Wireless pH Sensor

User Manual

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1. Introduction

RA0708_R72608_RA0708Y is a ClassA device based on the LoRaWAN open protocol.

RA0708_R72608_RA0708Y can be connected to the pH sensor and report the value collected by the sensor to the corresponding gateway.

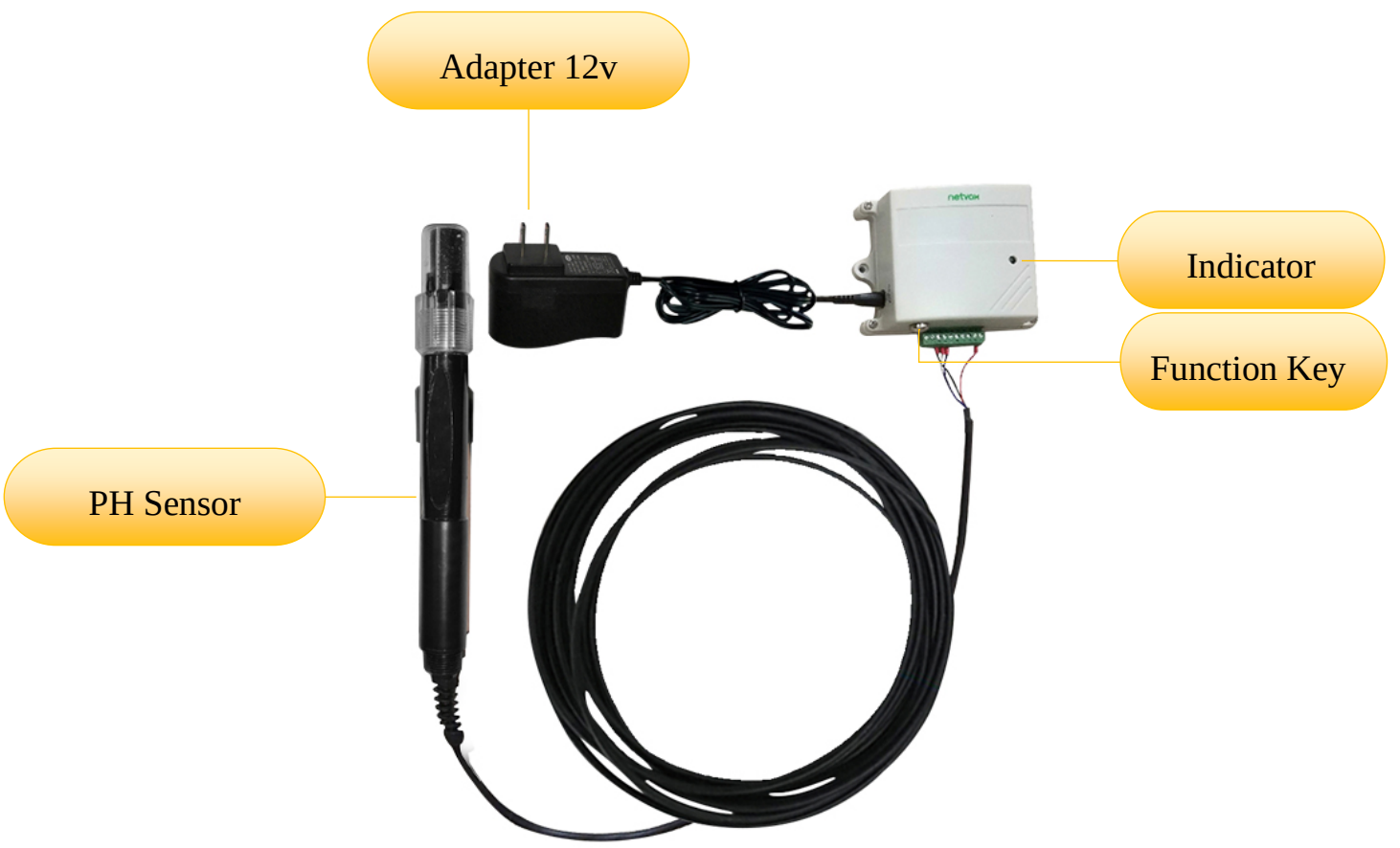
LoRa Wireless Technology:

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



RA0708

R72608

3. Main Features

- Compatible with LoRaWAN
- RA0708 and RA0708Y use DC 12V adapter power supply
- R72608 uses solar panel and rechargeable lithium batteries
- Simple operation and setting
- PH value and temperature detection
- Adopt SX1276 wireless communication module

4. Set up Instruction

On/Off

Power on	RA0708 and RA0708Y are connected to the DC 12V adapter for power-on R72608 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:	1. Engineering test modes require the burning engineering test software. 2. On/off interval is suggested to be about 10 seconds to avoid the interference of capacitor inductance and other energy storage components.

Network Joining

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

Function Key

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

Low Voltage Threshold

Low Voltage Threshold	10.5 V

Restore to Factory Setting

Instruction	RA0708_R72608_RA0708Y has a network information memory function when power-down. This function is turned off by default, that is, it will be re-joined every time it is powered 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 temperature ,voltage and pH value.

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

Default setting

ReportMaxTime:

RA0708/RA0708Y is 180s

R72608 is 1800s

*Value must be greater than *ReportMinTime* ≧*ReportType count* **ReportMinTime + 10* ,units: seconds

ReportMinTime:

30s (US915, AU915, KR920, AS923, IN865)

120s (EU868)

ReportType count = 1

Note:

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

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

(3) ReportChange is not supported by RA0708_R72608_RA0708Y (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: temperature, voltage and PH value.

(6) 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.

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

The device reported data parsing please refer to

Netvox LoraWAN Application Command document and *Netvox Lora Command Resolver*

http://loraresolver.netvoxcloud.com:8888/page/index

Report Configuration Example:

Description	Device	Cmd ID	Device Type	NetvoxPayLoadData		
Config ReportReq	RA07 Series R726 Series R727 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 RA0708 device parameters MinTime = 30s, MaxTime = 3600s (3600>30*1+10)

Note: The value of ReportMaxTime should be greater than (ReportType count *ReportMinTime+10) (Unit: second)

RA0708 Report data: PH value, temperature; ReportType Count = 1

(The MinTime of EU868 cannot be less than 120s.)

Downlink: 0105001E0E100000000000

Device returns:

810500000000000000000 (configuration successful)

810501000000000000000 (configuration failed)

(2) Read RA0708 device parameters

Downlink: 020500000000000000000

Device returns:

8205001E0E100000000000 (device current parameter)

Calibration Configuration Example

FPort：0x0E

Description	Cmd ID	SensorType	PayLoad(Fix =9 Bytes)				
SetGlobal CalibrateReq	0x01	0x13 PH 0x3D pH Temperature	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)

(1) Configure RA0708 device Temperature Calibration: 1℃; Configure channel 1: Multiplier: 1, Divisor: 1, DeltValue: 100

Downlink: 013D000001000100640000

Device returns:

813D0000000000000000000 (configuration successful)

813D0001000000000000000 (configuration failed)

(2) Read RA0708 device parameters

Downlink: 023D000000000000000000

Device returns:

823D000001000100640000 (device current parameter)

(3) Configure RA0708 device PH value: 1; Configure channel 1: Multiplier: 1, Divisor: 1, DeltValue: 100

Downlink: 011301000100010064000 0

Device returns:

811301000000000000000 0 (configuration successful)

811301010000000000000 0 (configuration failed)

(4) Read RA0708 device parameters

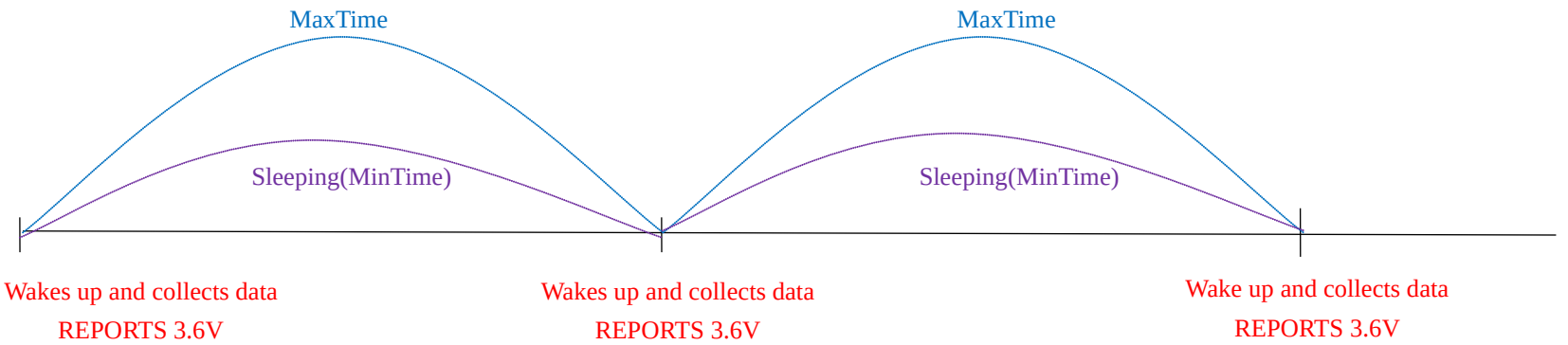
Downlink: 021300000000000000000 0

Device returns:

821301000100010064000 0 (device current parameter)

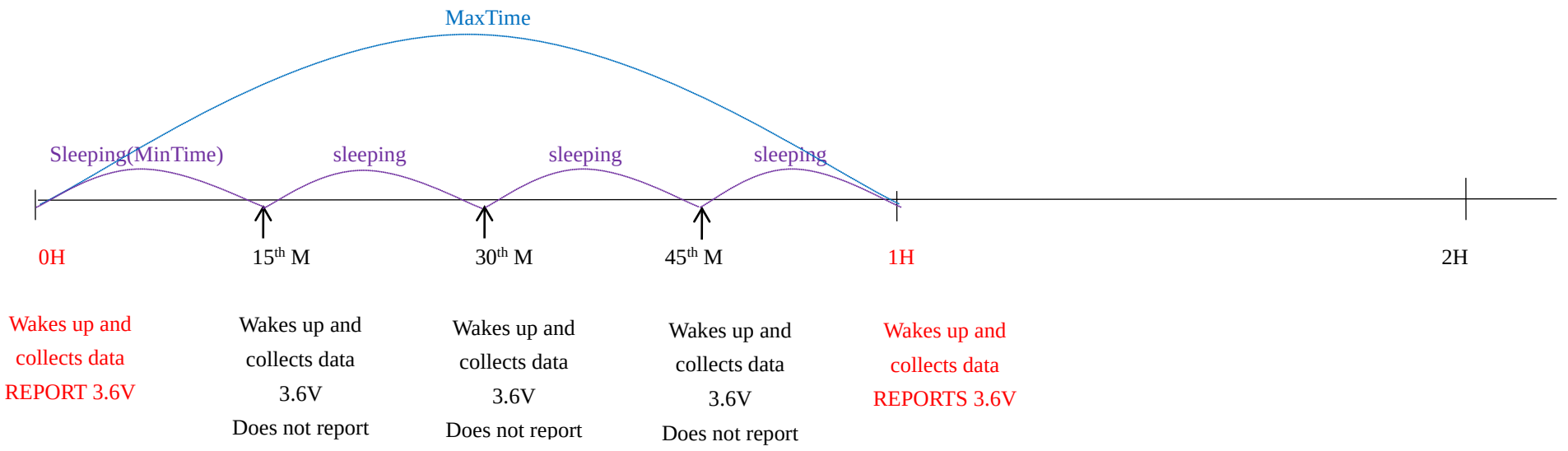
Example for MinTime/MaxTime logic:

Example#1 based on MinTime = 1 Hour, MaxTime= 1 Hour, Reportable Change i.e. BatteryVoltageChange=0.1V

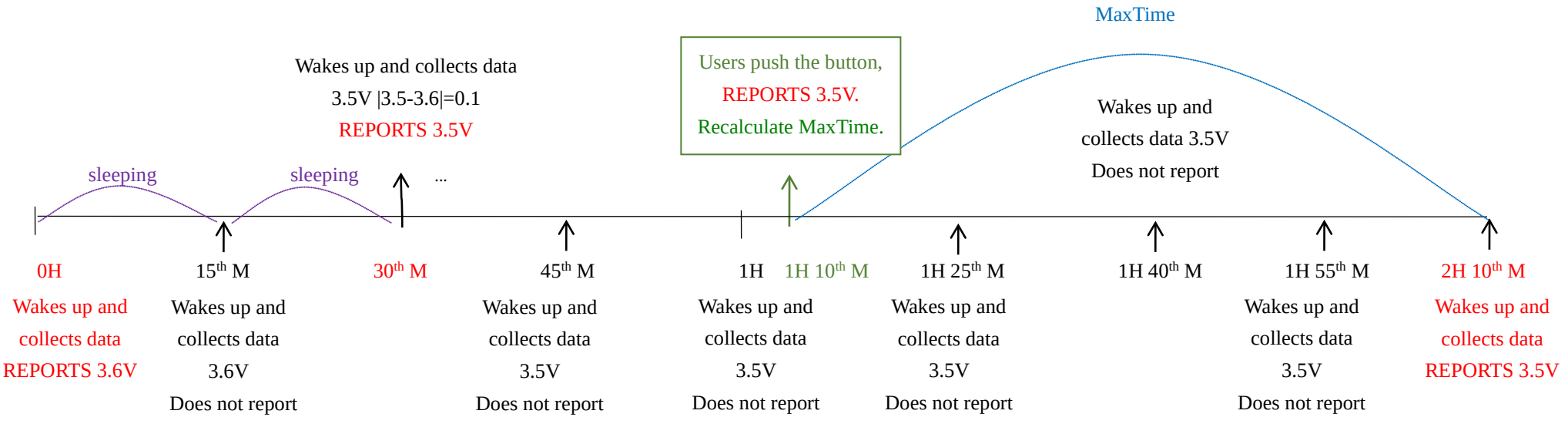


Note: MaxTime=MinTime. Data will only be report according to MaxTime (MinTime) duration regardless BatteryVoltageChange value.

Example#2 based on MinTime = 15 Minutes, MaxTime= 1 Hour, Reportable Change i.e. BatteryVoltageChange= 0.1V.



Example#3 based on MinTime = 15 Minutes, MaxTime= 1 Hour, Reportable Change i.e. BatteryVoltageChange= 0.1V.



Notes :

1) The device only wakes up and performs data sampling according to MinTime Interval. When it is sleeping, it does not collect data.

2) The data collected is compared with the last data reported. If the data variation is greater than the ReportableChange value, the device reports according to MinTime interval. If the data variation is not greater than the last data reported, the device reports according to MaxTime interval.
3) We do not recommend to set the MinTime Interval value too low. If the MinTime Interval is too low, the device wakes up frequently and the battery will be drained soon.
4) Whenever the device sends a report, no matter resulting from data variation, button pushed or MaxTime interval, another cycle of MinTime/MaxTime calculation is started.

6. Installation

6.1 RA0708

RA0708 does not have a waterproof function. After the network joining is completed, please place it indoor.

6.2 R72608

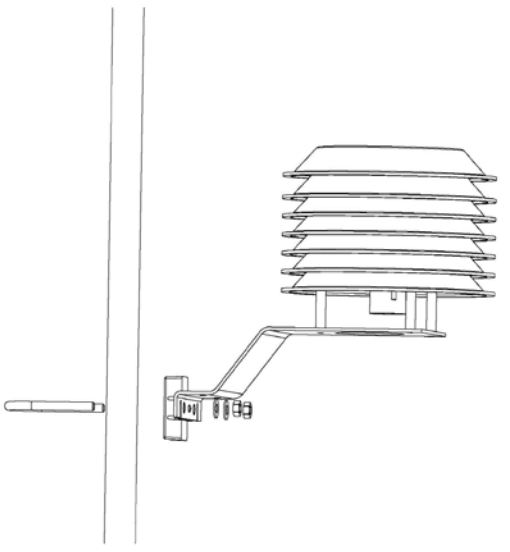
R72608 product is waterproof. After the network-joining is completed, please leave it outdoors.

(1) In the position to be installed, loosen the U-shaped screw of the bottom of the R72608 and the mating washer nut, and fix the U-shaped screw through the appropriate size cylinder on the R72608 fixed strut piece. Install the washer nut in order, lock the nut till R72608 body is stable and does not shake.

(2) At the upper side of the fixed position of R72608, 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 R72608 top waterproof cable to the solar panel wiring and lock it tight.



(5) R72608 has a battery compartment inside. Users can buy and install rechargeable 18650 lithium battery, 3 sections totally. A single rechargeable lithium battery voltage is 3.7V, and the capacity is recommended 5000mah.

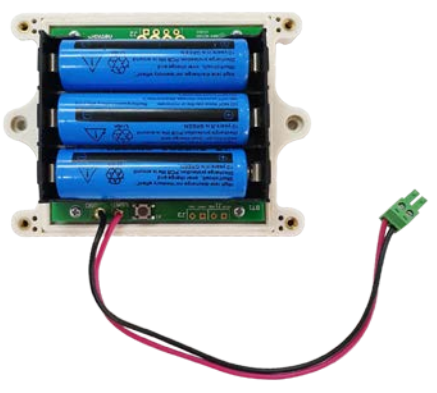
The installation of rechargeable lithium battery steps are as follows:

1: Remove the four screws around battery cover

2: Insert three 18650 lithium batteries.　　(Please make sure the battery positive and negative)

3: Press the activation button on the battery pack for the first time.

4: After activation, close the battery cover and lock the screws around battery cover.



activation button

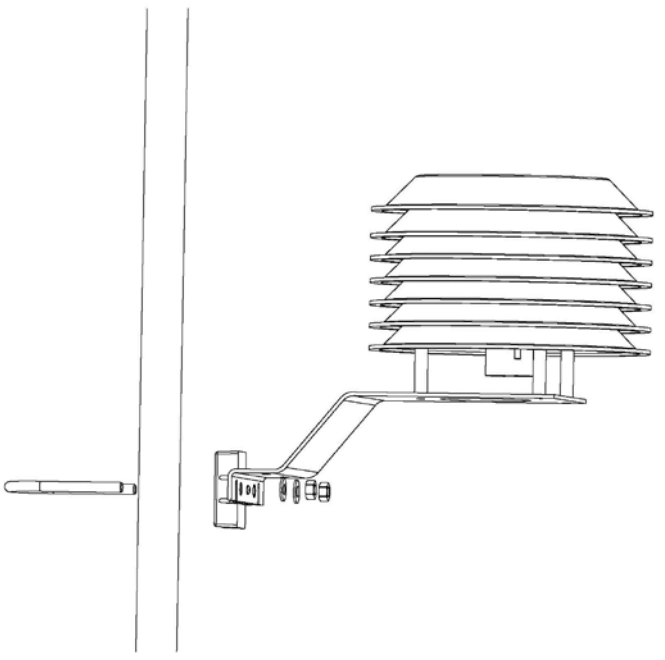
6.3RA0708Y

RA0708Y 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 RA0708Y and the mating washer nut, and fix the U-shaped screw through the appropriate size cylinder on the RA0708Y fixed strut piece. Install the washer nut in order, lock the nut till RA0708Y body is stable and does not shake.

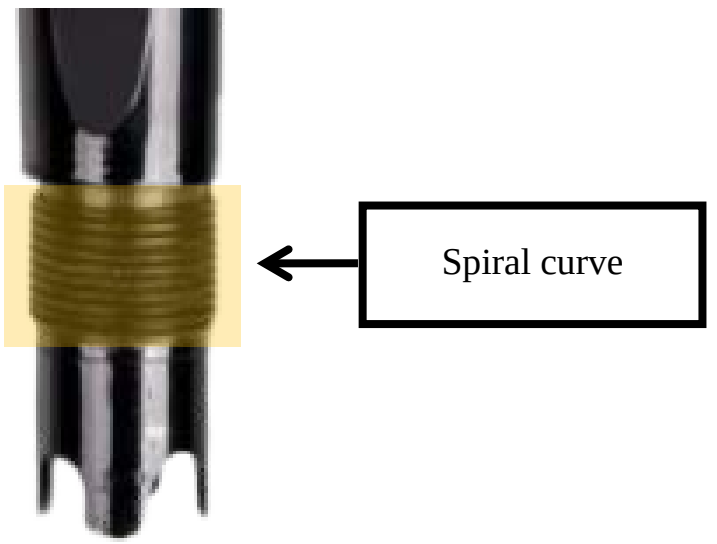
(2) Loosen the M5 nut at the bottom of the RA0708Y matte and take the matte together with the screw.

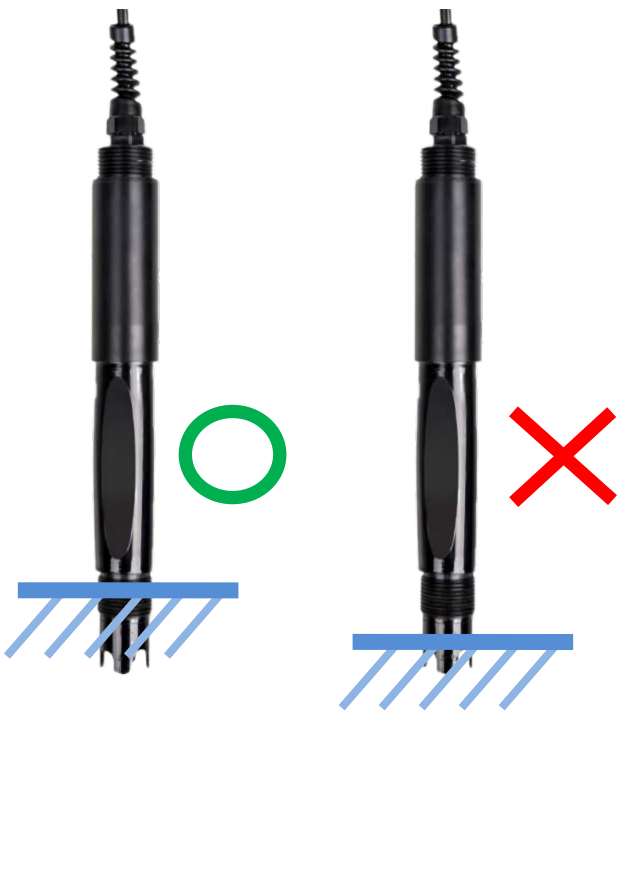
(3) Insert the power DC plug from the center through hole of the RA0708Y bottom cover, and insert it into the RA0708Y DC socket, and then return the mating screw to the original position and lock the M5 nut tight.



6.4 PH Sensor Use

The water level of the water you plan to measure the pH value of is recommended to be higher than the spiral curve on the pH sensor.

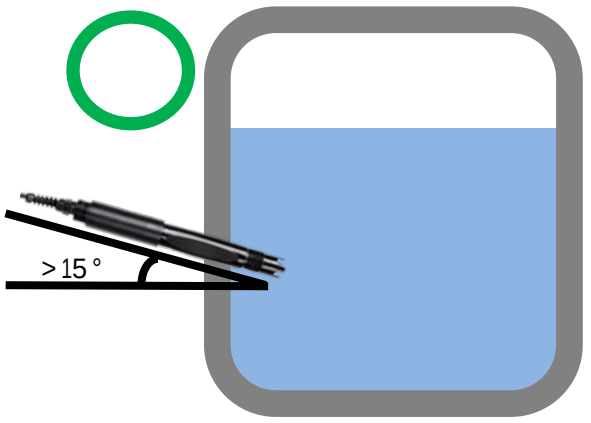


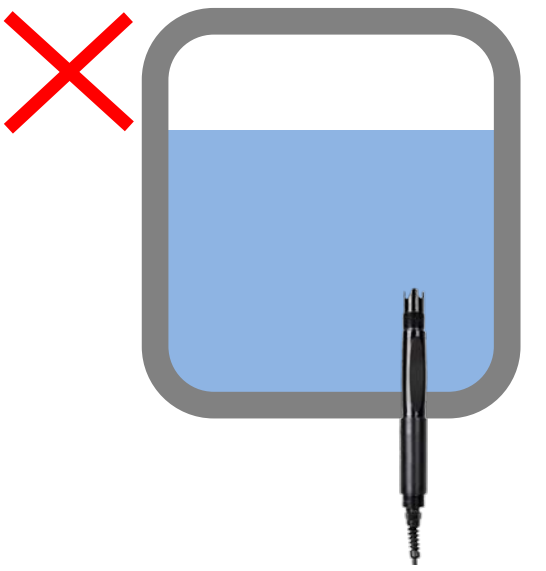


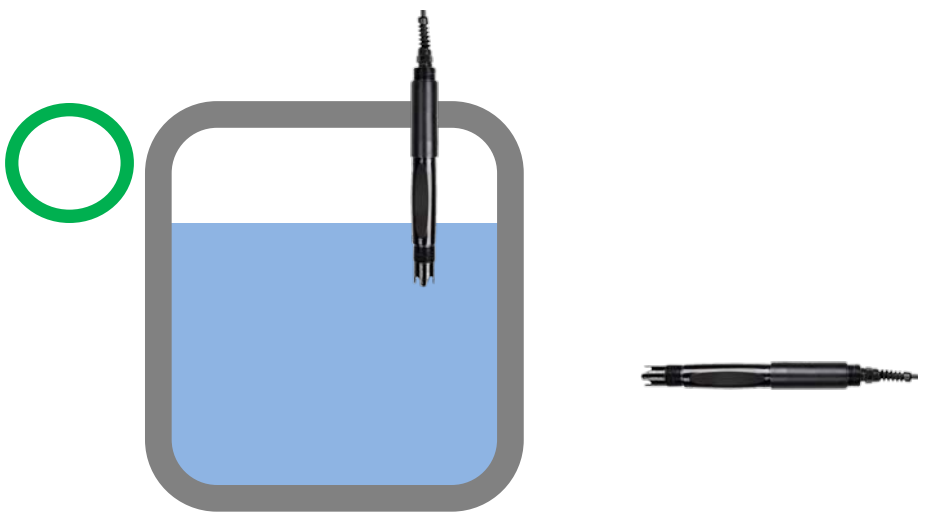
Note:

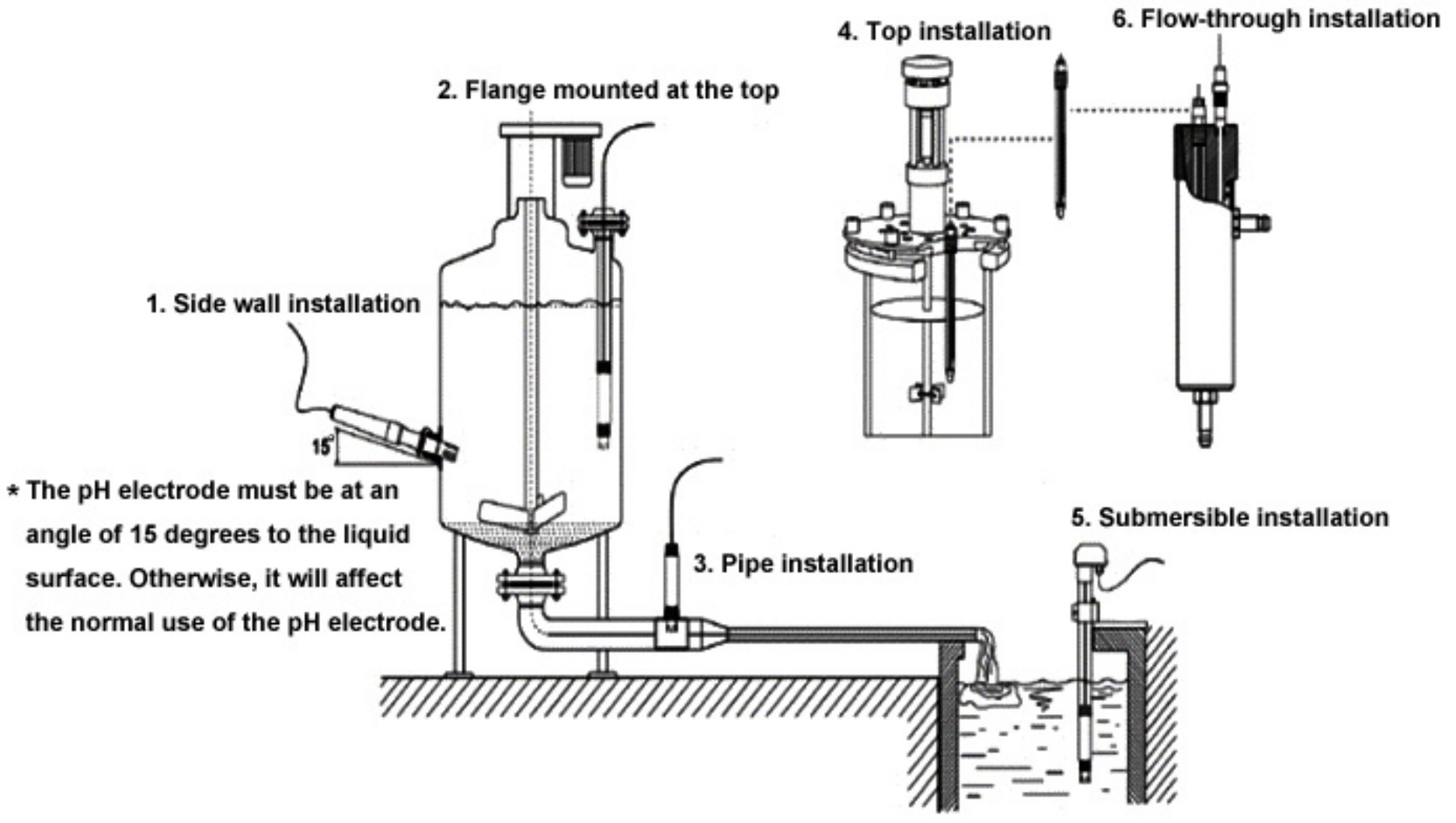
(1) The sensor is recommended to be installed with angles higher than 15 degrees.

(2) Horizontal or upside-down position is not allowed.









6.5 PH Sensor Maintenance

When measuring the pH sensor, it should be cleaned in distilled water (or deionized water), and the filter paper should be used to absorb moisture to prevent impurities from being introduced into the liquid to be tested. 1/3 of the sensor should be inserted into the solution to be tested.

The sensor should be washed when not in use, inserted into a protective sleeve with a 3.5 mol/L potassium chloride solution, or the sensor inserted into a container with a 3.5 mol/L potassium chloride solution.

If the liquid in the cover of the pH sensor dries out, you could replace the liquid with potassium chloride liquid or tap water. Please do not use purified water or deionized water.

Check if the terminal is dry. If it is stained, wipe it with absolute alcohol and dry it. Avoid long-term immersion in distilled water or protein solution and prevent contact with silicone grease. With a longer sensor, its glass film may become translucent or with deposits, which can be washed with dilute hydrochloric acid and rinsed with water. The sensor is used for a long time. When a measurement error occurs, it must be calibrated with the meter for calibration.

When the calibration and measurement cannot be performed while the sensor is being maintained and maintained in the above manner, the sensor has failed. Please replace the sensor.

Note:

PH sensor can be placed in water for a long time. If PH sensor is not applicable, please add some water to the sponge in the protective shell of the probe, and then install the protective shell to the probe position. PH senor can not be exposed to the sun, and should be placed in a humid environment. If PH sensor is put in the water for a long time, it will consume the electrode. When the electrode is consumed to a certain extent, the electrode needs to be replaced, and the life span is about half a year.

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.