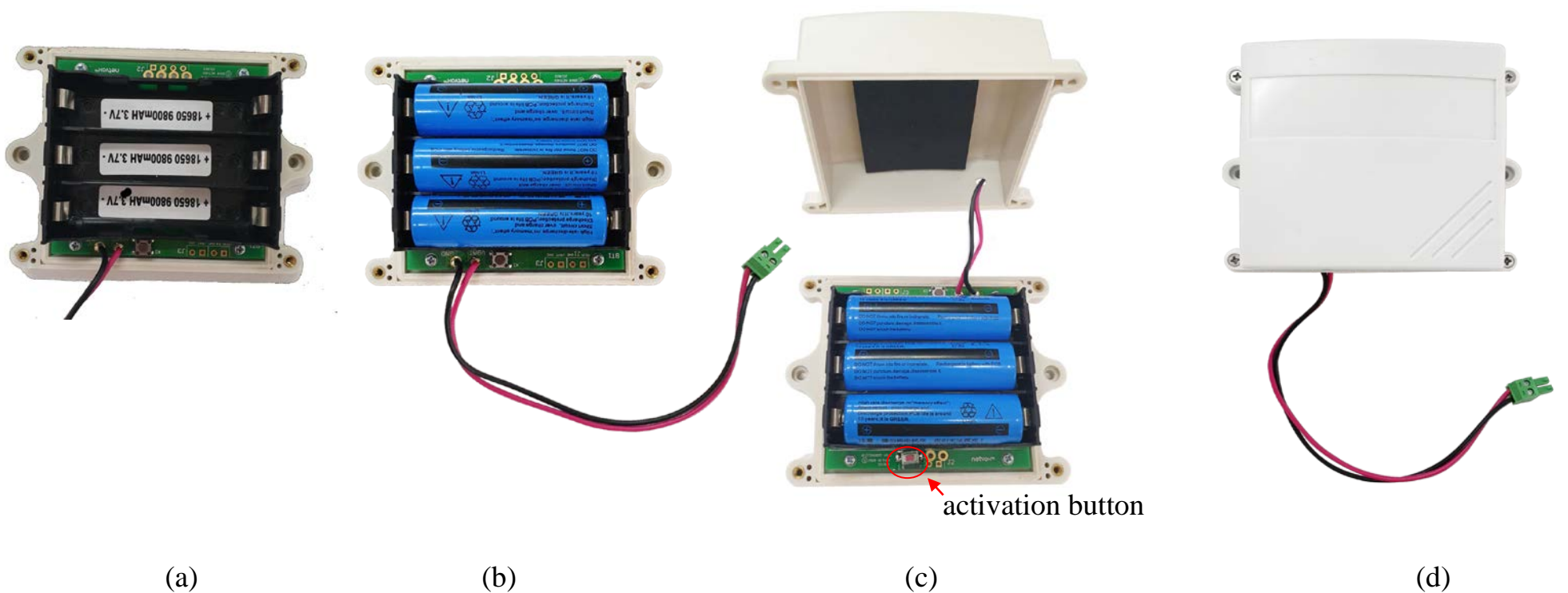
(3) Adjust the angle of the solar panel. After the adjustment is completed, lock the nut.

(4) Connect the R72611 top waterproof cable to the solar panel wiring and lock it tight.



(5) R72611 has a battery pack inside, users can buy and install rechargeable 18650 lithium battery, a total of 3 sections, a single rechargeable lithium battery voltage 3.7V, capacity recommended 3000mah ~ 5000mah, the installation of rechargeable lithium battery steps are as follows:

- a. Remove the four screws around battery cover
- b. Insert three 18650 lithium batteries. (Please make sure the battery positive and negative)
- c. Press the activation button on the battery pack for the first time.
- d. After activation, close the battery cover and lock the screws around battery cover.

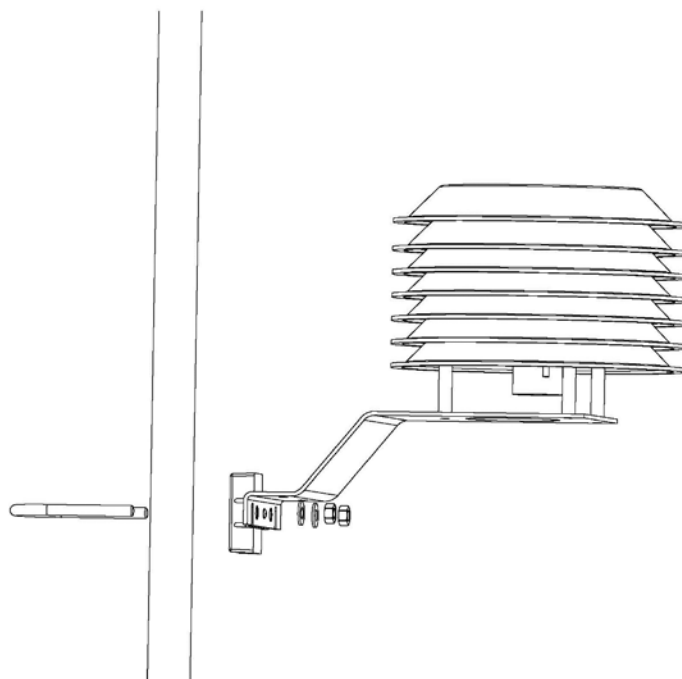


3. The RA0711Y product is waterproof and can be placed outdoors after the network-joining is completed.

(1) In the position to be installed, loosen the bottom U-shaped screw of the RA0711Y and the mating washer nut, and fix the U-shaped screw through the appropriate size cylinder on the RA0711Y fixed strut piece. Install the washer nut in order, lock the nut till RA0711Y body is stable and does not shake.

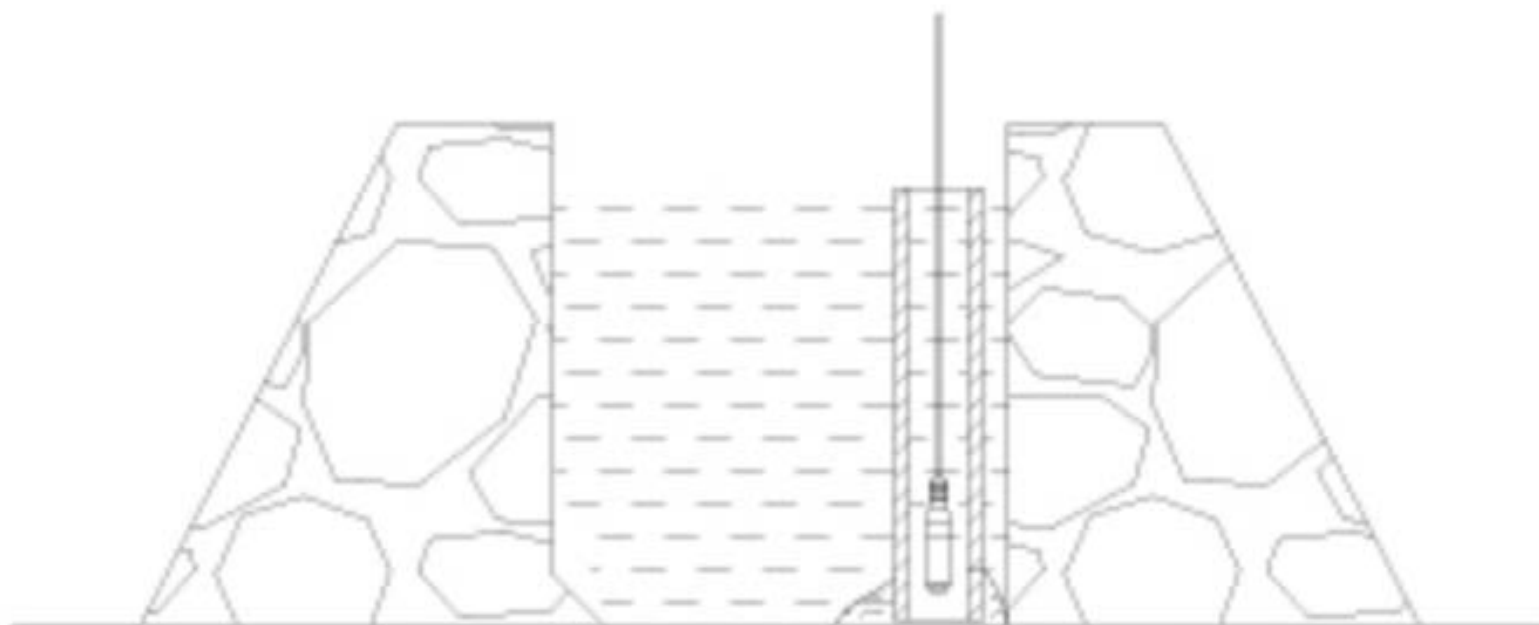
(2) Loosen the M5 nut at the bottom of the RA0711Y matte and take the matte together with the screw.

(3) Plug the DC adaptor from the center through hole of the RA0711Y bottom cover, insert it into the RA0711Y DC socket, and then return the mating screw to the original position and lock the M5 nut tight.

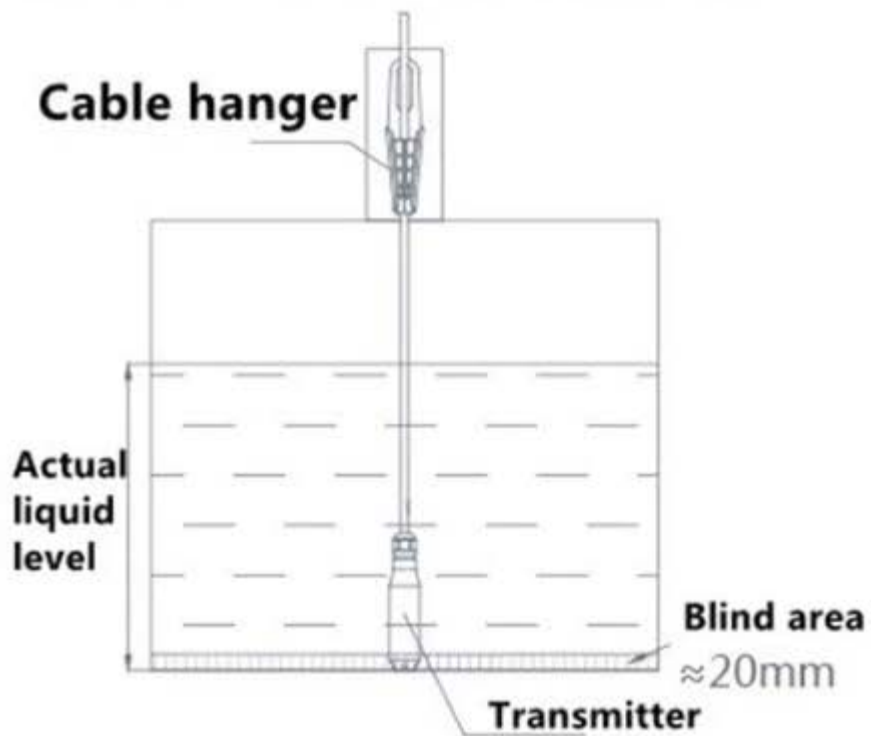


## 6.2 Liquid Level Transmitter Installation Precautions

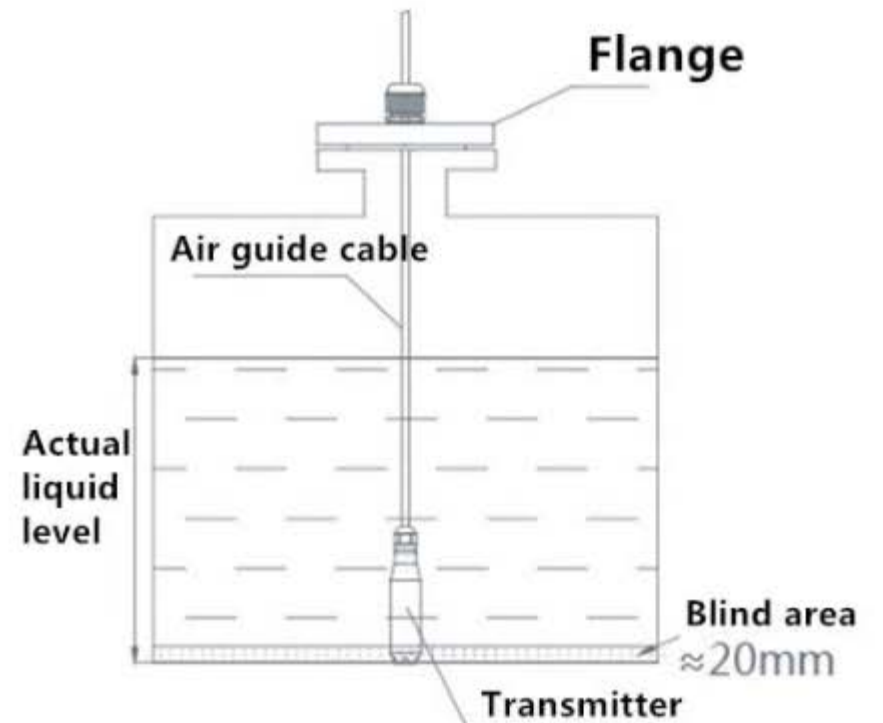
- (1) The liquid level transmitter can be installed vertically or tilted or leveled in the tank or tank, but care should be taken to prevent sediment or other impurities from entering the transmitter probe and affecting the measurement.
- (2) Avoid using the air guide cable to be too tight or bent when in use. In addition to being used as a power source and signal transmission, the air-conducting cable also plays a key role in atmospheric compensation, and bending will affect the measurement results.
- (3) If you use an environment that is highly fluctuating with the media, take care to fix the transmitter probe section. To prevent the sway of the transmitter from affecting the measurement, a steel pipe or a PVC pipe larger than the diameter of the transmitter can be inserted. In the opposite heights of the water flow direction, a plurality of small holes having a diameter larger than 5 mm are opened to allow water to enter the pipe. As shown below.



## 6.3 Installation Reference



Cable hanger installation



Cable fixing flange installation

### 6.3.1 Liquid Level Transmitter Use Precautions

- (1) The level transmitter is made of stainless steel and is not allowed to be used in media that are not compatible with stainless steel.
- (2) Before the liquid level transmitter is powered on, ensure that the power supply voltage meets the power supply requirements of the liquid level transmitter, the positive and negative terminals are connected correctly, and the highest liquid level is within the range of the liquid level transmitter.
- (3) When using, try to avoid the water level transmitter cable terminal immersing in water, the water will damage the liquid level transmitter.
- (4) When using, try to avoid sharp objects damage to the liquid level transmitter. Damage will cause the water inlet to damage the liquid level transmitter.
- (5) The liquid level transmitter is a precision instrument and is not allowed to be disassembled to avoid damage.
- (6) Place it in a dry and ventilated environment when it is not in use.
- (7) Keep the air duct and wiring place dry and ventilated when it is put in water. The service life is 3-8 years.
- (8) It may have zero and full scale drift when using the sensor. User needs to change the sensor probe if drift has occurred continually and cannot be calibrated.

### 6.3.2 Usage Scenarios

- Water tank
- Pool
- River water level measurement
- When it is necessary to detect the water level.

## 7. Important Maintenance Instruction

Your device is a product of superior design and craftsmanship and should be used with care.

The following suggestions will help you use the warranty service effectively.

- Keep the equipment dry. Rain, moisture, and various liquids or moisture may contain minerals that can corrode electronic circuits. In case the device is wet, please dry it completely.
- Do not use or store in dusty or dirty areas. This can damage its detachable parts and electronic components.
- Do not store in excessive heat. High temperatures can shorten the life of electronic devices, destroy batteries, and deform or melt some plastic parts.
- Do not store in excessive cold place. Otherwise, when the temperature rises to normal temperature, moisture will form inside, which will destroy the board.
- Do not throw, knock or shake the device. Rough handling of equipment can destroy internal circuit boards and delicate structures.
- Do not wash with strong chemicals, detergents or strong detergents.
- Do not apply with paint. Smudges can block debris in detachable parts and affect normal operation.
- Do not throw the battery into a fire to prevent the battery from exploding. Damaged batteries may also explode.

All of the above suggestions apply equally to your device, battery and accessories.

If any device is not working properly. Please take it to the nearest authorized service facility for repair.