Wireless Top-Mounted Ultrasonic Level Sensor with 1 x Digital Output

R900PB03AO1 User Manual

Contents

1. Introduction

R900PB03AO1 is a wireless ultrasonic level sensor with a digital output to detect the current water level/parking status. The detection angle is approximately 15°, making it suitable for distance detection in smaller spaces. It transmits digital signals to a third-party device when a value exceeds the threshold. With up to 7 flexible installation options, R900PB03AO1 integrates easily into various environments. In addition, with support for Netvox NFC app, users can easily configure settings, update firmware, and access data simply by tapping their smartphone to the device.

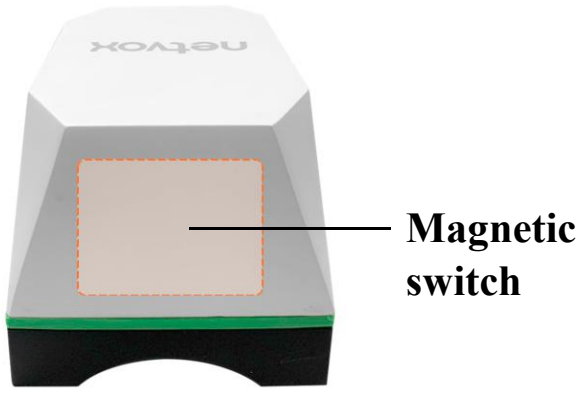
LoRa Wireless Technology

LoRa is a wireless communication technology famous for its long-distance transmission and low power consumption. Compared with other communication methods, LoRa spread spectrum modulation technique greatly extends the communication distance. It can be widely used in any case that requires long-distance and low-data wireless communications. For example, automatic meter reading, building automation equipment, wireless security systems, and industrial monitoring. It has features like small size, low power consumption, long transmission distance, strong 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

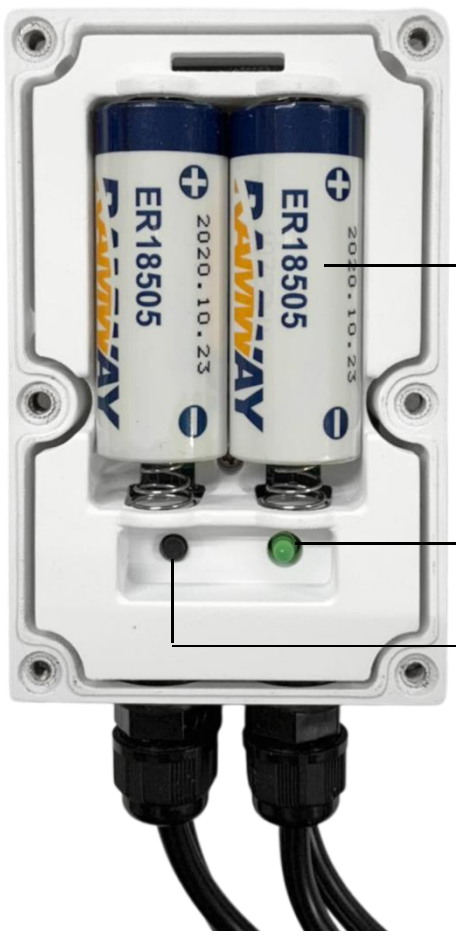


Top

Bottom

Left Side

Back



Battery

★ also support ER14505 battery with battery converter case

Indicator

Function key

3. Features

- Powered by 2* 3.6V ER18505 batteries (also support ER14505 batteries with battery converter case)
- Main unit: IP65
- Built-in vibration sensor for tamper alarm
- Up to 7 installation methods for different kinds of applications
- Support NFC. Configure and upgrade firmware on Netvox NFC app
- Store up to 10000 data
- LoRaWANTM Class A compatible
- Frequency hopping spread spectrum
- Configuration parameters can be configured through third-party software platforms, data can be read, and alarms can be set via SMS text and email (optional)
- Applicable to the third-party platforms: Actility / ThingPark, TTN, MyDevices / Cayenne
- Low power consumption and longer battery life

Note: Battery life is determined by the sensor reporting frequency and other variables, please visit http://www.netvox.com.tw/electric/electric_calc.html for battery life and calculation.

4. Setup Instructions

On / Off

Power on	Insert 2* ER18505 batteries or 2* ER14505 batteries with battery converter case.
Power off	Remove the batteries.

Function key

Turn on	Press and hold the function key for 3 seconds until the green indicator flashes once.
Turn off	Step 1. Press and hold the function key for 5 seconds until the green indicator flashes once. Step 2. Release the function key and short press it in 5 seconds. Step 3. The green indicator flashes 5 times. R900 turns off.
Factory reset	Step 1. Press and hold the function key for 10 seconds. The green indicator flashes once every 5 seconds. Step 2. Release the function key and short press it in 5 seconds. Step 3. The green indicator flashes 20 times. R900 is factory reset and off.

Magnetic switch

Turn on	Hold a magnet near R900 for 3 seconds until the green indicator flashes once.
Turn off	Step 1. Hold a magnet close to R900 for 5 seconds. The green indicator flashes once. Step 2. Remove the magnet and get close to R900 in 5 seconds. Step 3. The green indicator flashes 5 times. R900 turns off.
Factory reset	Step 1. Hold a magnet close to R900 for 10 seconds. The green indicator flashes once every 5 seconds. Step 2. Remove the magnet and get close to R900 in 5 seconds. Step 3. The green indicator flashes 20 times. R900 is factory reset and off.

Note:

a. Remove and insert the battery; the device is off by default.

b. 5 seconds after powering on, the device will be in engineering test mode.

c. The on/off interval should be about 10 seconds to avoid the interference of capacitor inductance and other energy storage components.

d. After the batteries are removed, the device can still operate for a while until the power supported by the supercapacitor runs out.

Join a Network

First time joining the network	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 before (Device is not factory reset.)	Turn on the device to search the network. The green indicator stays on for 5 seconds: Success The green indicator remains off: Fail
Fail to join the network	(1) Please turn off the device and remove the batteries to save power. (2) Please check the device verification information on the gateway or consult your platform server provider.

Function key

Short press	Device is in the network The green indicator flashes once. After sampling is completed, the device reports a data packet. Device is not in the network The green indicator remains off.

Note: The function key does not work during sampling.

Magnetic switch

Move magnet close to the switch and remove it	Device is in the network The green indicator flashes once. After sampling is completed, the device reports a data packet. Device is not in the network The green indicator remains off.

Sleep Mode

The device is on and in the network.	Sleeping period: Min Interval. When the reportchange exceeds the setting value or the state changes: send a data report based on the Min Interval.

Low Voltage Alarm

Low voltage	3.2V

Note: To ensure the accuracy of data, please replace the battery when it drops to low voltage.

5. Data Report

35 seconds after the device is powered on, it will send a version packet and data, including distance, fill level, and battery voltage.

Default setting:

Min Interval = 0x0708 (1800s)

Max Interval = 0x0708 (1800s) // should not be less than 30 seconds

Distance change = 0x012C (300mm)

Fill Max Distance = 0x1388 (5000mm)

Note: a. If no configuration is done, the device sends data based on the default settings.

b. Please refer to Netvox LoRaWAN Application Command document and Netvox Lora Command Resolver http://www.netvox.com.cn:8888/cmddoc to resolve uplink data.

Data report configuration and sending period are as follows:

Min Interval (unit: second)	Max Interval (unit: second)	Reportable Change	Current Change ≥ Reportable Change	Current Change < Reportable Change
Any number between 30 to 65535	Any number between Min time to 65535	Cannot be 0	Report per Min Interval	Report per Max Interval

5.1 Example of ReportDataCmd

FPort: 0x16

Bytes	1	2	1	Var (length based on the payload)
	Version	Device Type	Report Type	Netvox PayLoad Data

Version – 1 bytes – 0x03——the Version of Netvox LoRaWAN Application Command Version

Device Type – 2 bytes – Device Type of Device

The devicetype is listed in Netvox LoRaWAN Application Devicetype V3.0. doc.

Report Type – 1 byte – the presentation of the Netvox PayLoad Data, according to the device type

Netvox PayLoad Data – Var bytes (length based on the payload)

Tips

1. Battery Voltage

The voltage value is bit 0 – bit 6, bit 7=0 is normal voltage, and bit 7=1 is low voltage.

Battery=0xA0, binary= 1010 0000, if bit 7= 1, it means low voltage.

The actual voltage is 0010 0000 (BIN) = 0x20 (HEX)= 32 (DEC), 32*0.1v =3.2v.

2. Version Packet

When Report Type = 0x00 is the version packet, such as 030110000A0120250325, the firmware version is 2025.03.25.

3. Data Packet

When Report Type=0x01 is the data packet.

Device	Device Type	Report Type	NetvoxPayLoadData					
R900PB 03AO1	0x0110	0x01	Battery (1 Byte) unit: 0.1V	Status (1Byte) 0x01_On 0x00_Off	Distance (2 Bytes, unit: 1mm)	FillLevel (1 Byte, unit: 1%)	ThresholdAlarm (1 Byte) Bit0_Low Distance Alarm, Bit1_High Distance Alarm, Bit2_ Low FillLevel Alarm, Bit3_ High FillLevel Alarm, Bit4-7: Reserved	Shock Tamper Alarm (1 Byte) 0x00_NoAlarm, 0x01_Alarm

Example of Uplink: **03011001240001685C0000**

1st Byte (03): Version

2nd 3rd Byte (0110): Device Type－ R900PB03AO1

4th (01): Report Type

5th Byte (24): Battery – 3.6V 24 (Hex) = 36 (Dec), 36* 0.1v = 3.6V

6th Byte (00): Status – off

7th – 8th (0168): Distance – 360mm 0168 (Hex) = 360 (Dec), 360* 1mm = 360mm

9th Byte (5C): Fill Level – 92% 5C (Hex) = 92 (Dec), 92* 1% = 92%

10th Byte (00): Threshold Alarm –no alarm

11th Byte (00): Shock Tamper Alarm – no alarm

Note:

a. When the device is used for water level detection or waste fill level detection, the detected distance (Distance) and the percentage of water level or garbage (FillLevel) are reported. The parking status (Status) = 0x00 (off) by default.

b. When the device is used for parking space detection, it will report the detected distance (Distance) and the parking status (Status). The FillLevel = 0x00 by default.

5.2 Example of Configure Cmd

FPort: 0x17

Bytes	1	2	Var (length based on the payload)
	Cmd ID	Device Type	Netvox PayLoad Data

Cmd ID – 1 byte

Device Type – 2 bytes – Device Type of Device

The devicetype is listed in Netvox LoRaWAN Application Devicetype3.0.doc

Netvox PayLoad Data – Var bytes (length based on the payload)

Description	Device	Cmd ID	Device Type	Netvox PayLoad Data		
ConfigReport Req	R900PB 03AO1	0x01	0x0110	MinTime (2 Bytes, unit: s)	MaxTime (2 Bytes, unit: s)	DistanceChange (2 Bytes, unit: 1mm)
ConfigReport Rsp		0x81		Status (0x00_success)		
ReadConfigReportReq		0x02				
ReadConfigReportRsp		0x82		MinTime (2 Bytes, unit: s)	MaxTime (2 Bytes, unit: s)	DistanceChange (2 Bytes, unit: 1mm)
SetShockSensorSensitivityReq		0x03		Shock Sensor Sensitivity (1 Byte)		
SetShockSensorSensitivityRsp		0x83		Status (0x00_success)		
GetShockSensorSensitivityReq		0x04				
GetShockSensorSensitivityRsp		0x84		Shock Sensor Sensitivity (1 Byte)		
SetOnDistanceThresholdRreq		0x05		On Distance Threshold (2 Bytes, unit:1mm)		
SetOnDistanceThresholdRrsp		0x85		Status (0x00_success)		
GetOnDistanceThresholdRreq		0x06				

GetOnDistanceThresholdRrsp		0x86		On Distance Threshold (2 Bytes, unit:1mm)			
SetFillMaxDistanceReq		0x07		Fill Max Distance (2 Bytes, unit:1mm)			
SetFillMaxDistanceRsp		0x87		Status (0x00_success)			
GetFillMaxDistanceReq		0x08					
GetFillMaxDistanceRsp		0x88		Fill Max Distance (2 Bytes, unit:1mm)			
SetDeadZone DistanceReq (REMAIN Lastconfig when resetfac)		0x09		Dead Zone Distance (2 Bytes, unit:1mm)			
SetDeadZone DistanceRsp (REMAIN Lastconfig when resetfac)		0x89		Status (0x00_success)			
GetDeadZone DistanceReq		0x0A					
GetDeadZone DistanceRsp		0x8A		Dead Zone Distance (2 Bytes, unit:1mm)			
ConfigDigital OutPutReq		0x0B		Digital OutPut Type (1 Byte) 0x00_NormallyLowLevel 0x01_NormallyHigh Level	OutPulse Time (1 Byte, unit: s)	Bind Alarm Source (1 Byte) Bit0_Low Distance Alarm Bit1_High Distance Alarm Bit2_ Low FillLevel Alarm Bit3_ High FillLevel Alarm Bit4-7: Reserved	Channel (1 Byte) 0x00_Channel 1 0x01_Channle 2
ConfigDigital OutPutRsp		0x8B		Status (0x00_success)			
Read ConfigDigital OutPutReq		0x0C		Channel (1 Byte) 0x00_Channel 1; 0x01_Channle 2			
Read ConfigDigital OutPutRsp		0x8C		Digital OutPut Type (1 Byte) 0x00_Normally Low Level 0x01_Normally High Level	OutPulse Time (1 Byte, unit: s)	Bind Alarm Source (1 Byte) Bit0_Low Distance Alarm Bit1_High Distance Alarm Bit2_ Low Fill Level Alarm Bit3_ High Fill Level Alarm Bit4-7: Reserved	Channel (1 Byte) 0x00_Channel 1 0x01_Channle 2

TriggerDigital OutPutReq		0x0D		OutPulse Time (1 Byte, unit: s)	Channel (1Byte) 0x00_Channel 1; 0x01_Channle 2
TriggerDigital OutPutRsp		0x8D		Status (0x00_success)	

(1) Configure device parameters

MinTime = 0x003C (60s), MaxTime = 0x003C (60s), Distance Change = 0x012C (300mm)

Downlink: 010110003C003C012C

Response: 81011000 (configuration success)

81011001 (configuration fail)

Read device parameters

Downlink: 020110

Response: 820110003C003C012C

(2) Configure Shock Sensor Sensitivity = 0x14 (20)

Downlink: 03011014

Response: 83011000 (configuration success)

83011001 (configuration fail)

Note: Shock Sensor Sensitivity range = 0x01 to 0x14

0xFF (disables vibration sensor)

Read Shock Sensor Sensitivity

Downlink: 040110

Response: 84011014 (device's current parameters)

(3) Configure Fill Max Distance = 0x1388 (5000mm)

Downlink: 0701101388

Response: 87011000 (configuration success)

87011001 (configuration fail)

Note: Fill Max Distance and On Distance Threshold are reset to default when R900 is factory reset.

Read Fill Max Distance

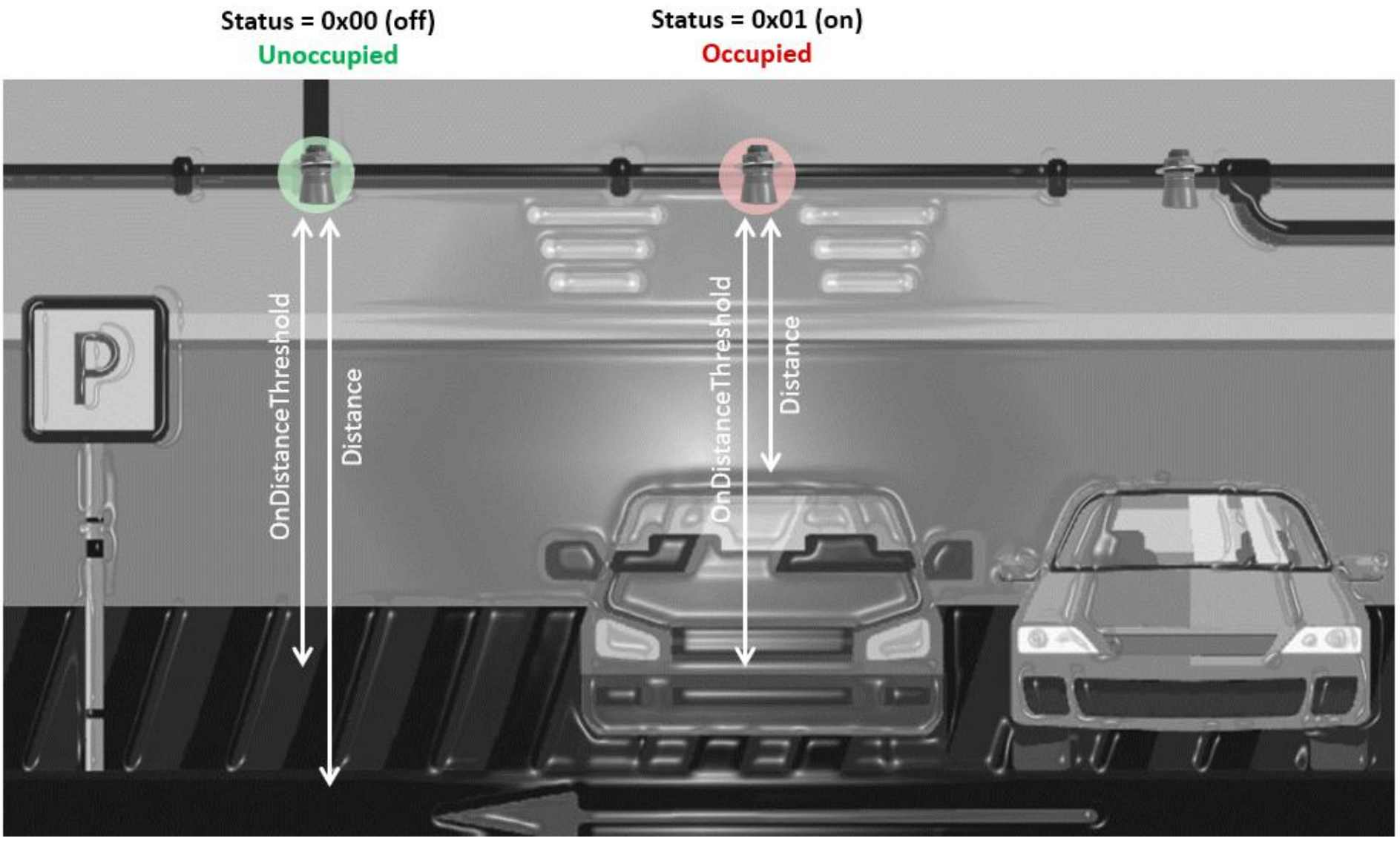
Downlink: 080110

Response: 8801101388

Switching modes

Modes can be switched from water level detection to parking space detection by configuring Fill Max Distance and On Distance Threshold.

- For parking space detection, set Fill Max Distance = 0x0000 (0mm) first, and set the desired value for On Distance Threshold.
- For water level detection, set On Distance Threshold to 0x0000 (0mm), then set the value for Fill Max Distance.



(4) For parking space detection, configure Fill Max Distance = 0x0000 (0mm)

Downlink: 0701100000

Response: 87011000 (configuration success)

87011001 (configuration fail)

Read Fill Max Distance

Downlink: 080110

Response: 8801100000

Set On Distance Threshold = 0x01F4 (500mm)

Downlink: 0501101F4

Response: 85011000 (configuration success)

85011001 (configuration fail)

Read On Distance Threshold

Downlink: 060110

Response: 86011001F4

Note: When Distance ≤ On Distance Threshold, the Status =0x01 (space occupied). To ensure accuracy, the On Distance Threshold should be set lower than the Distance when the parking space is empty.

(5) Set Dead Zone Distance = 0x00FA (250mm)

Downlink: 09011000FA

Response: 89011000 (configuration success)

89011001 (configuration fail)

Read Dead Zone Distance

Downlink: 0A0110

Response: 8A011000FA

(6) Configure Digital OutPut Type = 0x00 (Normally Low Level),

OutPulse Time = 0xFF (disable pulse duration),

Bind Alarm Source = 0x02 = 0000 0010 (BIN) Bit1_High Distance Alarm =1

(when High Distance Alarm is triggered, DO outputs signals)

Channel = 0x00_Channel 1

Downlink: 0B011000FF0200

Response: 8B011000 (configuration success)

8B011001 (configuration fail)

Read DO parameters

Downlink: 0C011000

Response: 8C011000FF0200

Configure OutPulse Time = 0x0A (10 seconds)

Downlink: 0D01100A00

Response: 8D011000 (configuration success)

5.3 Example of Set Sensor Alarm Threshold Cmd

FPort: 0x10

Cmd Descriptor	Cmd ID (1 Byte)	Payload (10 Bytes)			
SetSensorAlarm ThresholdReq	0x01	Channel (1 Byte) 0x00_Channel1, 0x01_Chanel2, 0x02_Channel3, etc.	Sensor Type (1 Byte) 0x00_Disable ALL 0x2F_ Distance, 0x30_ FillLevel	Sensor High Threshold (4 Bytes) unit: Distance – 1mm FillLevel – 1%	Sensor Low Threshold (4 Bytes) unit: Distance – 1mm FillLevel – 1%
SetSensorAlarm ThresholdRsp	0x81	Status (1 Byte) 0x00_success	Reserved (9 Bytes, Fixed 0x00)		
GetSensorAlarm ThresholdReq	0x02	Channel (1 Byte) 0x00_Channel1, 0x01_Chanel2, 0x02_Channel3, etc.	Sensor Type (1 Byte) 0x00_Disable ALL 0x2F_ Distance, 0x30_ Fill Level	Reserved (8 Bytes, Fixed 0x00)	
GetSensorAlarm ThresholdRsp	0x82	Channel (1 Byte) 0x00_Channel1, 0x01_Chanel2, 0x02_Channel3, etc.	Sensor Type (1 Byte) 0x00_Disable ALL 0x2F_ Distance, 0x30_ FillLevel	Sensor High Threshold (4 Bytes) unit: Distance – 1mm FillLevel – 1%	Sensor Low Threshold (4 Bytes) unit: Distance – 1mm FillLevel – 1%

Note: a. Set Sensor High / Low Threshold as 0xFFFFFFFF to disable threshold.

b. The last configuration will be saved when the device is reset to factory setting.

Channel = 0x00_Channel 1

(1) Configure parameters

Channel = 0x00, Sensor Type = 0x2F (Distance),

Sensor High Threshold = 0x000003E8 (1000mm), Sensor Low Threshold = 0x000001F4 (500mm)

Downlink: 01002F000003E8000001F4

Response: 810000000000000000000

(2) Get Sensor Alarm Threshold Req

Downlink: 02002F0000000000000000

Response: 82002F000003E8000001F4

(3) Clear all thresholds (Sensor Type = 0x00)

Downlink: 010000000000000000000

Response: 810000000000000000000

5.4 Example of Global Calibrate Cmd

FPort: 0x0E

Description	Cmd ID	Sensor Type	PayLoad (Fix = 9 Bytes)				
SetGlobalCalibrateReq	0x01	0x36_Distance Sensor	Channel (1 Byte) 0_Channel 1 1_Channel 2, etc.	Multiplier (2 Bytes, Unsigned)	Divisor (2 Bytes, Unsigned)	DeltValue (2 Bytes, Signed)	Reserved (2 Bytes, Fixed 0x00)
SetGlobalCalibrateRsp	0x81		Channel (1 Byte) 0_Channel 1 1_Channel 2, etc.	Status (1 Byte) 0x00_success)	Reserved (7 Bytes, Fixed 0x00)		
GetGlobalCalibrateReq	0x02		Channel (1 Byte) 0_Channel 1 1_Channel 2, etc.	Reserved (8 Bytes, Fixed 0x00)			
GetGlobalCalibrateRsp	0x82		Channel (1 Byte) 0_Channel 1 1_Channel 2, etc.	Multiplier (2 Bytes, Unsigned)	Divisor (2 Bytes, Unsigned)	DeltValue (2 Bytes, Signed)	Reserved (2 Bytes, Fixed 0x00)
ClearGlobalCalibrateReq	0x03	Reserved (10 Bytes, Fixed 0x00)					
ClearGlobalCalibrateRsp	0x83	Status (1 Byte, 0x00_success)	Reserved (9 Bytes, Fixed 0x00)				

Distance: SensorType – 0x36; Channel – 0x00

(1) Set Global Calibrate Req

Calibrate distance by increasing 200mm

Channel: 0x00 (channel1); Multiplier: 0x0001 (1); Divisor: 0x0001 (1); DeltValue: 0x00C8 (2200)

Downlink: 01360000010001 00C80000

Response: 8136000000000000000000 (configuration success)

81360001000000000000 (configuration fail)

(2) Read parameters

Downlink: 0236000000000000000000

Response: 82360000010001 00C80000 (configuration success)

(3) Clear Global Calibrate Req

Downlink: 0300000000000000000000

Response: 8300000000000000000000

5.5 Example of Netvox LoRaWAN Rejoin

Fport:0x20

Check if the device is connected to the network during Rejoin Check Period. If the device does not respond within the Rejoin Threshold, it will be rejoined back to the network automatically.

CmdDescriptor	CmdID (1 Byte)	Payload (Var Bytes)						
SetNetvoxLoRaWANRejoinReq	0x01	Rejoin Check Period (4 Bytes, unit: 1s) 0x FFFFFFFF_Disable Netvox Rejoin Function					Rejoin Threshold (1 Byte)	
SetNetvoxLoRaWANRejoinRsp	0x81	Status (1 Byte) 0x00_success	Reserved (4 Bytes, Fixed 0x00)					
GetNetvoxLoRaWANRejoinReq	0x02	Reserved (5 Bytes, Fixed 0x00)						
GetNetvoxLoRaWANRejoinRsp	0x82	Rejoin Check Period (4 Bytes, unit: 1s) 0x FFFFFFFF_Disable Netvox Rejoin Function					Rejoin Threshold (1 Byte)	
SetNetvoxLoRaWANRejoinTimeReq	0x03	1st Rejoin Time (2 Bytes, unit:1 min)	2nd Rejoin Time (2 Bytes, unit: 1 min)	3rd Rejoin Time (2 Bytes, unit: 1 min)	4th Rejoin Time (2 Bytes, unit: 1 min)	5th Rejoin Time (2 Bytes, unit: 1 min)	6th Rejoin Time (2 Bytes, unit: 1 min)	7th Rejoin Time (2 Bytes, unit: 1 min)
SetNetvoxLoRaWANRejoinTimeRsp	0x83	Status (1 Byte) 0x00_success	Reserved (13 Bytes, Fixed 0x00)					
GetNetvoxLoRaWANRejoinTimeReq	0x04	Reserved (15 Bytes, Fixed 0x00)						
GetNetvoxLoRaWANRejoinTimeRsp	0x84	1st Rejoin Time (2 Bytes, unit:1 min)	2nd Rejoin Time (2 Bytes, unit: 1 min)	3rd Rejoin Time (2 Bytes, unit: 1 min)	4th Rejoin Time (2 Bytes, unit: 1 min)	5th Rejoin Time (2 Bytes, unit: 1 min)	6th Rejoin Time (2 Bytes, unit: 1 min)	7th Rejoin Time (2 Bytes, unit: 1 min)

Note:

a. Set RejoinCheckThreshold as 0xFFFFFFFF to stop the device from rejoining the network.

b. The last configuration would be kept when the device is factory reset.

c. Default setting:

RejoinCheckPeriod = 2 (hr) and RejoinThreshold = 3 (times)

1st Rejoin Time = 0x0001 (1 min), 2nd Rejoin Time = 0x0002 (2 mins), 3rd Rejoin Time = 0x0003 (3 mins),

4th Rejoin Time = 0x0004 (4 mins), 5th Rejoin Time = 0x003C (60 mins), 6th Rejoin Time = 0x0168 (360 mins),

7th Rejoin Time = 0x05A0 (1440 mins)

d. If device loses connection from network before data are reported, the data will be saved and reported every 30 seconds after the device is reconnected. Data will be reported based on the format of Payload + Unix timestamp. After all data are reported, the report time will be back to the normal setting.

(1) Command Configuration

Set Rejoin Check Period = 0x00000E10 (3600s), Rejoin Threshold = 0x03 (3 times)

Downlink: 0100000E1003

Response: 810000000000 (Configuration success)

810100000000 (Configuration failure)

(2) Read Rejoin Check Period and Rejoin Threshold

Downlink: 020000000000

Response: 8200000E1003

(3) Configure Rejoin Time

1st Rejoin Time = 0x0001 (1 min), 2nd Rejoin Time = 0x0002 (2 mins), 3rd Rejoin Time = 0x0003 (3 mins),
4th Rejoin Time = 0x0004 (4 mins), 5th Rejoin Time = 0x0005 (5 mins), 6th Rejoin Time = 0x0006 (6 mins),
7th Rejoin Time = 0x0007 (7 mins)

Downlink: 0300010002000300040005000600 07

Response: 830000000000000000000000000000 (Configuration success)

830100000000000000000000000000 (Configuration failure)

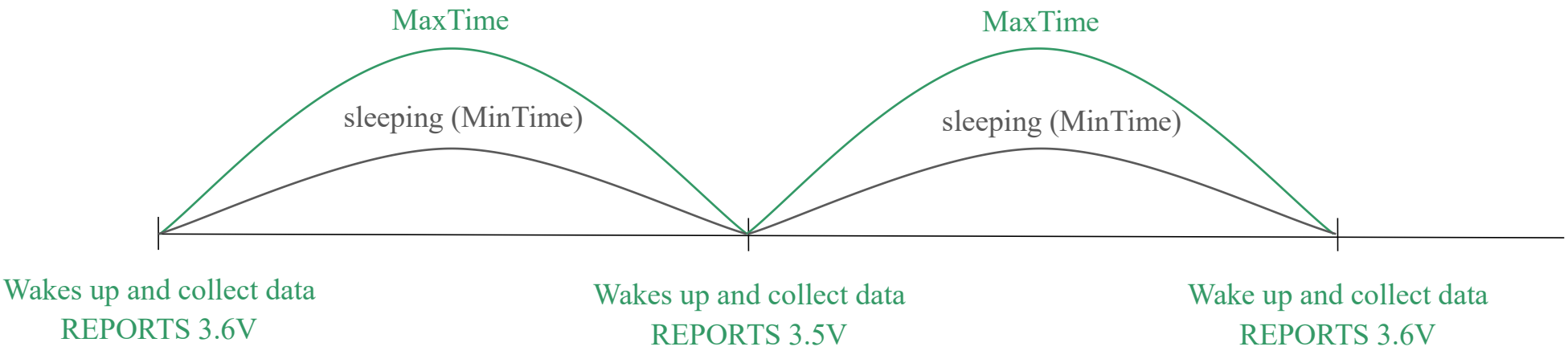
(4) Read Rejoin Time parameter

Downlink: 040000000000000000000000000000

Response: 840001000200030004000500060007

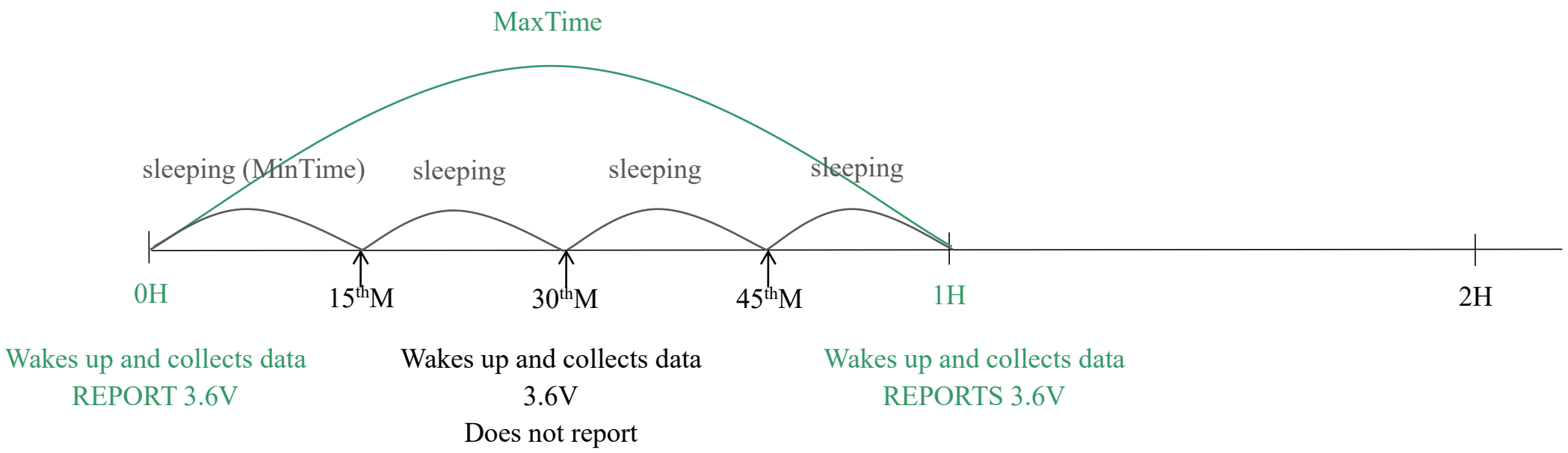
5.6 Example for MinTime / MaxTime Logic

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

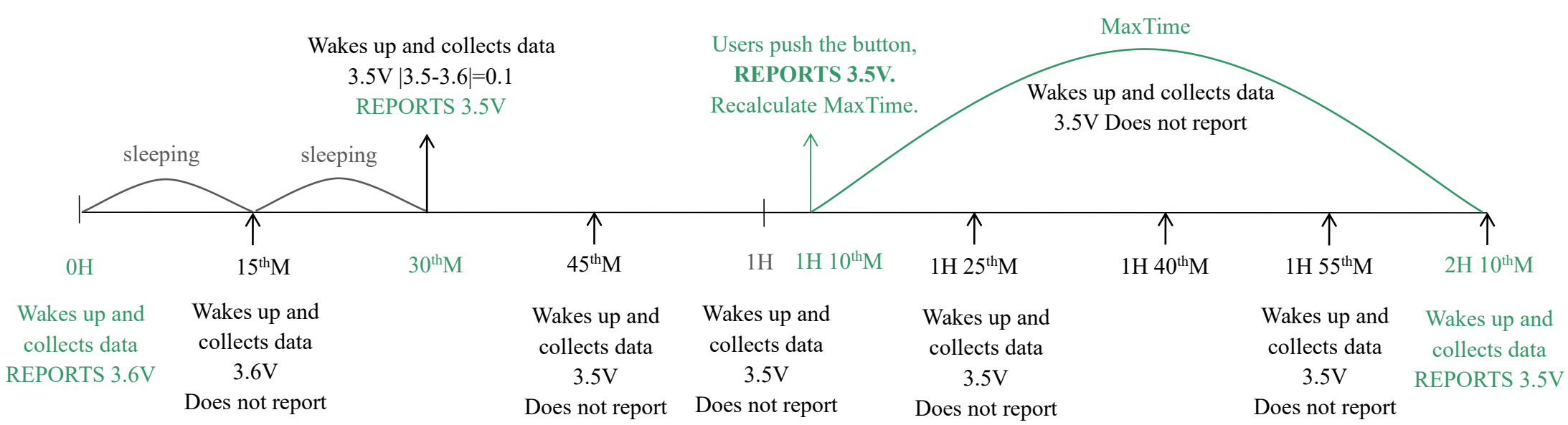


Note: MaxTime = MinTime. Data will only be reported according to MaxTime (MinTime) duration regardless BatteryVoltageChange value.

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



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



Notes:

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

b. 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.

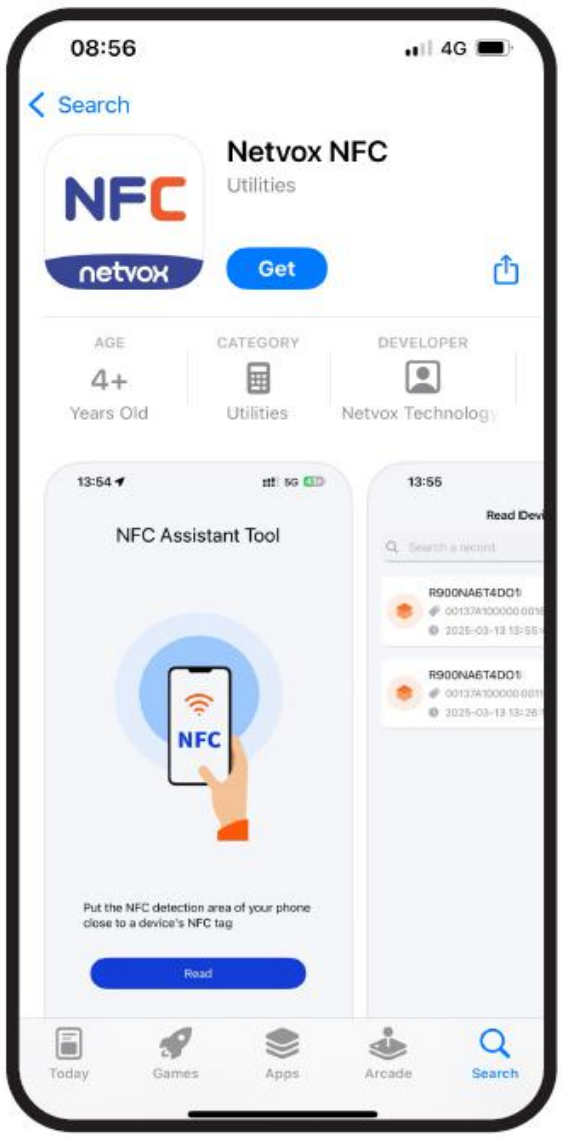
c. We do not recommend setting the MinTime Interval value too low. If the MinTime Interval is too low, the device wakes up frequently and the battery will be drained soon.

d. 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. Read R900 Data on NFC App

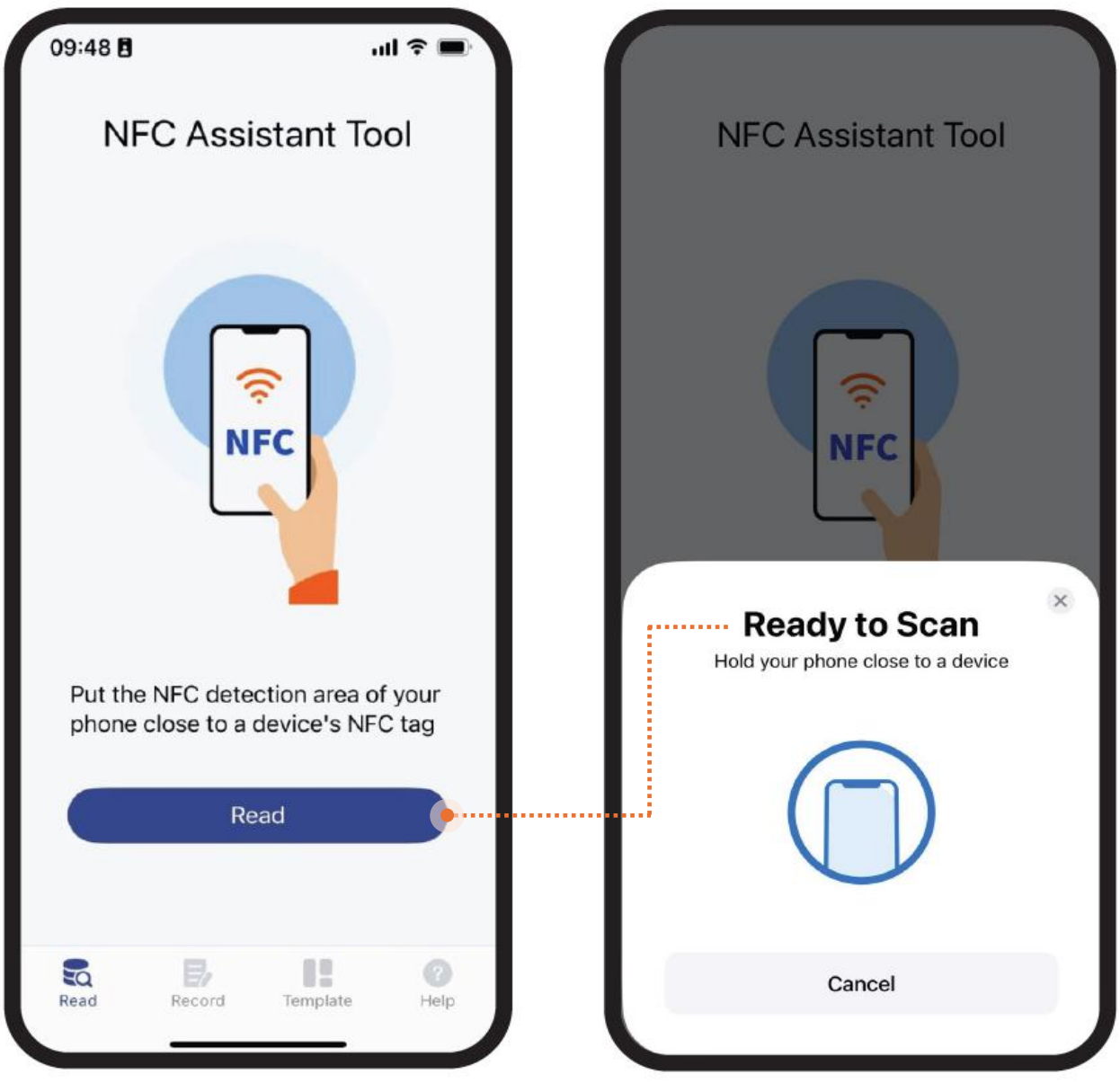
(1) Download Netvox NFC app.

Please make sure your phone supports NFC.

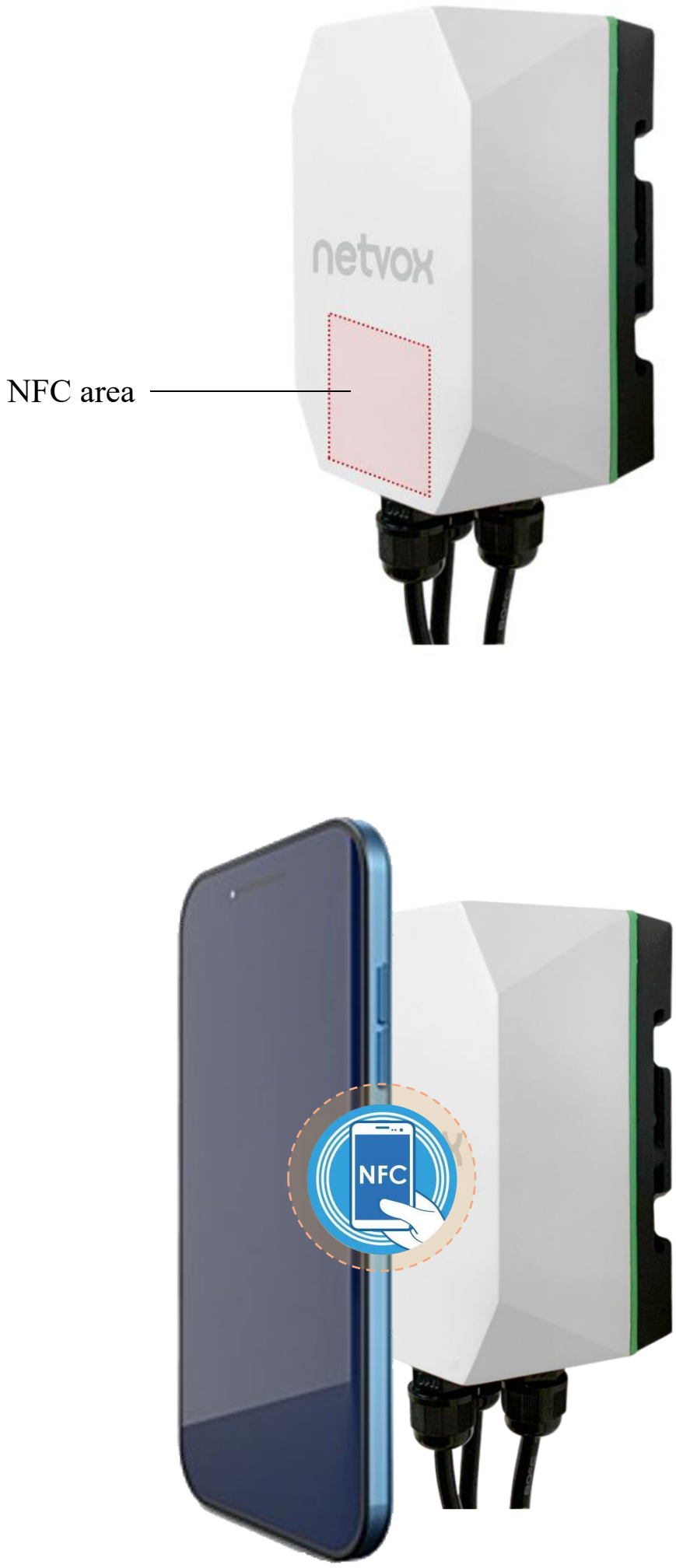


(2) Enable NFC in Settings and find your phone’s NFC area.

Open the app and click Read.

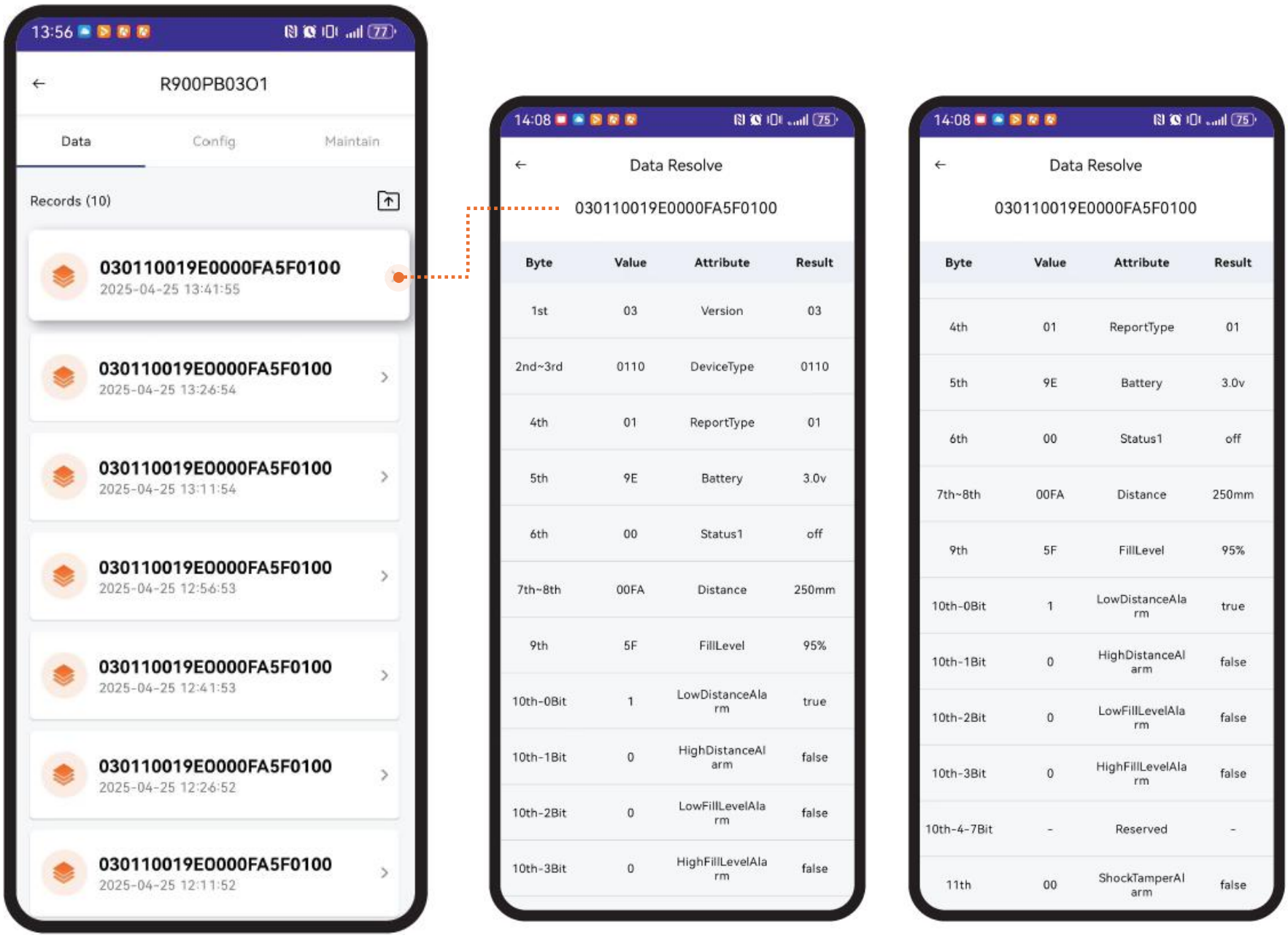


(3) Hold your phone near R900’s NFC tag.



(4) After R900 is successfully read, the latest 10 data will be displayed.

Select a data and go to the Data processing.

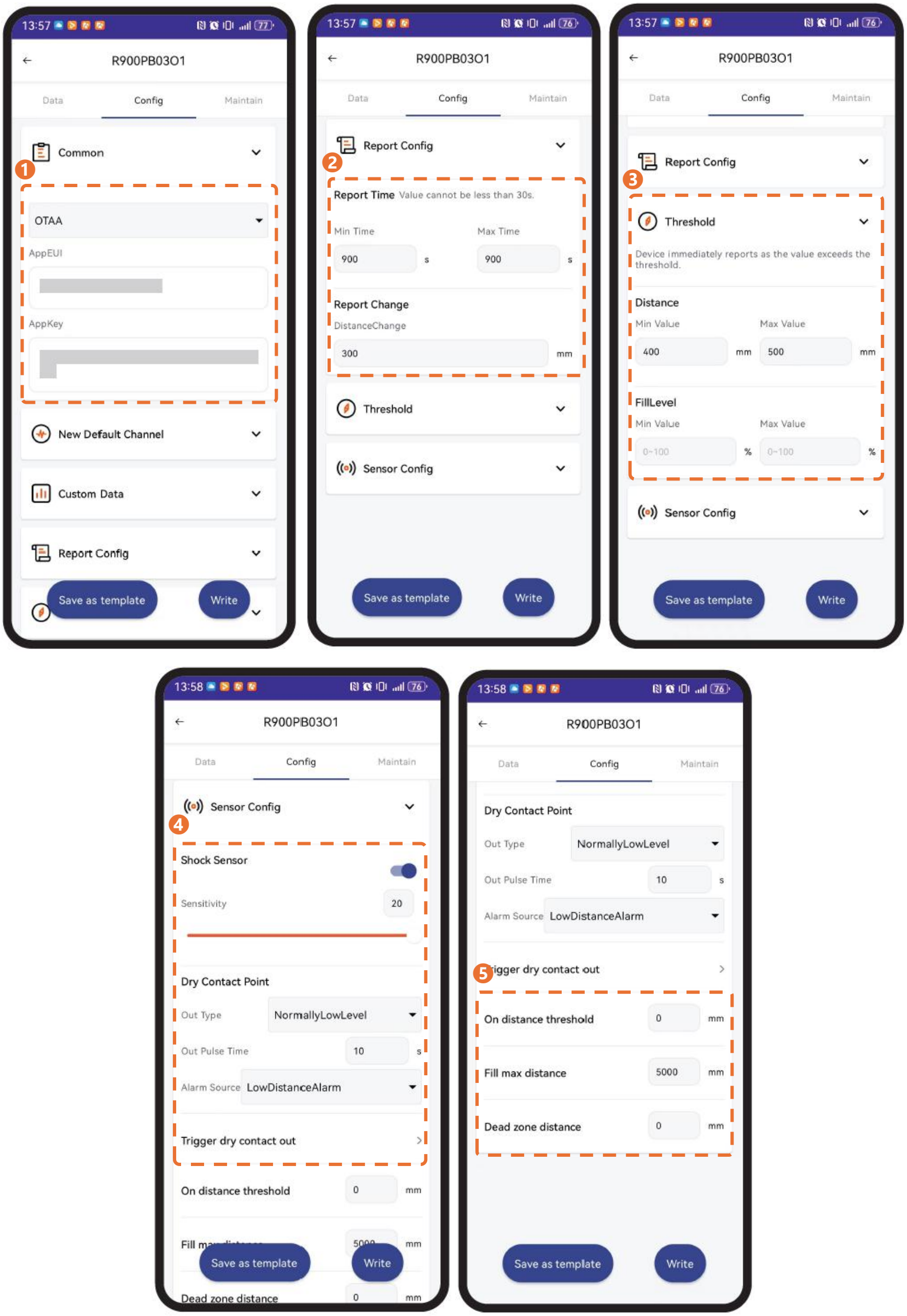


(5) Click Config to edit R900's settings, including network connection, report configuration, threshold, sensor parameters, and distance configuration.

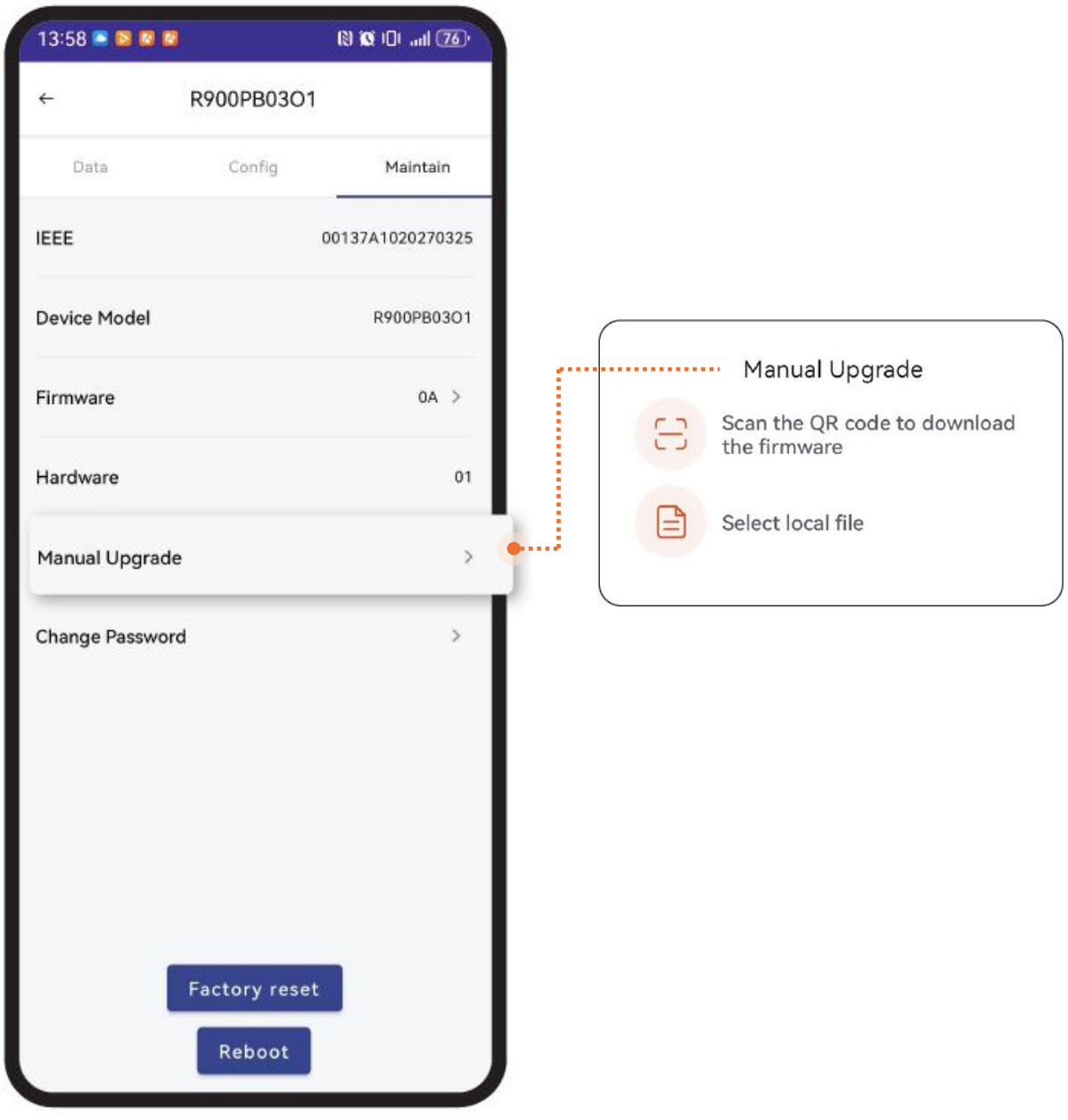
Note: a. To configure device parameters, users need to enter password: **12345678** (default).

b. Password can be changed on the app and reset to default when R900 is factory reset.

c. Please reboot the device if the parameters of network connection are configured.



(6) Click Maintain to check R900PB03AO1’s info and available upgrade.

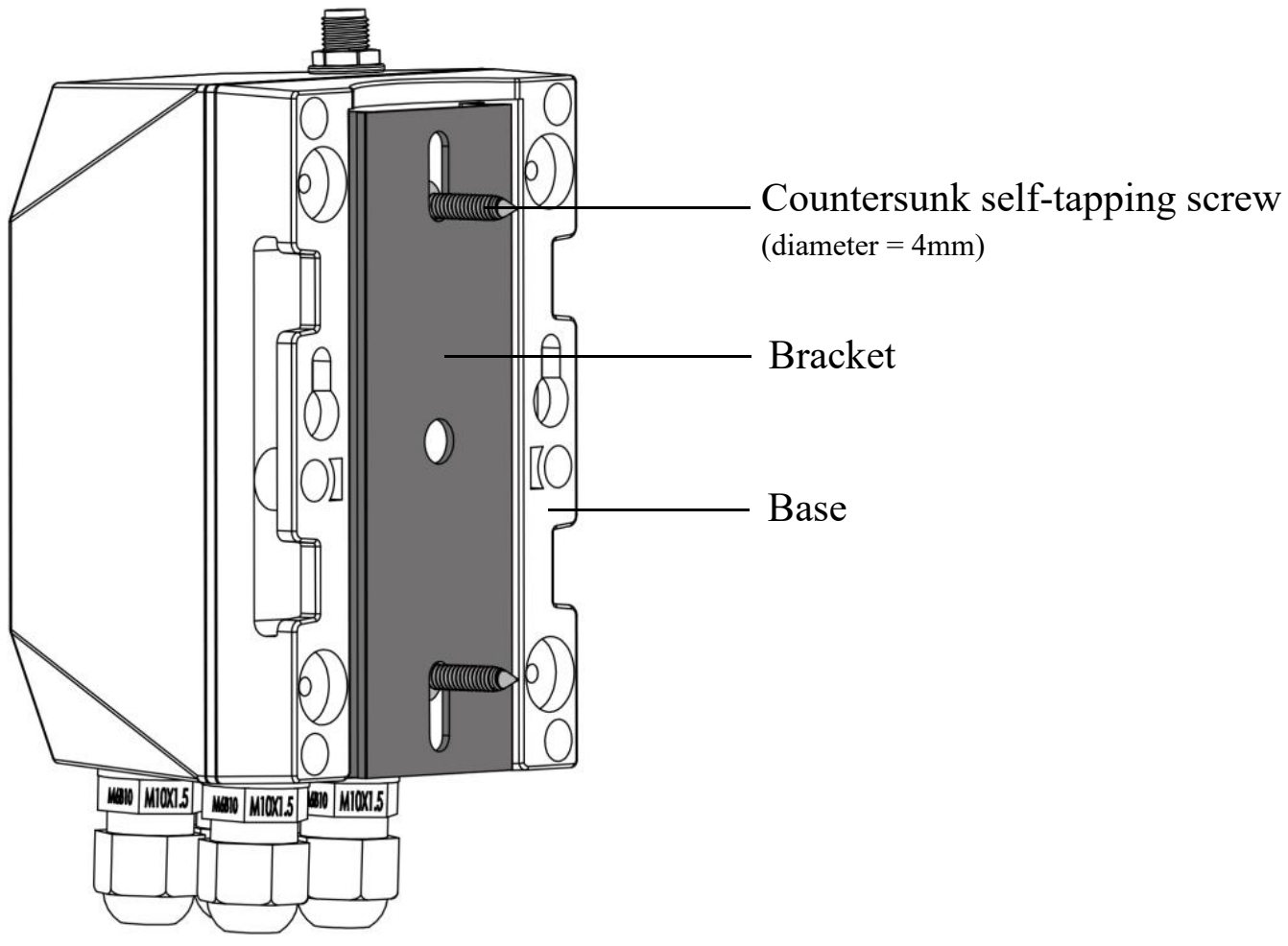


7. Installation

R900

- Standard

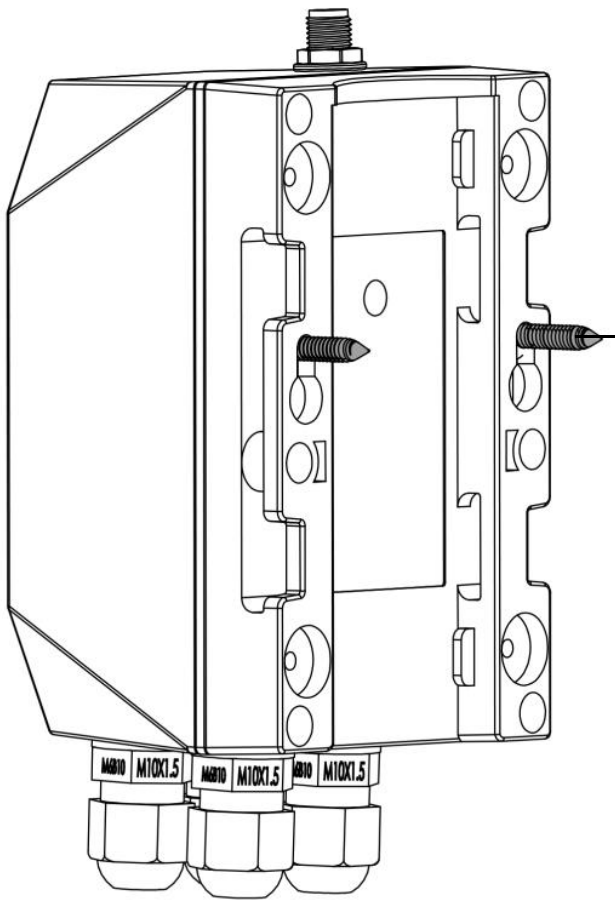
(1) Screws + Bracket



❶ Mount the bracket on a surface with 2 counter self-tapping screws.

❷ Hold R900 and slide down to connect the base and bracket.

(2) Screws



Countersunk self-tapping screw
(Thread diameter 3mm; Head diameter < 7mm)

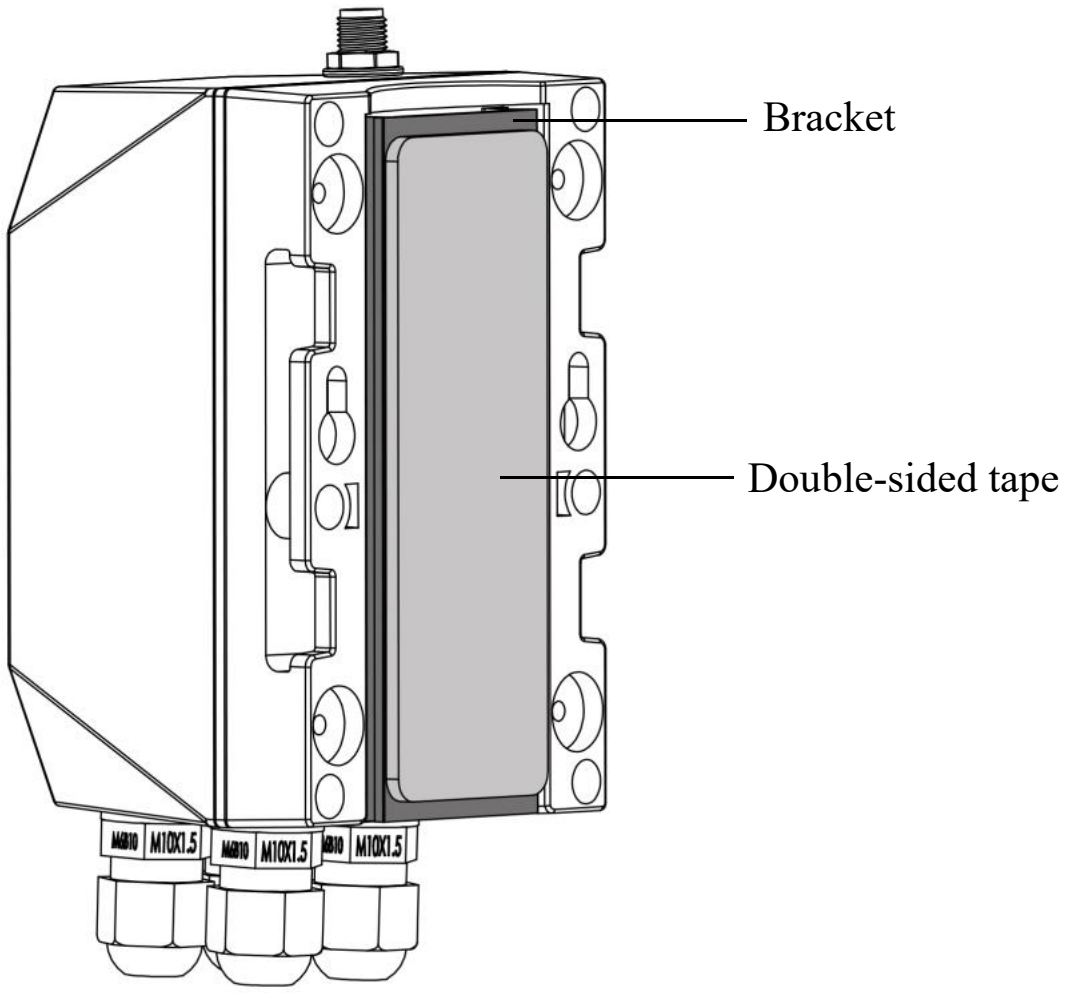
❶ Mount 2 countersunk self-tapping screws or expansion bolts on the wall.

The distance between the two screws should be 48.5mm. The gap between the bottom of the screw head and the wall should be 3mm.

❷ After the screws are mounted, align the holes of the base with the screws.

❸ Move R900 down to clamp it.

(3) Double-Sided Tape



❶ Stick the double-sided tape on the bracket.

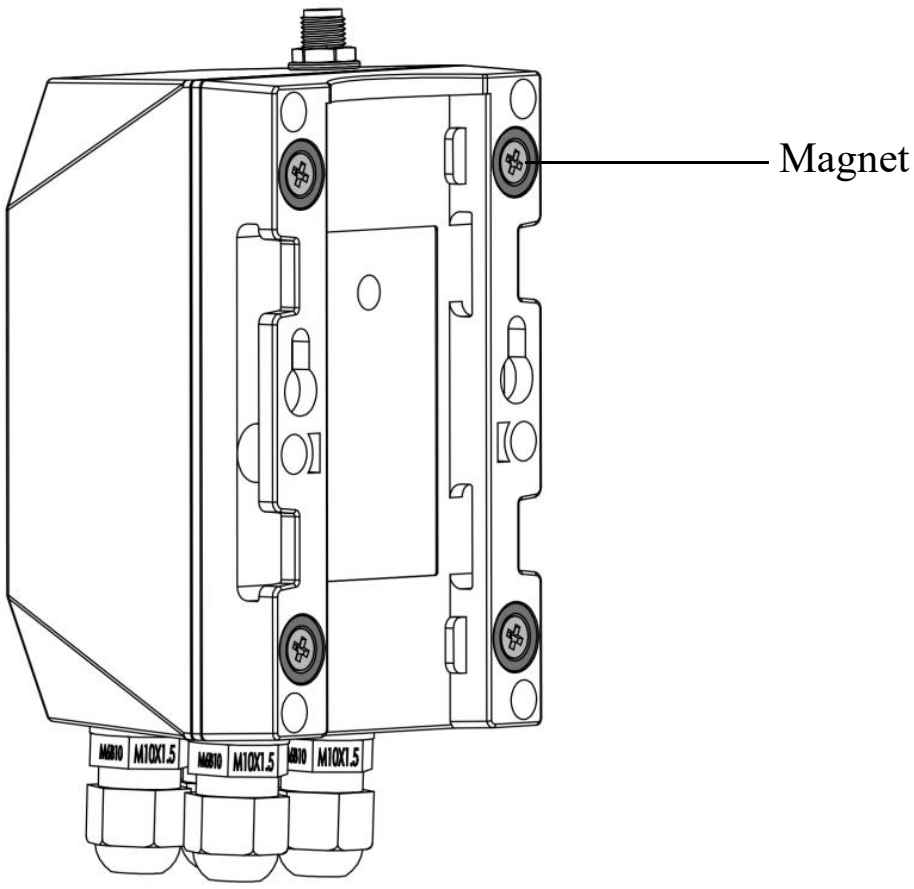
❷ Peel the liner and fix R900 on the surface.

❸ Press to ensure R900 is firmly installed.

Note: Please make sure the surface is clean and dry before applying double-sided tape.

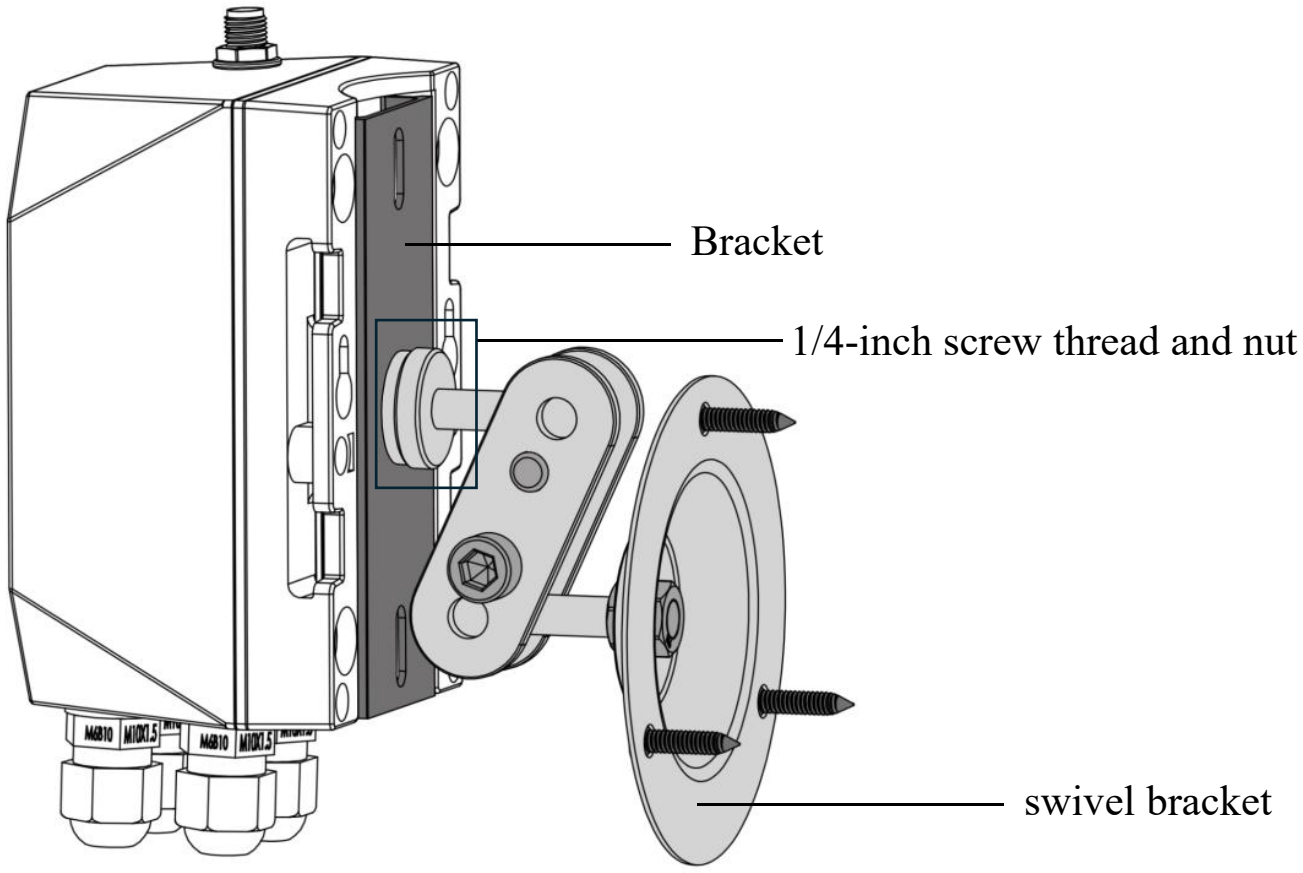
- Optional

(1) Magnet



❶ Fix the R900 on a metal surface.

(2) Swivel Bracket



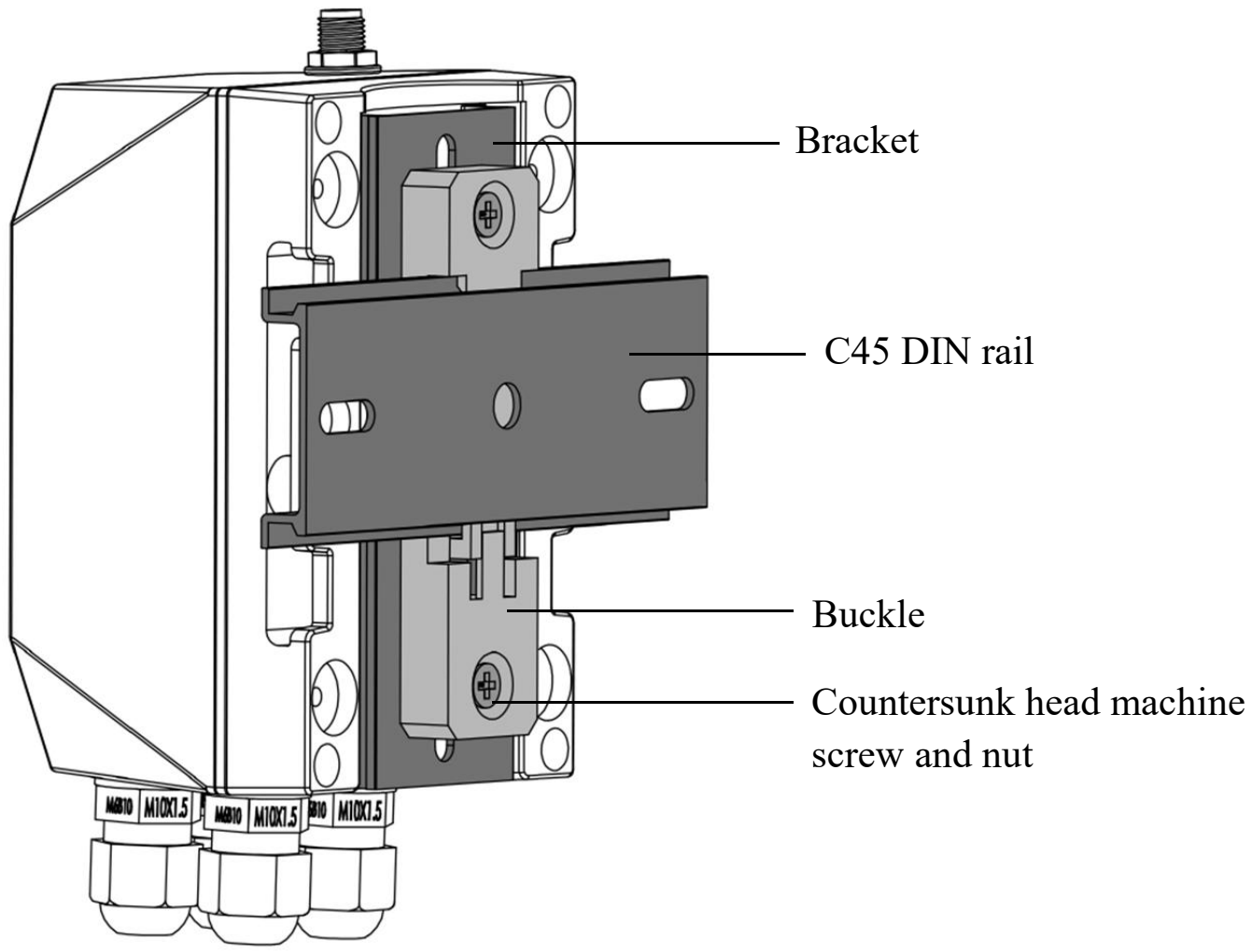
❶ Insert a 1/4-inch screw thread into the hole of the bracket.

❷ Tighten the thread with a nut.

❸ Mount the swivel bracket with self-tapping screws and expansion bolts.

❹ Hold R900 and slide down to connect the base and bracket.

(3) DIN Rail



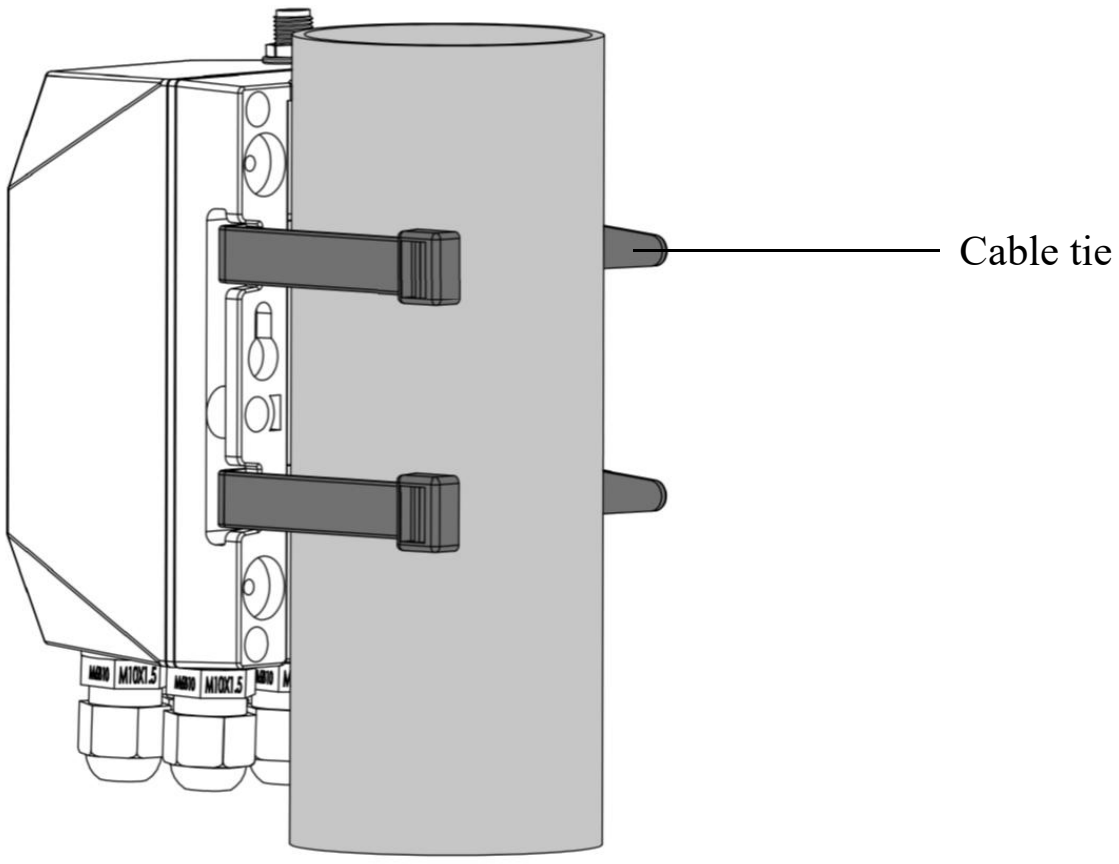
❶ Mount the rail buckle onto R900’s bracket with countersunk head machine screws and nuts.

❷ Snap the buckle onto the DIN rail.

❸ Hold R900 and slide down to connect the base and bracket.

- Prepared by customers

(1) Cable Tie



❶ Insert cable ties through the holes of the base.

❷ Insert the pointed end through the slot.

❸ Tighten the cable ties and make sure R900 is fixed firmly around a column.

Ultrasonic Sensor

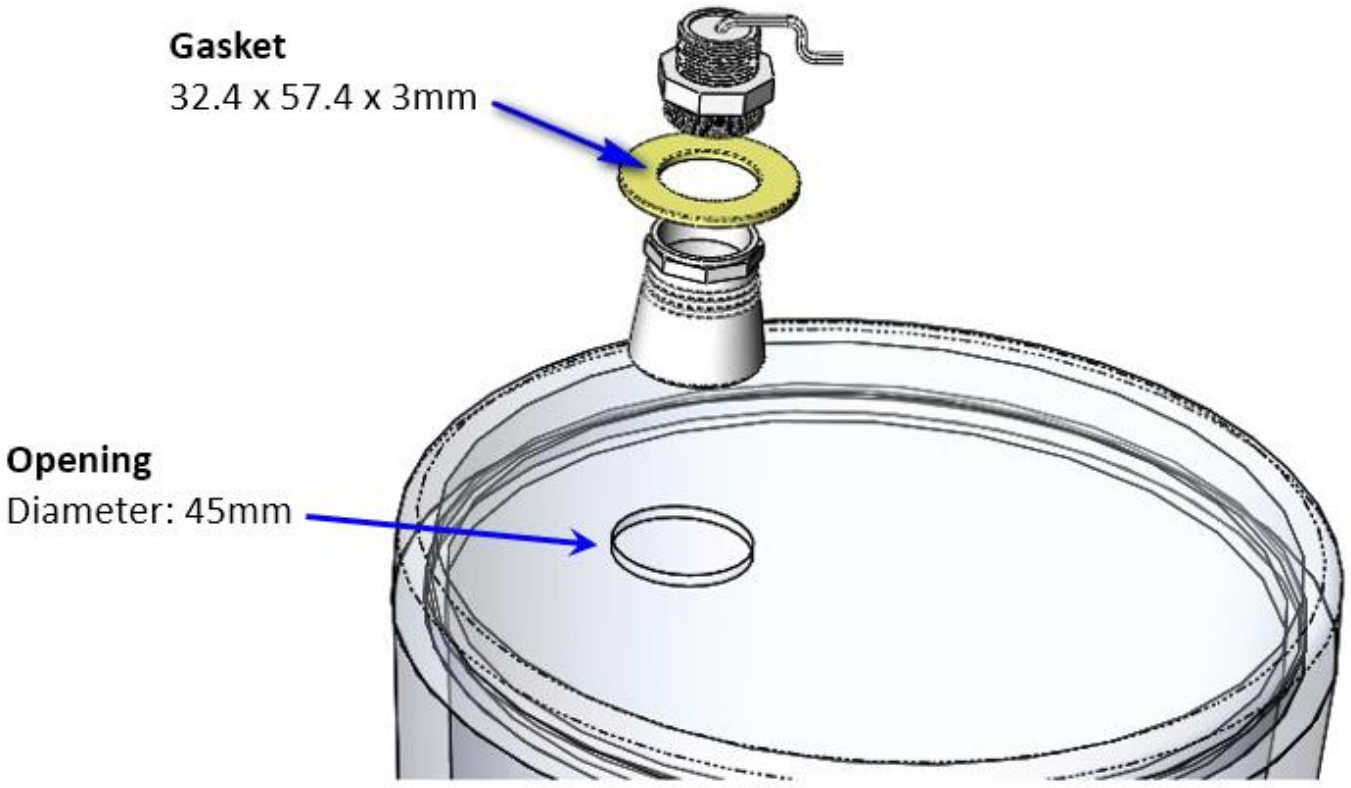
Detecting range: 250mm – 8000mm

Detection angle: About 15°

Install in a container

❶ Make an opening of approximately 45mm at the top of the container.

❷ Insert the lower part of the probe, along with the gasket, into the hole and secure it.



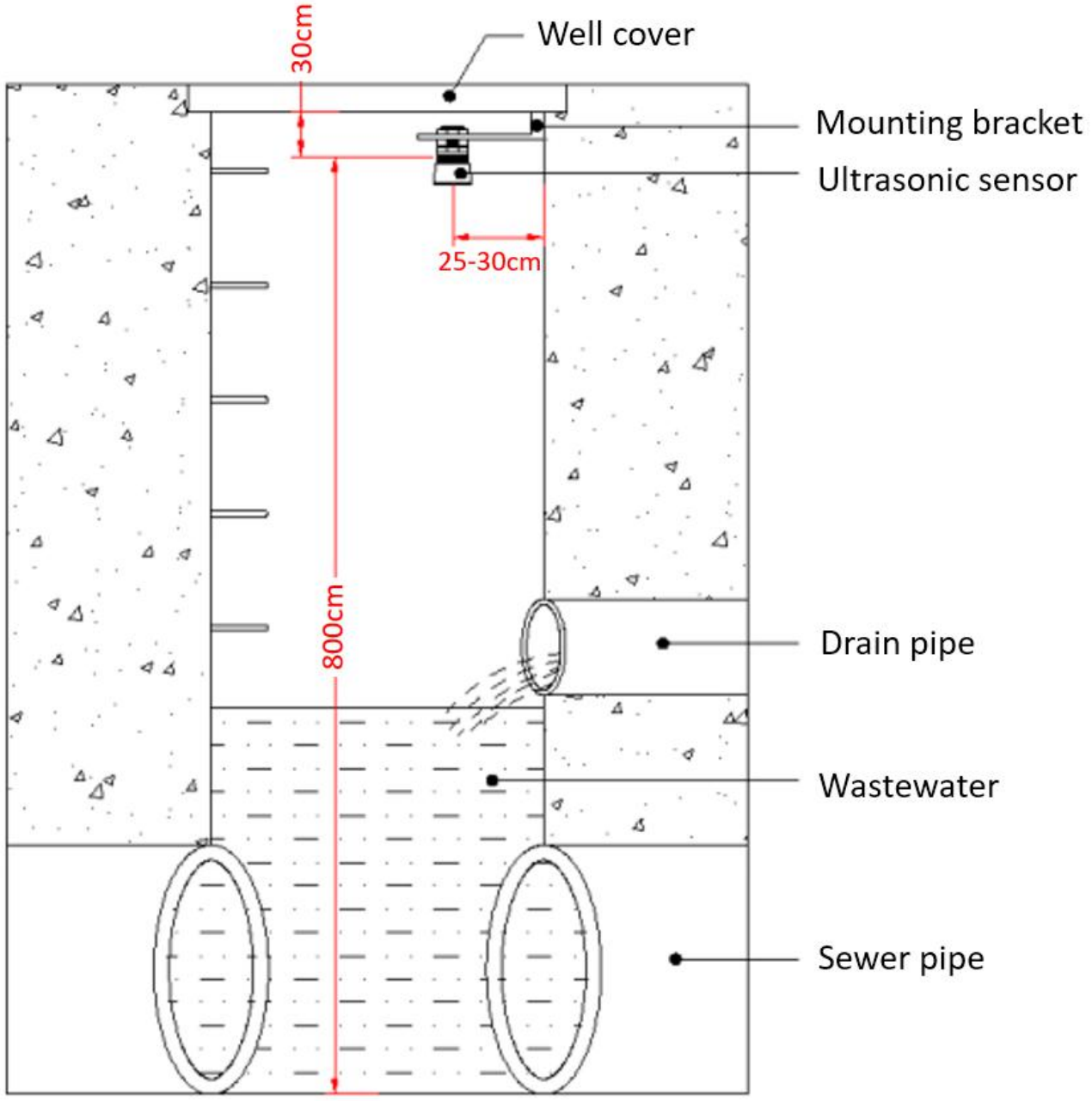
Installation Precautions:

- Please do not install the probe directly above areas where the liquid surface fluctuates violently, such as near water inlets and outlets, or where foam and floating debris tend to accumulate.
- Ensure there are no obstacles within the sensing area. For example, when installing in a well, please avoid placing the probe near ladders, inlet/outlet pipes, or similar structures.
- Please install the sensor as far as possible from equipment that generates strong electromagnetic interference.
- The ultrasonic probe should be mounted perpendicular to the surface of the measured object and secured firmly. A tilted or unstable probe could affect accuracy.

Install in a well

❶ Choose the flattest side of the well wall as the mounting surface. Install the sensor away from protruding objects on the wall such as steps.

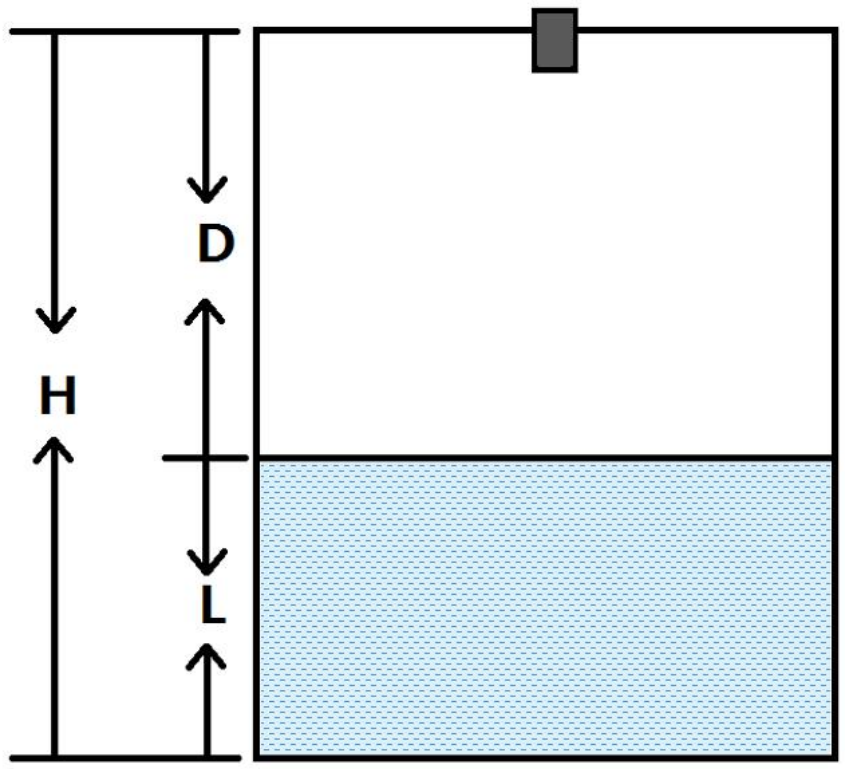
❷ The ideal distance between the sensor and the wall on the same side is 25 cm to 30 cm, and the distance from the sensor to the well cover should not exceed 30cm. Once installed and secured, the sensor should be perpendicular to the water surface and parallel to the wall.



Usage Precautions:

- Please keep the surface of the probe as clean as possible. Do not cover the ultrasonic sensor.
- If the probe becomes dirty, clean it with a soft damp cloth to avoid scratching the surface.
- Please do not use the sensor in environments with strong acids, strong alkalis, or other highly corrosive substances.
- Please keep the probe still and make sure it is protected from potential impacts.
- If the sensor is for outdoor applications, protection from lightning strikes should be considered.
- Please ensure a stable voltage supply during the operation of the sensor.
- When using the sensor for measurement of horizontal distance, the sensor must be installed at a height of at least 30 cm above the ground. (If the ground is uneven, the height should be greater than 30 cm.)

What is Fill Level and how to calculate it?



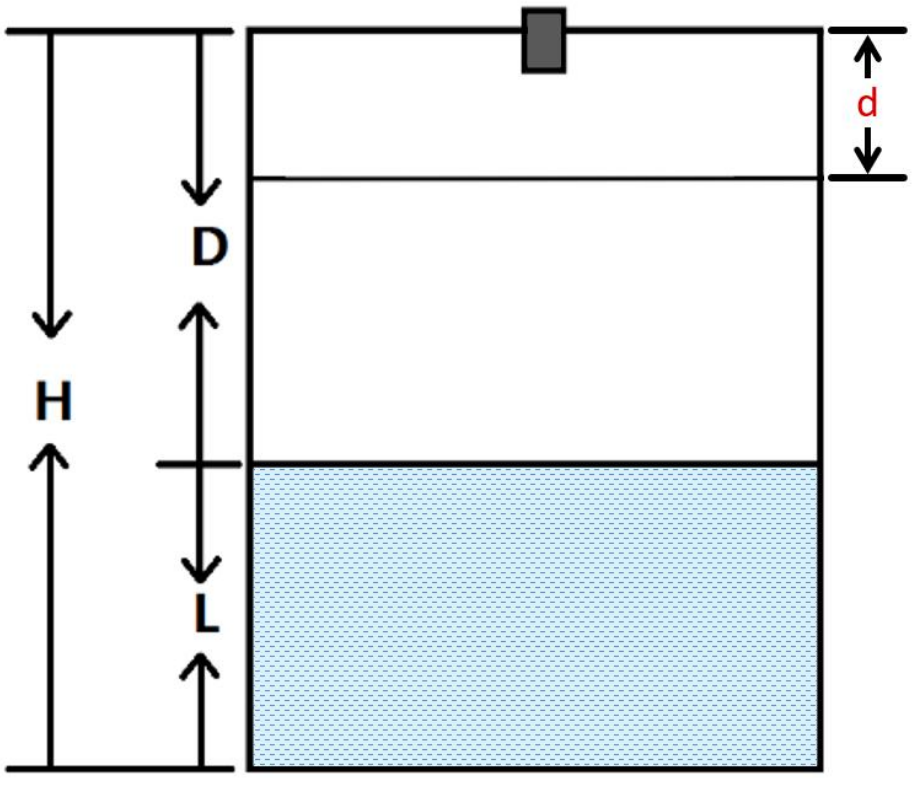
▼ When Dead Zone Distance = 0mm

H (Fill Max Distance): the height of the water tank

D (Distance): the distance between the sensor and the water

L: water level = H – D

Fill Level: the percentage of the water level in the tank



▼ When Dead Zone Distance is set

d (Dead Zone Distance): the distance that the sensor cannot detect

Fill Level: the percentage of the water level in the tank

8. Battery Passivation

Many Netvox devices are powered by 3.6V ER14505 / ER18505 Li-SOCl2 (lithium-thionyl chloride) batteries that offer many advantages including low self-discharge rate and high energy density. However, primary lithium batteries like Li-SOCl2 batteries will form a passivation layer as a reaction between the lithium anode and thionyl chloride if they are in storage for a long time or if the storage temperature is too high. This lithium chloride layer prevents rapid self-discharge caused by continuous reactions between lithium and thionyl chloride, but battery passivation may also lead to voltage delay when the batteries are put into operation, and our devices may not work correctly in this situation.

As a result, please make sure to purchase batteries from reliable vendors, and it is suggested that if the storage period is more than one month from the date of battery production, all the batteries should be activated. If encountering the situation of battery passivation, please **activate the battery with 67Ω load resistance for 8 minutes** to eliminate hysteresis in batteries.

R900 Assembly Precautions:

Disassembly and reassembly are only required when the user installs a new battery. In other cases, please do not disassemble. During the process of battery installation, do not touch the waterproof sealing strip, waterproof fixing head, etc. After the battery installation is completed, the enclosure screws must be assembled using an electric screwdriver with torque set to 4 kgf. (If no electric screwdriver is available, please use a cross screwdriver that matches the screws to tighten them, ensuring that the upper and lower covers are tightly assembled.) Otherwise, the airtightness after assembly may be affected.
When disassembling the device, it is recommended to first understand the internal structure of the device to avoid damage.

9. Important Maintenance Instructions

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

- Keep the device dry. Rain, moisture, or any liquid might contain minerals and thus corrode electronic circuits. If the device gets wet, please dry it completely.
- Do not use or store the device in a dusty or dirty environment. It might damage its detachable parts and electronic components.
- Do not store the device under extremely hot conditions. High temperatures can shorten the life of electronic devices, destroy batteries, and deform or melt some plastic parts.
- Do not store the device in places that are too cold. Otherwise, when the temperature rises, moisture that forms inside the device will damage the board.
- Do not throw, knock, or shake the device. Rough handling of equipment can destroy internal circuit boards and delicate structures.
- Do not clean the device with strong chemicals, detergents, or strong detergents.
- Do not apply the device with paint. Smudges might block the device and affect the operation.
- Do not throw the battery into the fire, or the battery will explode. Damaged batteries may also explode.

All of the above applies to your device, battery, and accessories. If any device is not operating properly, please take it to the nearest authorized service facility for repair