

Wireless PH Sensor

User Manual

Copyright©Netvox Technology Co., Ltd.

This document contains proprietary technical information which is the property of NETVOX Technology. It shall be maintained in strict confidence and shall not be disclosed to other parties, in whole or in part, without written permission of NETVOX Technology. The specifications are subject to change without prior notice.

Table of Contents

1. Introduction	2
2. Appearance	2
3. Features.....	3
4. Set up Instruction	4
5. Data Report.....	5
5.1 Example of ReportDataCmd.....	6
5.2 Report Configuration Example	8
5.3 Calibration Configuration Example	9
5.4 Example for MinTime/MaxTime logic	11
6. Installation	12
6.1 RA0708.....	12
6.2 R72608.....	12
6.3 RA0708Y.....	13
6.4 PH Sensor Use.....	14
6.5 PH Sensor Maintenance.....	15
7. Important Maintenance Instruction	16

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.

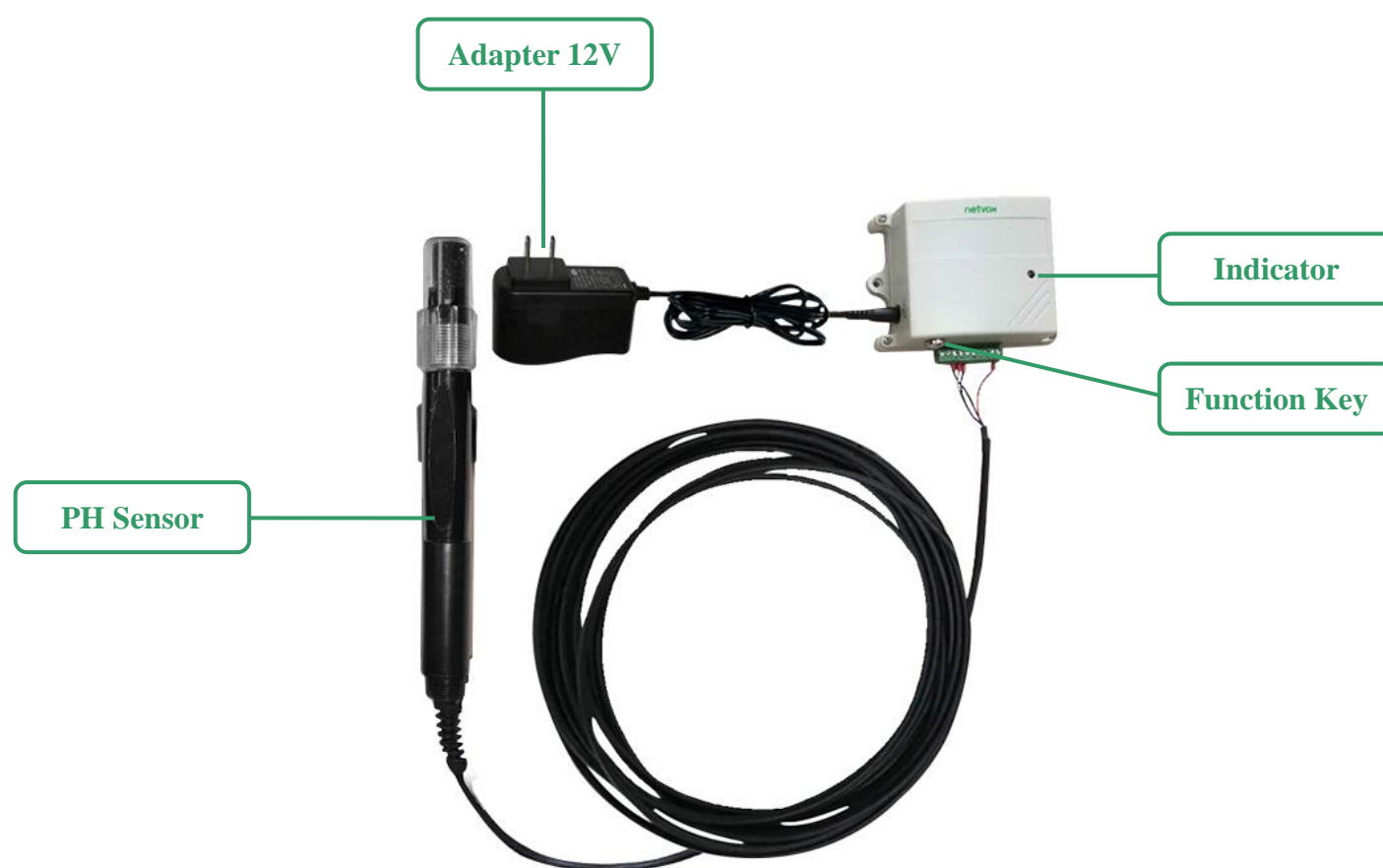
LoRa Wireless Technology:

LoRa is a wireless communication technology dedicated to long distances 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, and industrial monitoring. The main features include small size, low power consumption, transmission distance, and anti-interference ability.

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. 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
- 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 until green indicator flashes for 20 times.
Power off	Remove power
Note	<ol style="list-style-type: none"> 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	<u>Turn on the device to search the network.</u> The green indicator stays on for 5 seconds: Success The green indicator remains off: Fail
Had joined the network (Not reset back to factory setting)	<u>Turn on the device to search the previous network.</u> The green indicator stays on for 5 seconds: Success The green indicator remains off: Fail
Fail to join the network	Please check the device verification information on the gateway or consulting your platform server provider.

Function Key

Press and hold for 5 seconds	<u>Restore to factory setting / Turn off</u> The green indicator flashes 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	<p>RA0708_R72608_RA0708Y has a network information memory function when power-down.</p> <p>This function is turned off by default, that is, it will be re-joined every time it is powered on.</p> <p>This function can be turned on by the ResumeNetOnOff command.</p> <p>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.)</p> <p>It will not be re-joined the previous network.</p>
-------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

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 based on the default configuration before any configuration is done.

Default setting

ReportMaxTime:

RA0708 / RA0708Y: 0xB4 (180s)

R72608: 0x708 (1800s)

Note: Value must be greater than $ReportMinTime \geq ReportType\ count * ReportMinTime + 10$, units: seconds

ReportMinTime:

0x1E (30s): US915, AU915, KR920, AS923, IN865

0x78 (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.

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

<http://www.netvox.com.cn:8888/cmddoc> to resolve uplink data.

5.1 Example of ReportDataCmd

Fport: 0x06

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

Version – 1 bytes – 0x01—the Version of NetvoxLoRaWAN Application Command Version

DeviceType – 1 byte – Device Type of Device

ReportType – 1 byte – the Presentation of the NetvoxPayloadData , according the devicetype

NetvoxPayloadData – Fixed bytes (Fixed =8bytes)

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 0105000D04202101060000, the firmware version is 2021.01.06

3. Data Packet

(a) When Report Type=0x01 is data packet.

(If the device data exceeds 11 bytes or there are shared data packets, the Report Type will have different values.)

(b) When Report Type=0xFFFF, it means that RA0708/ R72608/RA0708Y does not support the connected device or sensor malfunction.

4. Signed Value:

When the temperature is negative, 2's complement should be calculated.

Device	DeviceType	ReportType	NetvoxPayLoadData				
		0x08	Battery (1Byte, unit:0.1V)	PH (2Byte ,0.01pH)	TemperaturewithPH (Signed 2Bytes, unit: 0.01°C)	ORP (Signed 2Byte, 1mv)	Reserved (1Byte, fixed 0x00)
RA07 Series R726 Series R727 Series	0x05 0x09 0x0D	0x12	Battery(1Byte, unit:0.1V)	ThresholdAlarm(7Bytes, Bit0_LowPM2.5Alarm(ug/m3), Bit1_HighPM2.5Alarm(ug/m3), Bit2_LowPM10Alarm(ug/m3), Bit3_HighPM10Alarm(ug/m3), Bit4_LowO3Alarm, Bit5_HighO3Alarm, Bit6_LowCOAlarm, Bit7_HighCOAlarm, Bit8_LowNOAlarm, Bit9_HighNOAlarm, Bit10_LowNO2Alarm, Bit11_HighNO2Alarm, Bit12_LowSO2Alarm, Bit13_HighSO2Alarm, Bit14_LowH2SAlarm, Bit15_HighH2SAlarm, Bit16_LowCO2Alarm, Bit17_HighCO2Alarm, Bit18_LowNH3Alarm, Bit19_HighNH3Alarm, Bit20_LowNosieAlarm, Bit21_HighNosieAlarm, Bit22_LowPHAlarm, Bit23_HighPHAlarm, Bit24_LowORPAlarm, Bit25_HighORPAlarm, Bit26_LowNTUAlarm,			

Example of Uplink: 0105080002B40866FFFF00

1st byte (01): Version

2nd byte (05): DeviceType 0x05 – RA07 series

3rd byte (08): ReportType

4th byte (00): Battery 0v, 00 (HEX) = 0 (DEC) 0*0.1v = 0.0v

5th 6th byte (02B4): pH – 6.92pH, 02B4 (HEX) = 692 (DEC), 692*0.01°C = 6.92pH

7th 8th byte (0866): TemperaturewithPH – 21.50°C, 0866(HEX)=2150(DEC),2150*0.01°C=21.50°C

9th 10th byte (FFFF): ORP – N/A

11th byte (00): Reserved

5.2 Report Configuration Example

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	Cmd ID	Device Type	NetvoxPayloadData		
ConfigReportReq	RA07 Series R726 Series R727 Series	0x01	0x05	MinTime (2bytes Unit:s)	MaxTime (2bytes Unit:s)	Reserved (5Bytes,Fixed 0x00)
ConfigReportRsp		0x81		Status (0x00_success)	Reserved (8Bytes,Fixed 0x00)	
ReadConfigReportReq		0x02	0x09	Reserved (9Bytes,Fixed 0x00)		
ReadConfigReportRsp		0x82	0x0D	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:

810500000000000000000000 (configuration successful)

810501000000000000000000 (configuration failed)

(2) Read RA0708 device parameters

Downlink: 02050000000000000000

Device returns:

8205001E0E100000000000 (device current parameter)

5.3 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°C; Configure channel 0; Multiplier: 1, Divisor: 1, DeltValue: 100

Downlink: 013D000001000100640000

Device returns:

813D0000000000000000000 (configuration successful)

813D0010000000000000000 (configuration failed)

(2) Read RA0708 device parameters

Downlink: 023D0000000000000000

Device returns:

823D000001000100640000 (device current parameter)

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

Downlink: 0113010001000100640000

Device returns:

8113010000000000000000 (configuration successful)

8113010100000000000000 (configuration failed)

(4) Read RA0708 device parameters

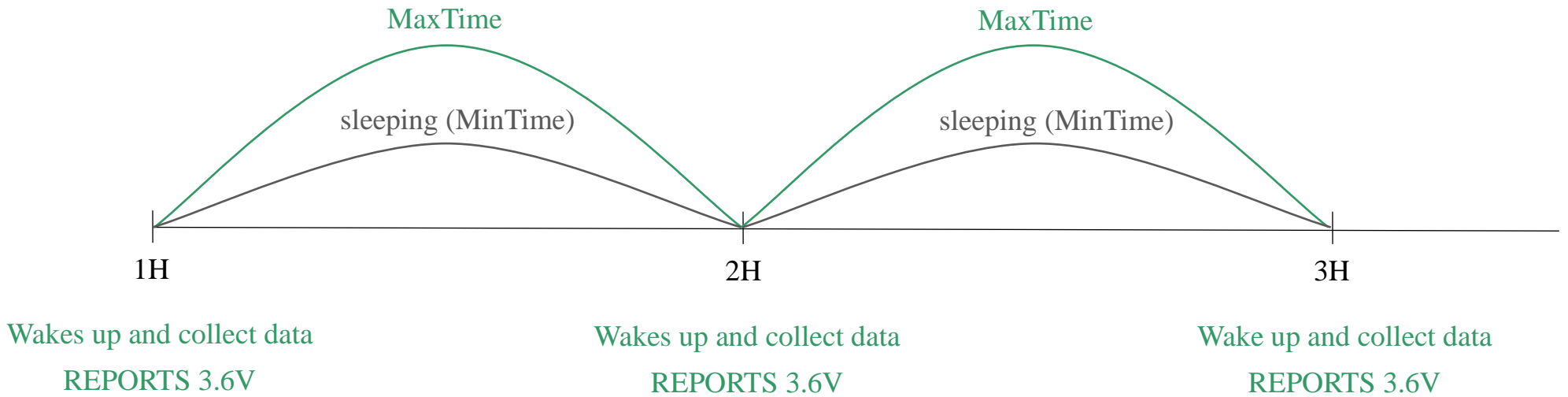
Downlink: 02130000000000000000

Device returns:

8213010001000100640000 (device current parameter)

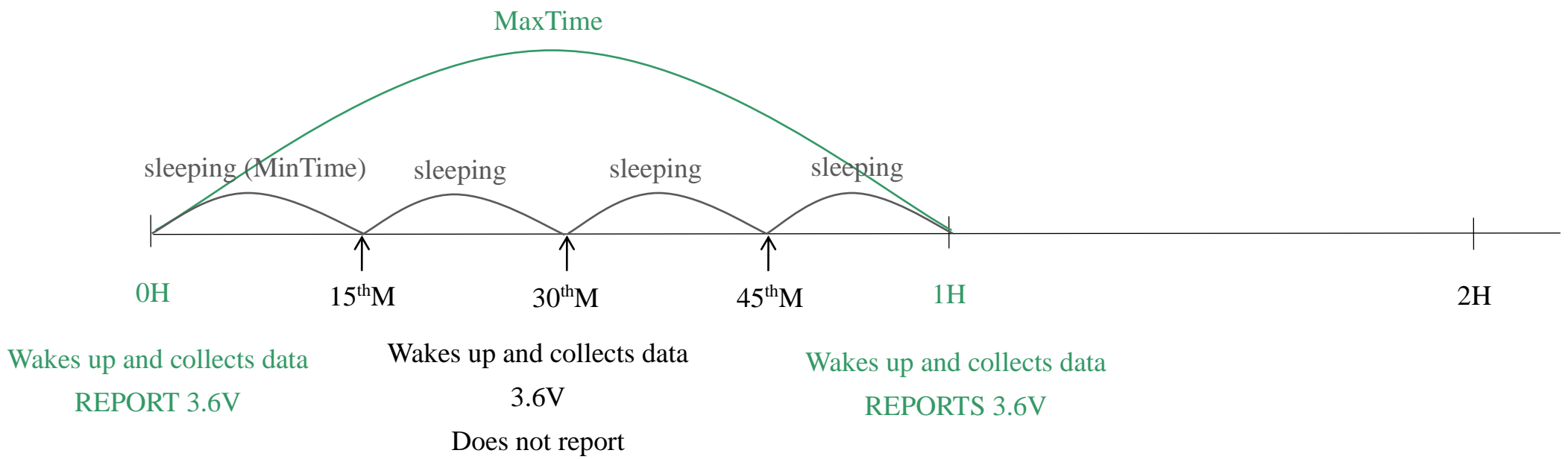
5.4 Example for MinTime/MaxTime logic

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

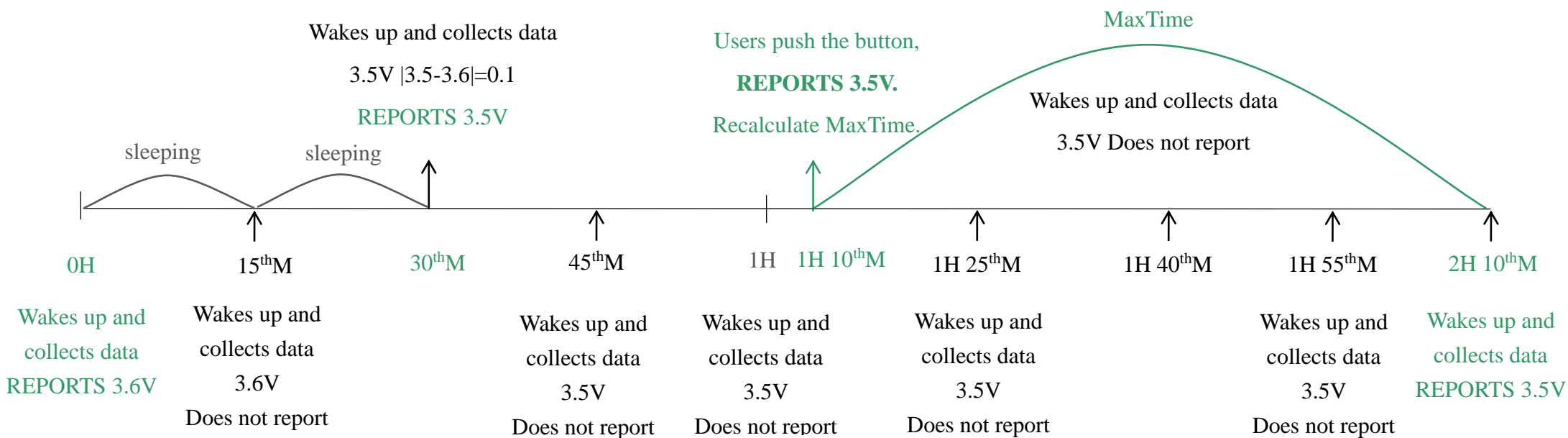


Note: MaxTime = MinTime. Data will only be reported based on MaxTime (MinTime) duration regardless BatteryVoltageChange value.

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

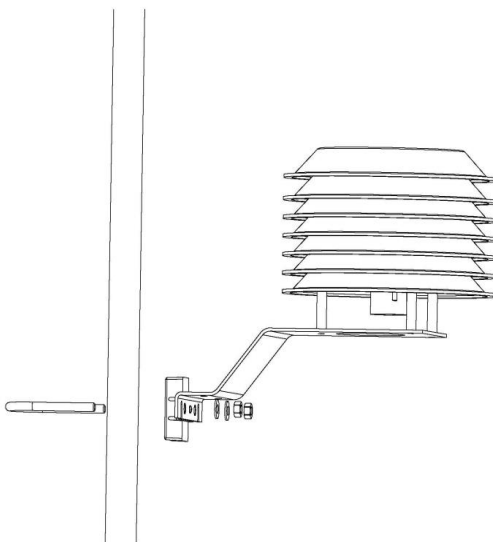
6.1 RA0708

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

6.2 R72608

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

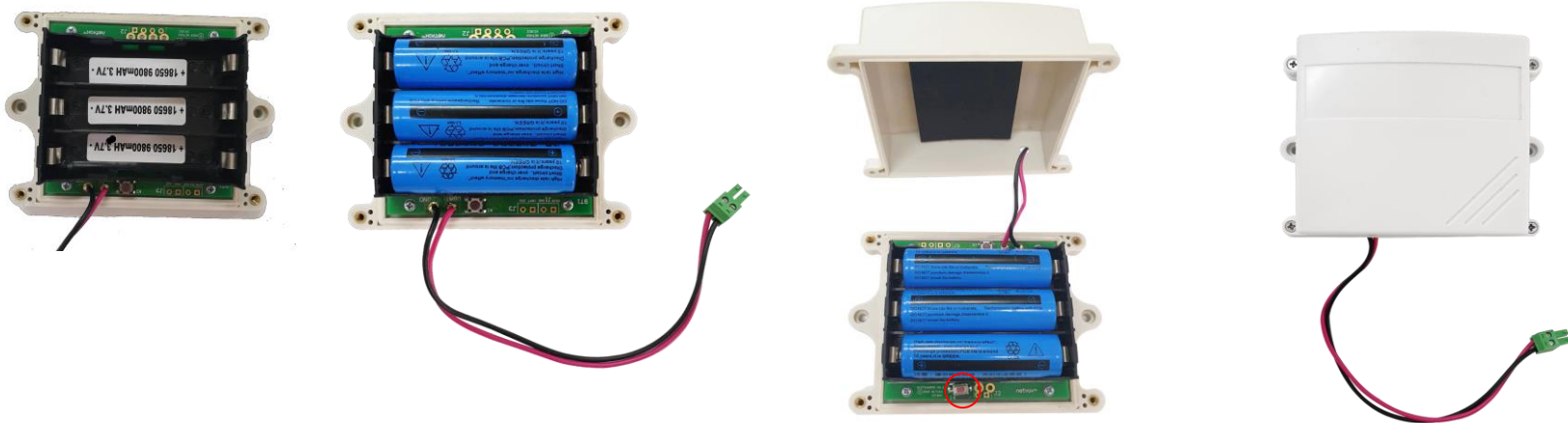
- (1) In the position to be installed, loosen the U-shaped screw of the bottom of the R72608 and the mating washer nut, and fix the U-shaped screw through the appropriate size cylinder on the R72608 fixed strut piece. Install the washer nut in order, and lock the nut until the R72608 body is stable and 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 the nut until 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 total. A single rechargeable lithium battery voltage is 3.7V, and the capacity is recommended at 5000mah.

The installation of rechargeable lithium battery steps are as follows:

- 1: Remove the four screws around the battery cover
- 2: Insert three 18650 lithium batteries. (Please make sure the battery is 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 the battery cover.

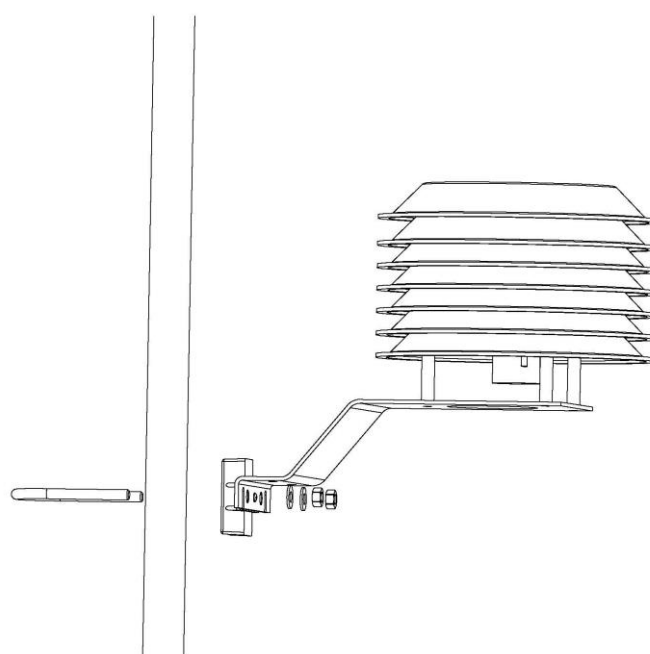


activation button

6.3 RA0708Y

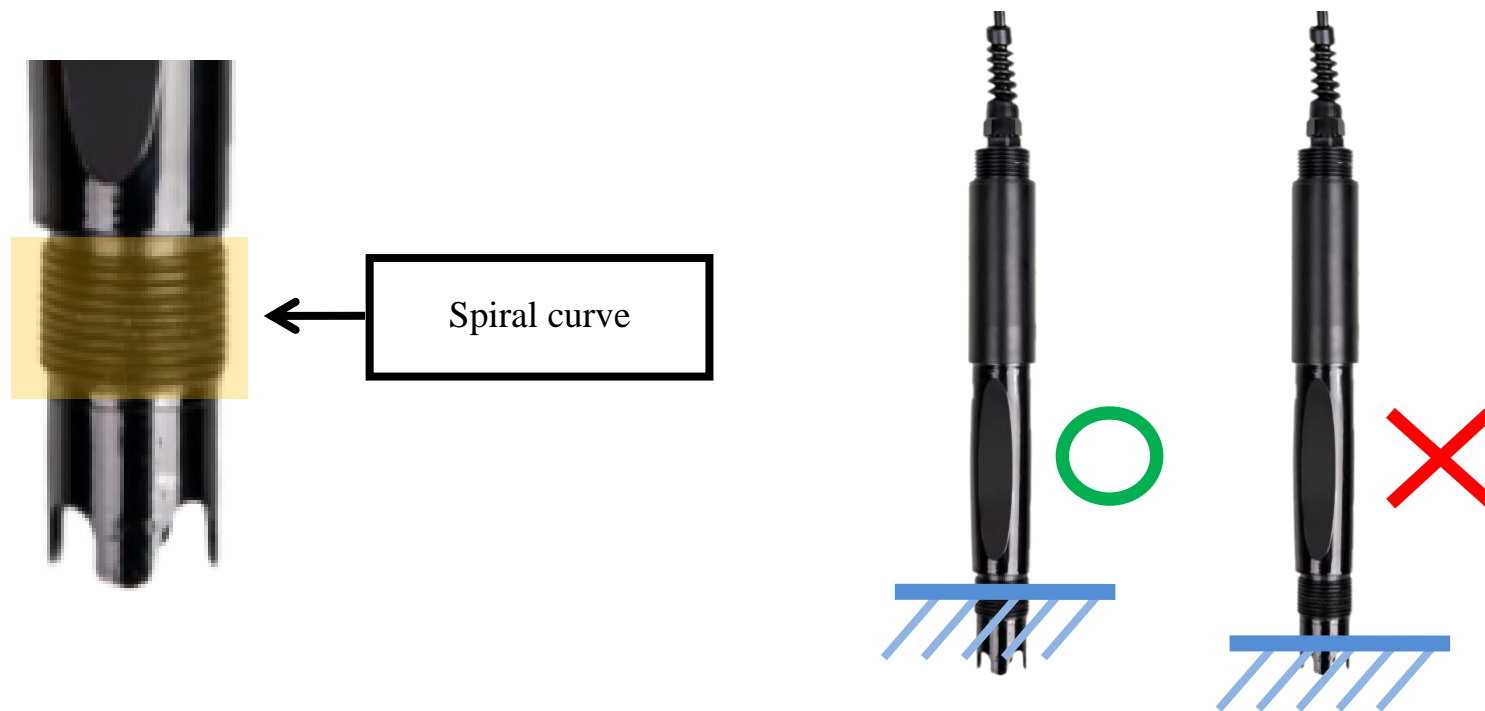
RA0708Y product is waterproof and can be placed outdoors after the network joining is completed.

- (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 until 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.



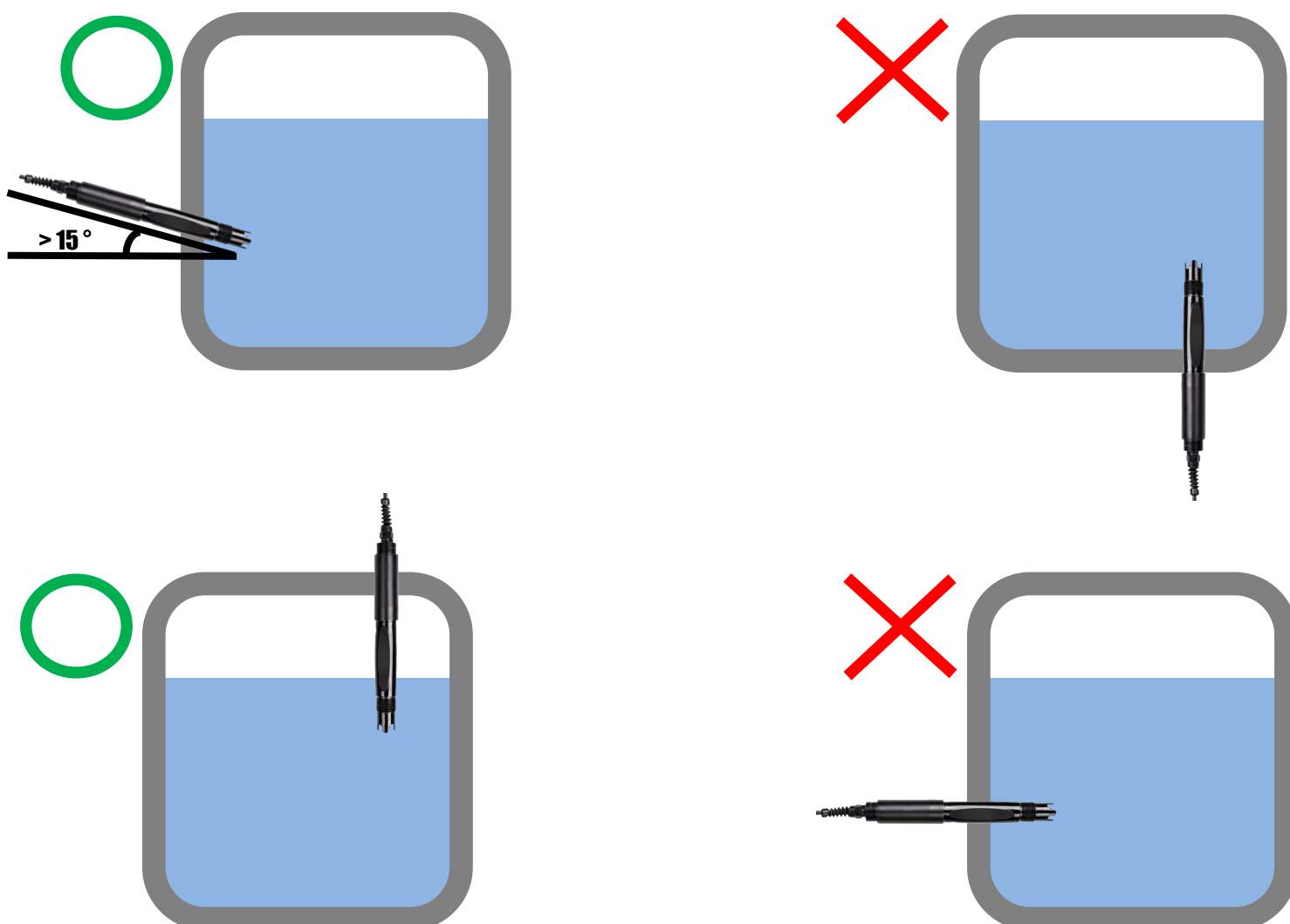
6.4 PH Sensor Use

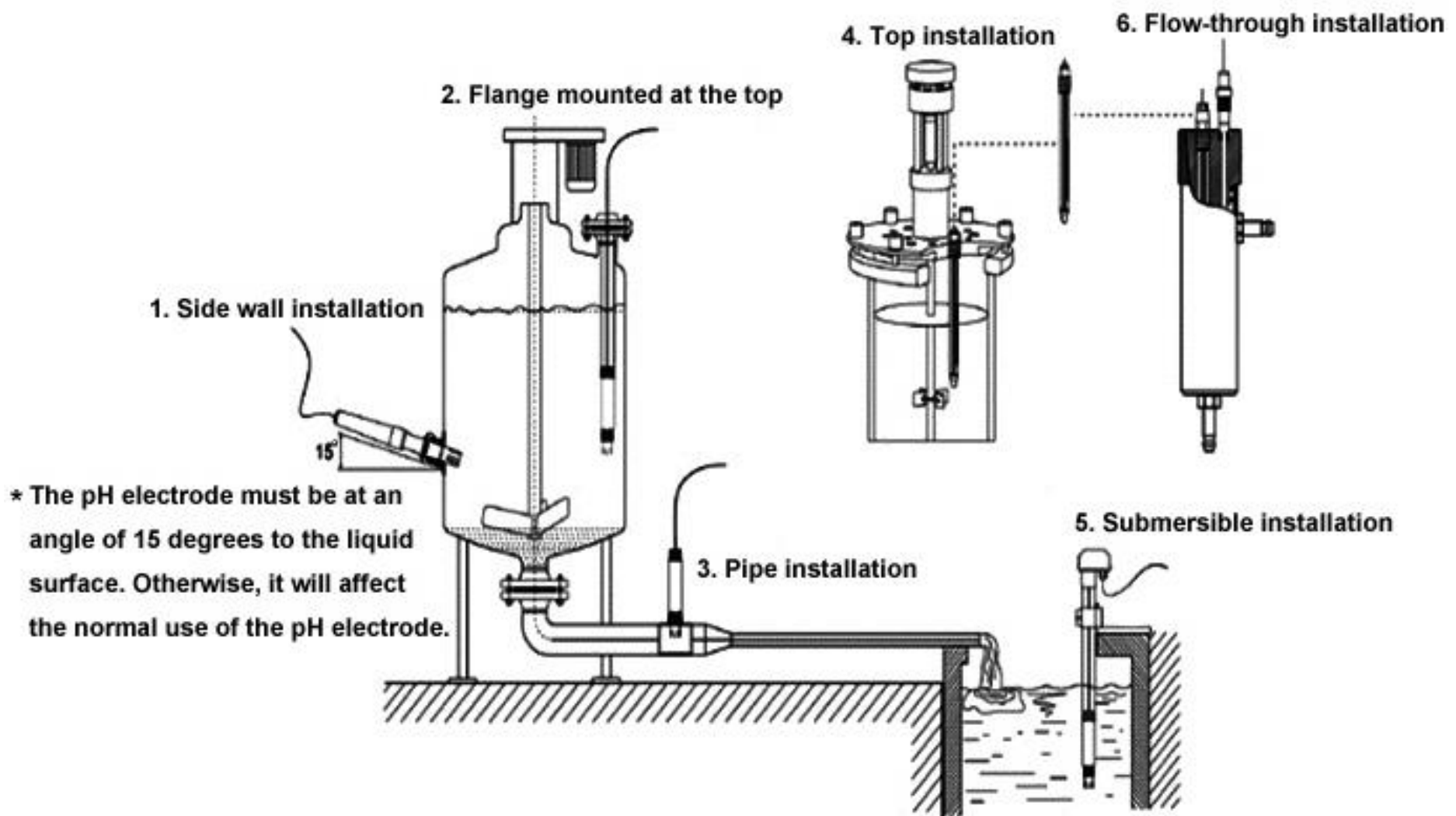
The water level of the water you plan to measure the pH value of is recommended to be higher than the spiral curve on the pH sensor.



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 sensor 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

Kindly pay attention to the following to achieve the best maintenance of the product:

- Do not put the device near or submerge into water. Minerals in rain, moisture, and other liquids could cause corrosion of electronic components. Please dry the device, if it gets wet.
- Do not use or store the device in dusty or dirty environments to prevent damage to parts and electronic components.
- Do not store the device in high temperatures. This may shorten the lifespan of electronic components, damage batteries, and deform plastic parts.
- Do not store the device in cold temperatures. Moisture may damage circuit boards as the temperatures rise.
- Do not throw or cause other unnecessary shocks to the device. This may damage internal circuits and delicate components.
- Do not clean the device with strong chemicals, detergents, or strong detergents.
- Do not apply the device with paint. This may block detachable parts and cause malfunction.
- Do not dispose of batteries in fire to prevent explosion.

The instructions are applied to your device, battery, and accessories.

If any device is not working properly, please bring it to the nearest authorized service provider for repair.