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# PS-CB/CS -- NB-IoT/LTE-M Air/Water Pressure Sensor User Manual



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# Table of Contents

1. Introduction	6
1.1 What is NB-IoT Pressure Sensor	6
1.2 Features	6
1.3 Specification	6
1.4 Probe Types	7
1.4.1 Thread Installation Type	8
1.4.2 Immersion Type	8
1.4.3 Wireless Differential Air Pressure Sensor	9
1.5 Application and Installation	9
1.5.1 Thread Installation Type	9
1.5.2 Immersion Type	10
1.5.3 Wireless Differential Air Pressure Sensor	14
1.6 Sleep mode and working mode	16
1.7 Button & LEDs	16
1.8 BLE connection	18
1.9 Pin Definitions , Switch & SIM Direction	18
1.8.1 Jumper JP2	18
1.8.2 BOOT MODE / SW1	19
1.8.3 Reset Button	19
1.8.4 SIM Card Direction	19
1.9 BLE connection	19
1.10 Mechanical	19
1.10.1 for CB version	20
1.10.2 for CS version	20
2. Use PS-CB/CS to communicate with IoT Server	20
2.1 Send data to IoT server via NB-IoT network	20
2.2 Payload Types	22
2.2.1 General Json Format(Type=5)	23
2.2.2 HEX format Payload(Type=0)	25
2.2.3 ThingsBoard Payload(Type=3)	29
2.2.4 ThingSpeak Payload(Type=1)	30

3. Configure PS-CB/CS .....	31
3.1 Configure Methods .....	31
3.2 Serial Access Password .....	31
3.3 AT Commands Set .....	34
3.4 Trggier an uplink by external interrupt .....	36
3.5 Set Power Output Duration .....	36
3.6 Set the Probe Model .....	38
3.7 Multiple VDC /IDC collections in one uplink .....	39
3.8 Clock logging .....	39
3.9 Power on / power off BG95 module .....	40
3.10 Example Query saved historical records .....	41
3.11 Uplink log query .....	42
3.12 Set CoAP option .....	43
3.12 Set the downlink debugging mode(Since firmware v1.1.0) .....	44
3.13 Report on Change Feature(Since v1.1.2) .....	44
4. Battery & Power Consumption .....	47
5. Firmware update .....	47
6. FAQ .....	47
6.1How can I access the BG95-NGFF AT Commands? .....	47
6.2 How to configure the device through the MQTT subscription function? .....	48
6.3 Differential pressure sensor tubing fitting installation .....	48
6.4 Why is there no LED response when I press the button on the solar panel model? .....	49
7. Order Info .....	49
7.1 Thread Installation Type & Immersion Type Pressure Sensor .....	49
7.2 Wireless Differential Air Pressure Sensor .....	50
8. Packing Info .....	51
9. Support .....	51



## Table of Contents:

- [1. Introduction](#)
  - [1.1 What is NB-LoT Pressure Sensor](#)
  - [1.2 Features](#)
  - [1.3 Specification](#)
  - [1.4 Probe Types](#)
    - [1.4.1 Thread Installation Type](#)
    - [1.4.2 Immersion Type](#)
    - [1.4.3 Wireless Differential Air Pressure Sensor](#)
  - [1.5 Application and Installation](#)
    - [1.5.1 Thread Installation Type](#)
    - [1.5.2 Immersion Type](#)
    - [1.5.3 Wireless Differential Air Pressure Sensor](#)
  - [1.6 Sleep mode and working mode](#)
  - [1.7 Button & LEDs](#)

- [1.8 BLE connection](#)
- [1.9 Pin Definitions , Switch & SIM Direction](#)
  - [1.8.1 Jumper JP2](#)
  - [1.8.2 BOOT MODE / SW1](#)
  - [1.8.3 Reset Button](#)
  - [1.8.4 SIM Card Direction](#)
- [1.9 BLE connection](#)
- [1.10 Mechanical](#)
  - [1.10.1 for CB version](#)
  - [1.10.2 for CS version](#)
- [2. Use PS-CB/CS to communicate with IoT Server](#)
  - [2.1 Send data to IoT server via NB-IoT network](#)
  - [2.2 Payload Types](#)
    - [2.2.1 General Json Format\(Type=5\)](#)
    - [2.2.2 HEX format Payload\(Type=0\)](#)
    - [2.2.3 ThingsBoard Payload\(Type=3\)](#)
    - [2.2.4 ThingSpeak Payload\(Type=1\)](#)
- [3. Configure PS-CB/CS](#)
  - [3.1 Configure Methods](#)
  - [3.2 Serial Access Password](#)
  - [3.3 AT Commands Set](#)
  - [3.4 Trggier an uplink by external interrupt](#)
  - [3.5 Set Power Output Duration](#)
  - [3.6 Set the Probe Model](#)
  - [3.7 Multiple VDC /IDC collections in one uplink](#)
  - [3.8 Clock logging](#)
  - [3.9 Power on / power off BG95 module](#)
  - [3.10 Example Query saved historical records](#)
  - [3.11 Uplink log\\_query](#)
  - [3.12 Set CoAP option](#)
  - [3.12 Set the downlink debugging mode\(Since firmware v1.1.0\)](#)
  - [3.13 Report on Change Feature\(Since v1.1.2\)](#)
- [4. Battery & Power Consumption](#)
- [5. Firmware update](#)
- [6. FAQ](#)
  - [6.1How can I access the BG95-NGFF AT Commands?](#)
  - [6.2 How to configure the device through the MQTT subscription function?](#)
  - [6.3 Differential pressure sensor tubing fitting installation](#)
  - [6.4 Why is there no LED response when I press the button on the solar panel model?](#)
- [7. Order Info](#)
  - [7.1 Thread Installation Type & Immersion Type Pressure Sensor](#)
  - [7.2 Wireless Differential Air Pressure Sensor](#)
- [8. Packing Info](#)
- [9. Support](#)

# 1. Introduction

## 1.1 What is NB-IoT Pressure Sensor

The Dragino PS-CB/CS series sensors are **NB-IoT/LTE-M Pressure Sensor** for Internet of Things solution. PS-CB/CS can **measure Air, Water pressure and liquid level** and upload the sensor data send to IoT platform via NB-IoT network.

The PS-CB/CS series sensors include **Thread Installation Type and Immersion Type**, it supports **different pressure range** which can be used for different measurement requirement.

PS-CB/CS supports different uplink methods including **MQTT, MQTTs, UDP, TCP or CoAP** for different application requirement, and support uplinks to various IoT Servers.

PS-CB/CS **supports BLE configure** and **OTA update** which make user easy to use.

PS-CB/CS is powered by **8500mAh Li-SOCI2 battery** or **solar powered + Li-ion battery**, it is designed for long-term use up to several years.

PS-CB/CS has optional built-in SIM card and default IoT server connection version. Which makes it works with simple configuration.

\*make sure you have NB-IoT or CAT-M1 coverage locally.

## 1.2 Features

- For -NB Bands: B1/B2/B3/B4/B5/B8/B12/B13/B17/B18/B19/B20/B25/B28/B66/B70/B85
- For -CB Bands: B1/B2/B3/B4/B5/B8/B12/B13//B18/B19/B20/B25/B28/B66/B71/B85
- CAT-M1 / LTE-M Bands: B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B25/B26/B27/B28/B66/B85
- Ultra-low power consumption
- Measure air / gas or water pressure
- Different pressure range available
- Thread Installation Type or Immersion Type
- Multiply Sampling and one uplink
- Support Bluetooth v5.1 remote configure and update firmware
- Uplink on periodically
- Downlink to change configure
- 8500mAh Li/SOCI2 Battery (PS-CB)
- Solar panel + 3000mAh Li-ion battery (PS-CS)
- IP66 Waterproof Enclosure
- Uplink via MQTT, MQTTs, TCP, UDP or CoAP
- Nano SIM card slot for NB-IoT SIM

## 1.3 Specification

### Common DC Characteristics:

- Supply Voltage: 2.5v ~ 3.6v

- Operating Temperature: -40 ~ 85°C

#### **Current Input (DC) Measuring :**

- Range: 0 ~ 20mA
- Accuracy: 0.02mA
- Resolution: 0.001mA

#### **Voltage Input Measuring:**

- Range: 0 ~ 30v
- Accuracy: 0.02v
- Resolution: 0.001v

#### **NB-IoT Spec:**

##### **NB-IoT Module: BG95-NGFF**

#### **Support Bands:**

- B1 @H-FDD: 2100MHz
- B2 @H-FDD: 1900MHz
- B3 @H-FDD: 1800MHz
- B4 @H-FDD: 2100MHz
- B5 @H-FDD: 860MHz
- B8 @H-FDD: 900MHz
- B12 @H-FDD: 720MHz
- B13 @H-FDD: 740MHz
- B17 @H-FDD: 730MHz
- B18 @H-FDD: 870MHz
- B19 @H-FDD: 870MHz
- B20 @H-FDD: 790MHz
- B25 @H-FDD: 1900MHz
- B28 @H-FDD: 750MHz
- B66 @H-FDD: 2000MHz
- B70 @H-FDD: 2000MHz
- B85 @H-FDD: 700MHz

#### **Battery:**

- Li/SOCI2 un-chargeable battery
- Capacity: 8500mAh
- Self Discharge: <1% / Year @ 25°C
- Max continuously current: 130mA
- Max boost current: 2A, 1 second

#### **Power Consumption**

- STOP Mode: 10uA @ 3.3v
- Max transmit power: 350mA@3.3v

## 1.4 Probe Types

### 1.4.1 Thread Installation Type



- Hersman Pressure Transmitter
- Measuring Range: -0.1 ~ 0 ~ 60MPa, see order info.
- Accuracy: 0.2% F.S
- Long-Term Stability: 0.2% F.S  $\pm$ 0.05%
- Overload 200% F.S
- Zero Temperature Drift: 0.03% FS/ $^{\circ}$ C( $\leq$ 100Kpa), 0.02%FS/ $^{\circ}$ C(>100Kpa)
- FS Temperature Drift: 0.003% FS/ $^{\circ}$ C( $\leq$ 100Kpa), 0.002%FS/ $^{\circ}$ C(>100Kpa)
- Storage temperature: -30 $^{\circ}$ C~80 $^{\circ}$ C
- Operating temperature: -20 $^{\circ}$ C~60 $^{\circ}$ C
- Connector Type: Various Types, see order info

### 1.4.2 Immersion Type



- Immersion Type, Probe IP Level: IP68
- Measuring Range: Measure range can be customized, up to 100m.
- Accuracy: 0.2% F.S
- Long-Term Stability:  $\pm$ 0.2% F.S / Year
- Storage temperature: -30 $^{\circ}$ C~80 $^{\circ}$ C
- Operating temperature: 0 $^{\circ}$ C~50 $^{\circ}$ C
- Material: 316 stainless steels

### 1.4.3 Wireless Differential Air Pressure Sensor



- Measuring Range: -100Pa ~ 100KPa(Optional measuring range).
- Accuracy: 0.5% F.S, resolution is 0.05%.
- Overload: 300% F.S
- Zero temperature drift:  $\pm 0.03\%$ F.S/ $^{\circ}$ C
- Operating temperature:  $-20^{\circ}$ C~ $60^{\circ}$ C
- Storage temperature:  $-20^{\circ}$ C~ $60^{\circ}$ C
- Compensation temperature:  $0\sim 50^{\circ}$ C

## 1.5 Application and Installation

### 1.5.1 Thread Installation Type

#### Application:

- Hydraulic Pressure
- Petrochemical Industry
- Health and Medical
- Food & Beverage Processing
- Auto-controlling house
- Constant Pressure Water Supply
- Liquid Pressure measuring

Order the suitable thread size and install to measure the air / liquid pressure

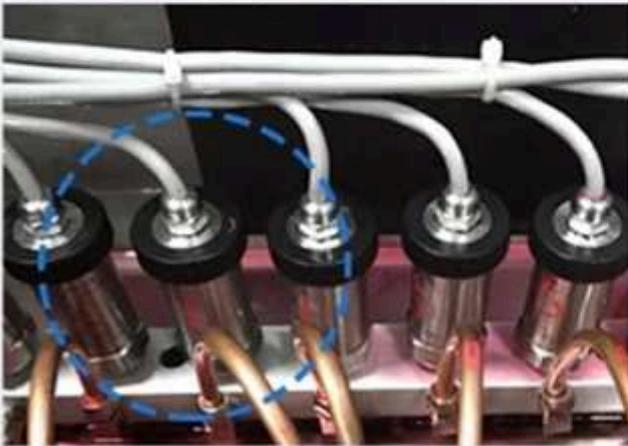
## Apply to various industrial applications



Water supply pressure



Hydraulic equipment



Laboratory facilities



Air pressure detection

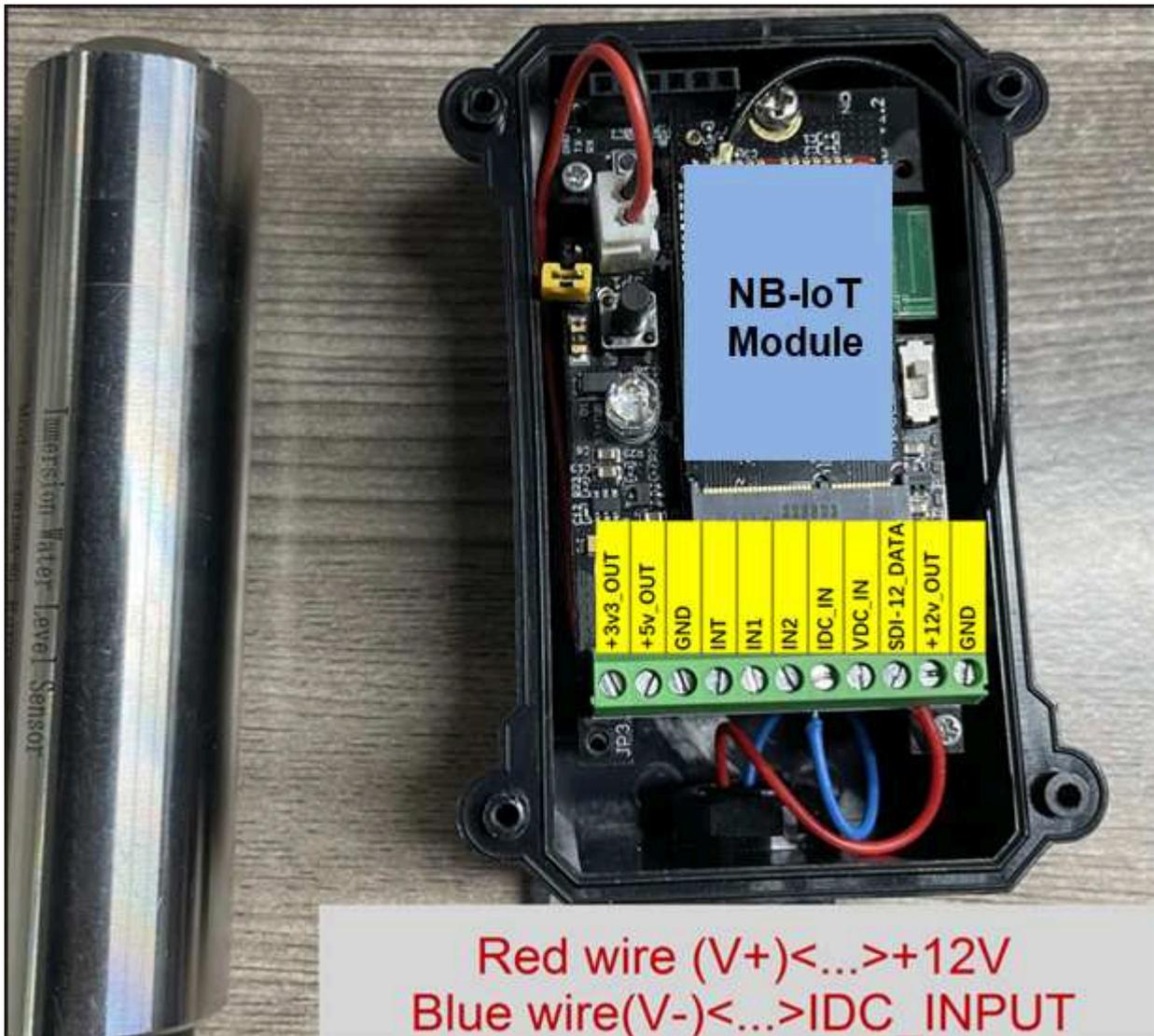
### 1.5.2 Immersion Type

#### **Application:**

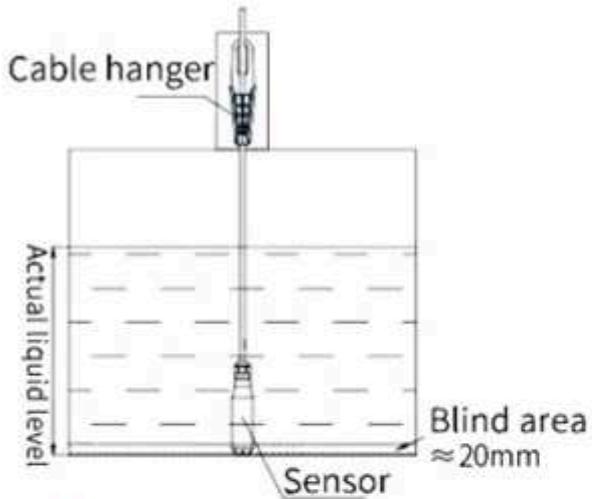
Liquid & Water Pressure / Level detect.



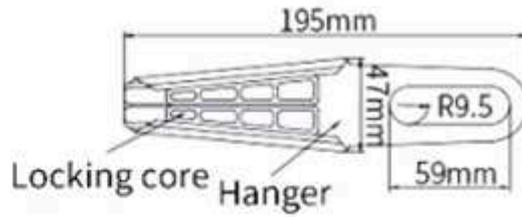
The Immersion Type pressure sensor is shipped with the probe and device separately. When user got the device, below is the wiring to for connect the probe to the device.



# Installation Diagram



**Cable Hanger Installation**

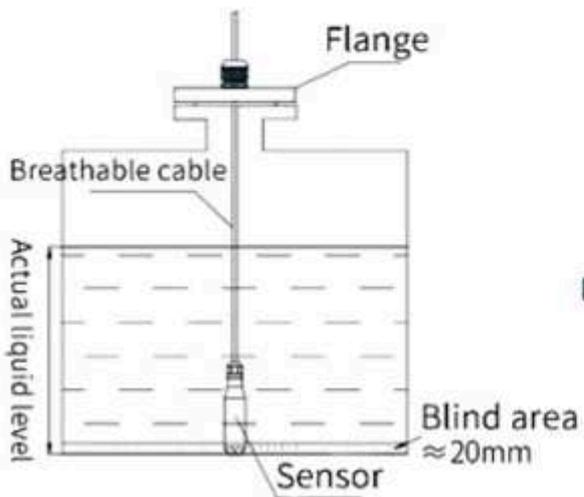


Locking core material: Engineering plastic

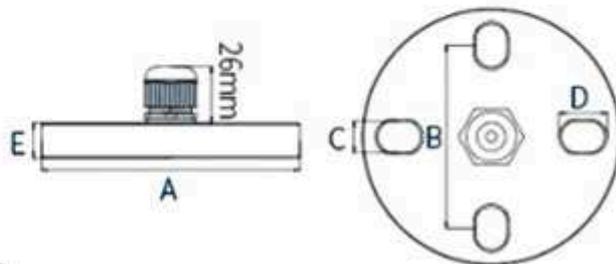
Hanger material: 304 stainless steel

Weight: 110g

**Cable Hanger Size**

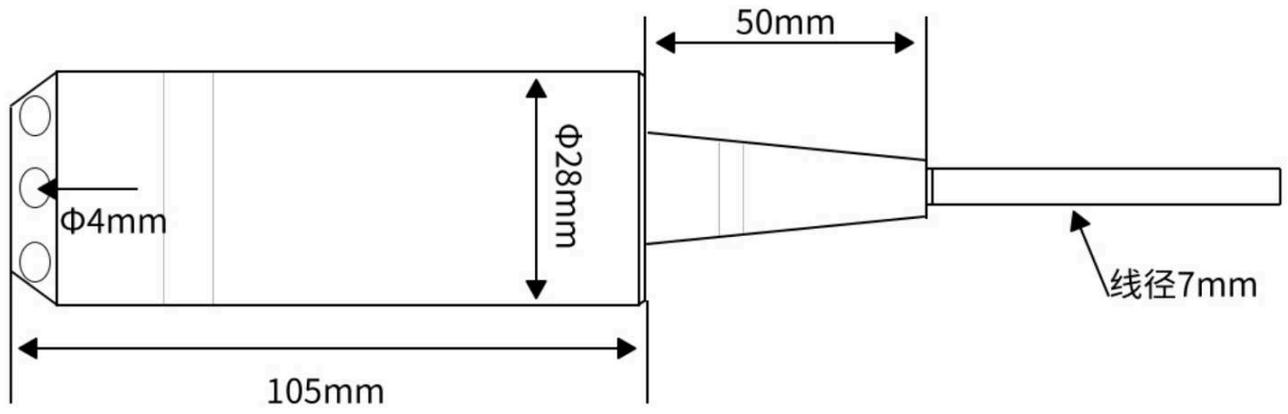


**Flange Fixed Installation**



**Flange Fixed Size**

Size of immersion type water depth sensor:

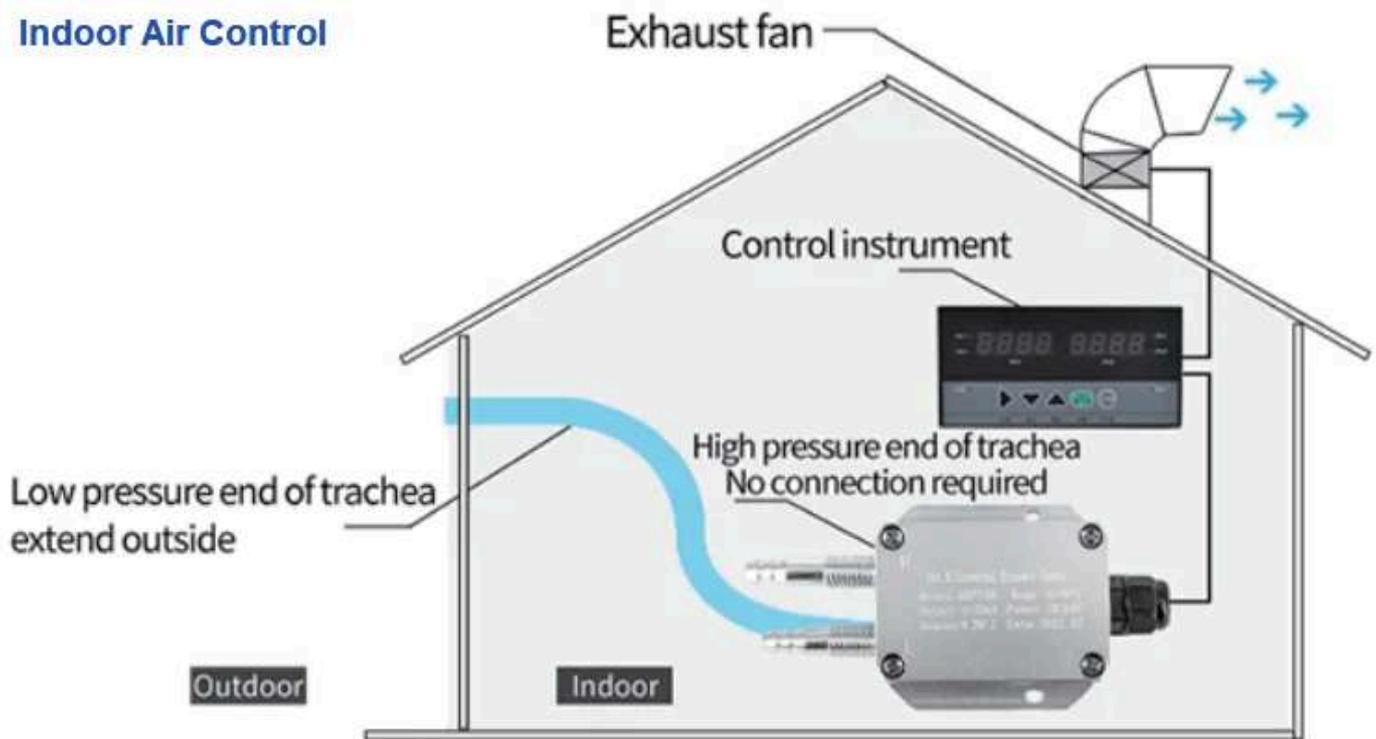


### 1.5.3 Wireless Differential Air Pressure Sensor

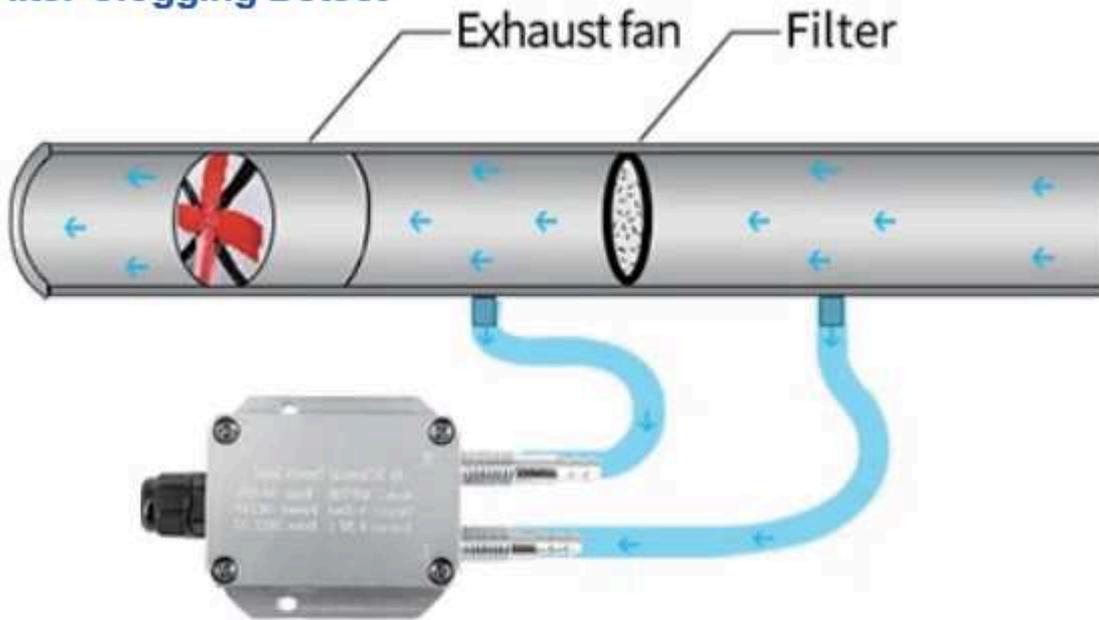
**Application:**

Indoor Air Control & Filter clogging Detect.

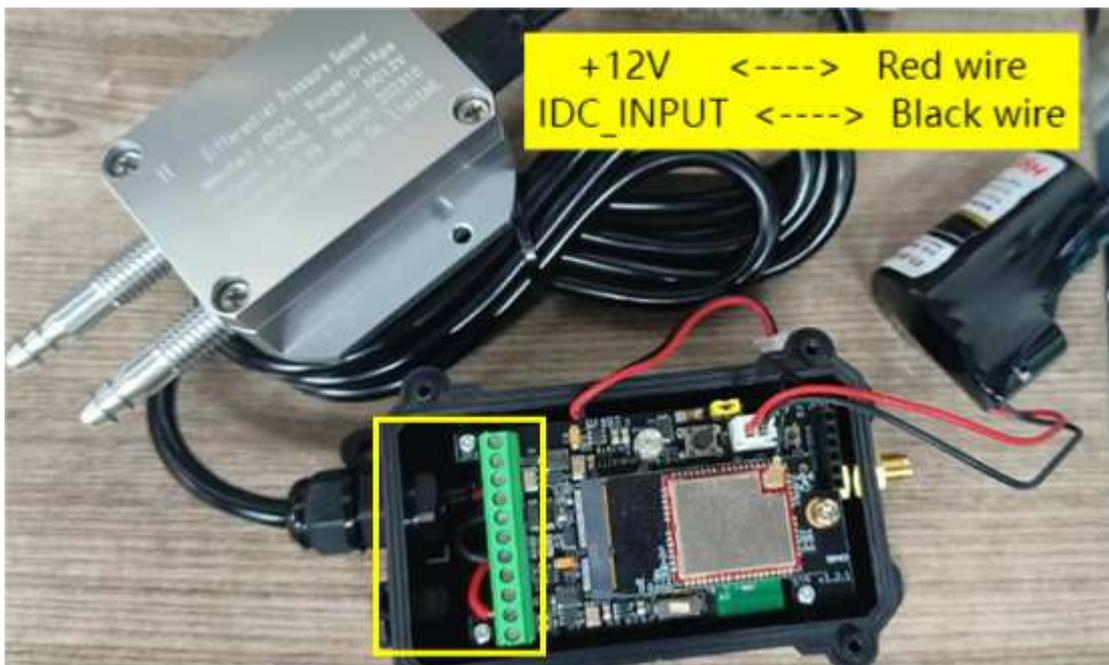
**Indoor Air Control**



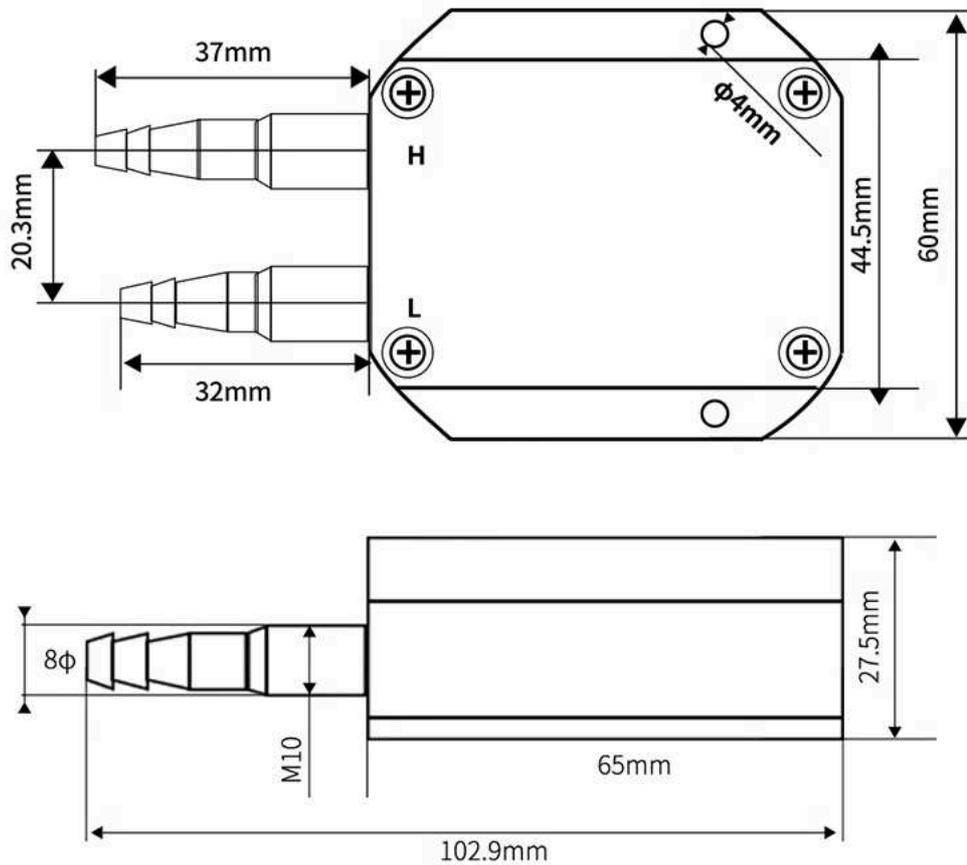
## Filter Clogging Detect



Below is the wiring for connect the probe to the device.



Size of wind pressure transmitter:



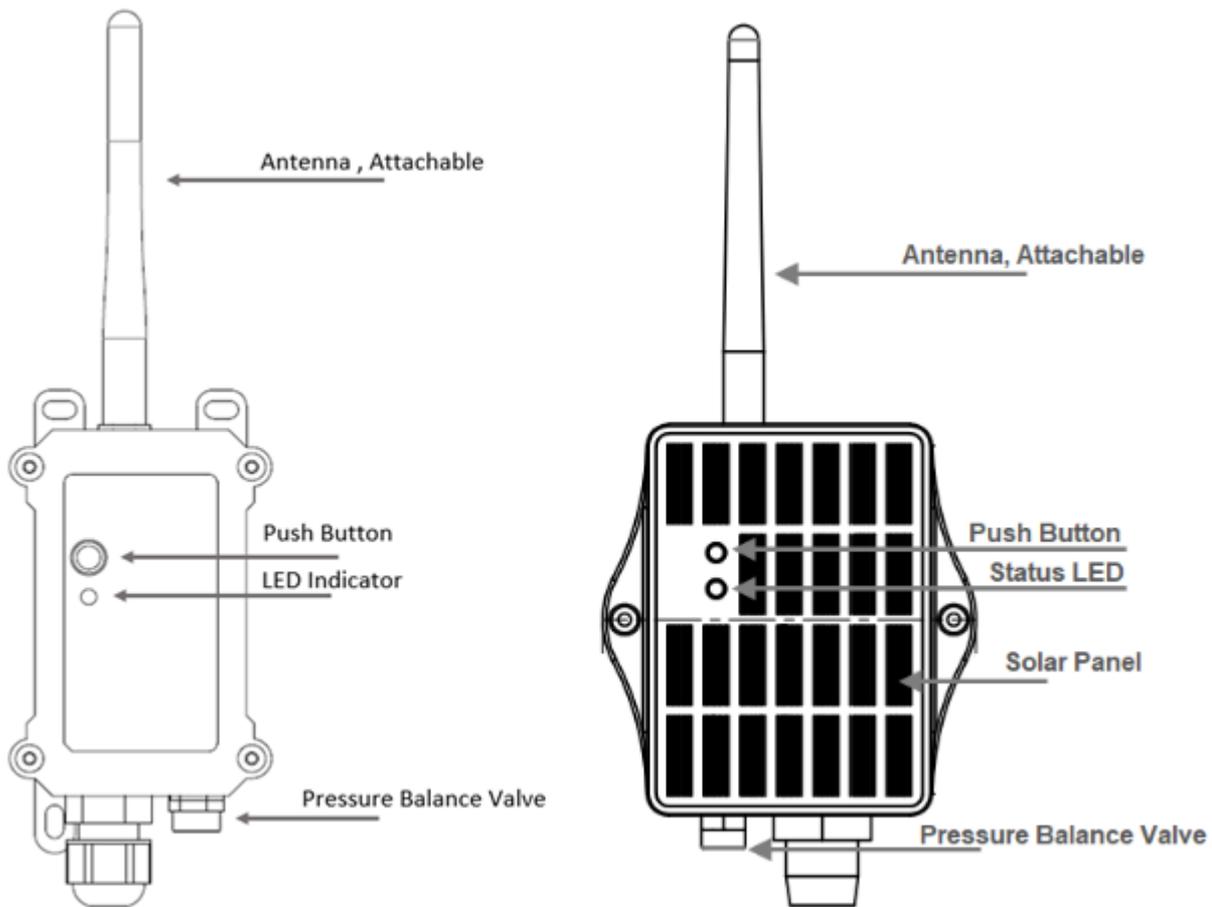
**Note: The above dimensions are measured by hand, and the numerical error of the shell is within  $\pm 0.2mm$ .**

## 1.6 Sleep mode and working mode

**Deep Sleep Mode:** Sensor doesn't have any NB-IoT activate. This mode is used for storage and shipping to save battery life.

**Working Mode:** In this mode, Sensor will work as NB-IoT Sensor to Join NB-IoT network and send out sensor data to server. Between each sampling/tx/rx periodically, sensor will be in IDLE mode), in IDLE mode, sensor has the same power consumption as Deep Sleep mode.

## 1.7 Button & LEDs



Behavior on ACT	Function	Action
 1~3s	Send an uplink	If sensor has already attached to NB-IoT/CAT-M1 network, sensor will send an uplink packet, <b>blue led</b> will blink once. Meanwhile, BLE module will be active and user can connect via BLE to configure device.
 >3s	Active Device	<b>Green led</b> will fast blink 5 times, device will enter <b>OTA mode</b> for 3 seconds. And then start to attach NB-IoT/CAT-M1 network. Once sensor is active, BLE module will be active and user can connect via BLE to configure device, no matter if device attach NB-IoT/CAT-M1 network or not.
 x5	Deactivate Device	<b>Red led</b> will solid on for 5 seconds. Means device is in Deep Sleep Mode.

**Note: When the device is executing a program, the buttons may become invalid. It is best to press the buttons after the device has completed the program execution.**

## 1.8 BLE connection

PS-CB/CS support BLE remote configure and firmware update.

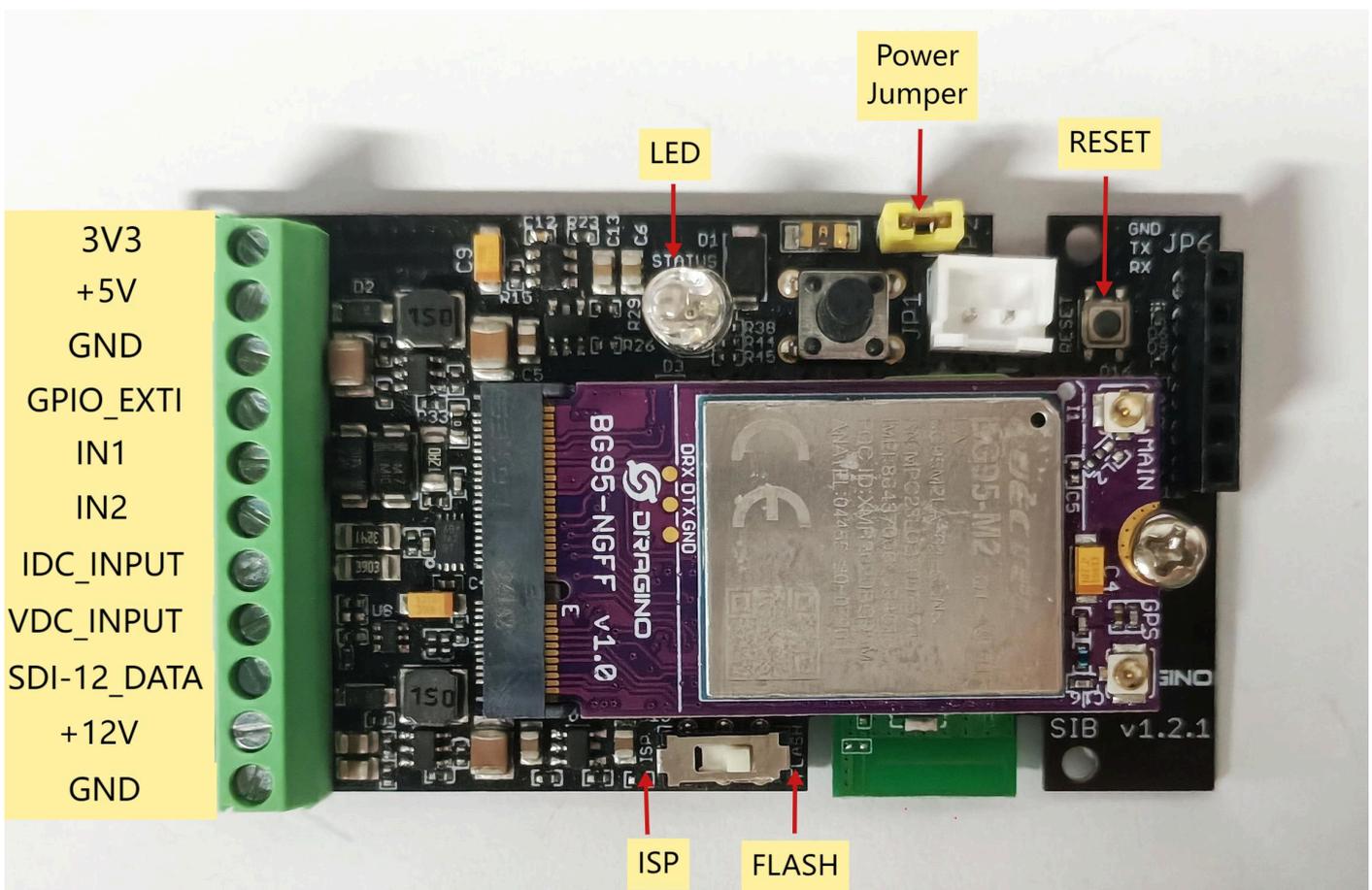
BLE can be used to configure the parameter of sensor or see the console output from sensor. BLE will be only activate on below case:

- Press button to send an uplink
- Press button to active device.
- Device Power on or reset.

If there is no activity connection on BLE in 60 seconds, sensor will shut down BLE module to enter low power mode.

## 1.9 Pin Definitions , Switch & SIM Direction

PS-CB/CS use the mother board which as below.



### 1.8.1 Jumper JP2

Power on Device when put this jumper.

## 1.8.2 BOOT MODE / SW1

1) **ISP**: upgrade mode, device won't have any signal in this mode. but ready for upgrade firmware. LED won't work. Firmware won't run.

2) **Flash**: work mode, device starts to work and send out console output for further debug

## 1.8.3 Reset Button

Press to reboot the device.

## 1.8.4 SIM Card Direction

See this link. [How to insert SIM Card](#) .

## 1.9 BLE connection

PS-CB/CS support BLE remote configure.

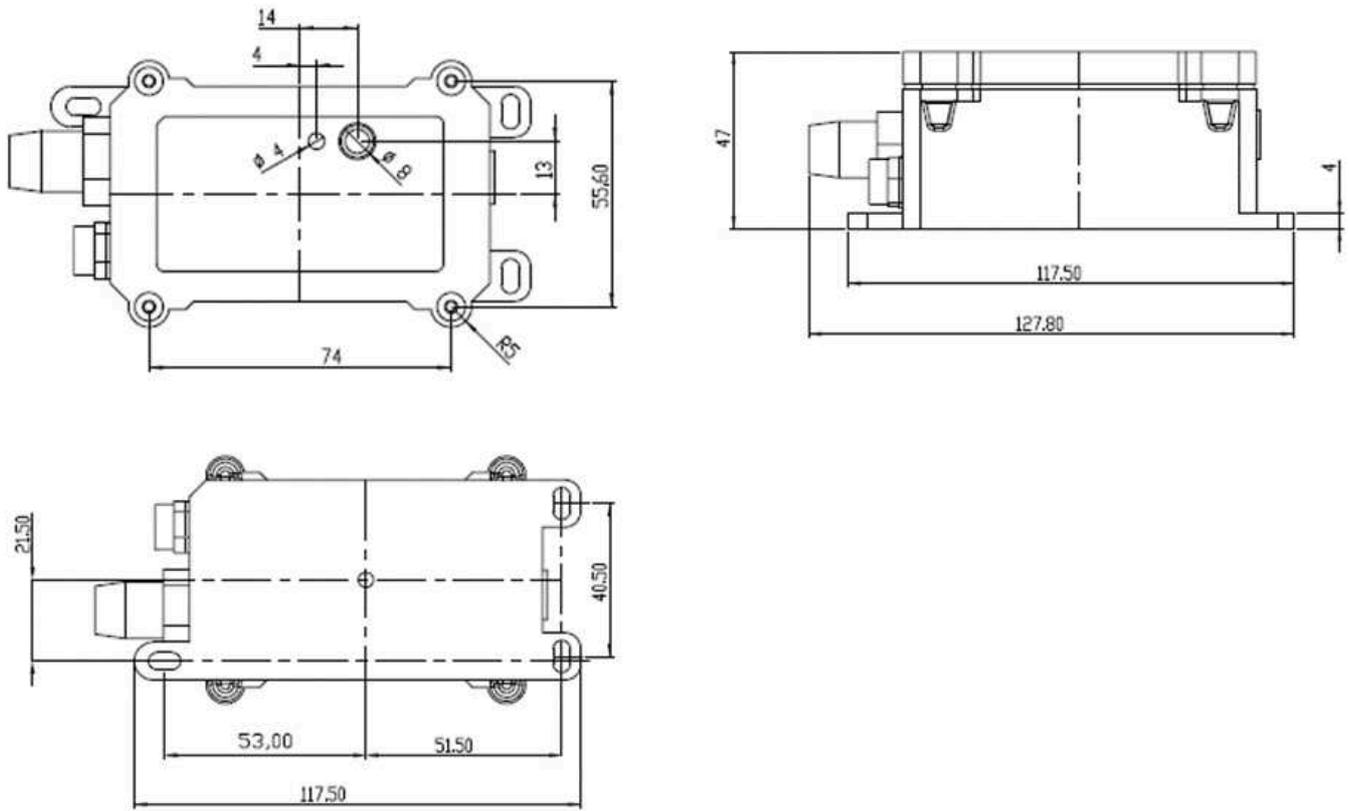
BLE can be used to configure the parameter of sensor or see the console output from sensor. BLE will be only activate on below case:

- Press button to send an uplink
- Press button to active device.
- Device Power on or reset.

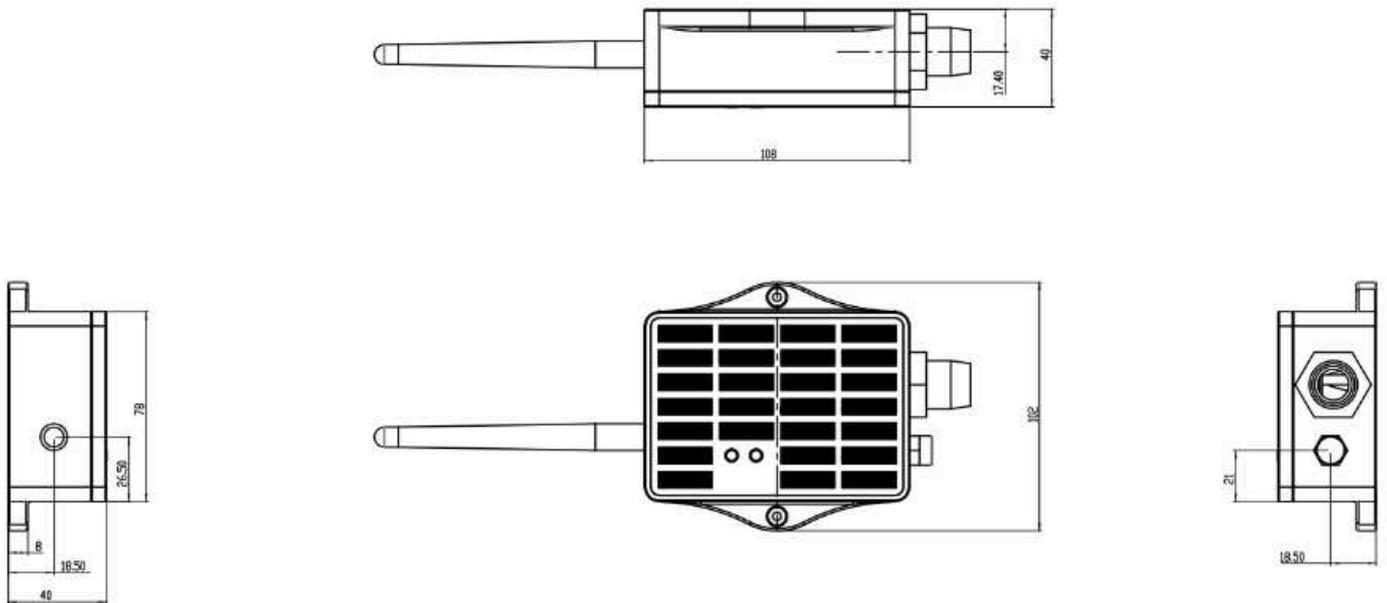
If there is no activity connection on BLE in 60 seconds, sensor will shut down BLE module to enter low power mode.

## 1.10 Mechanical

### 1.10.1 for CB version



### 1.10.2 for CS version



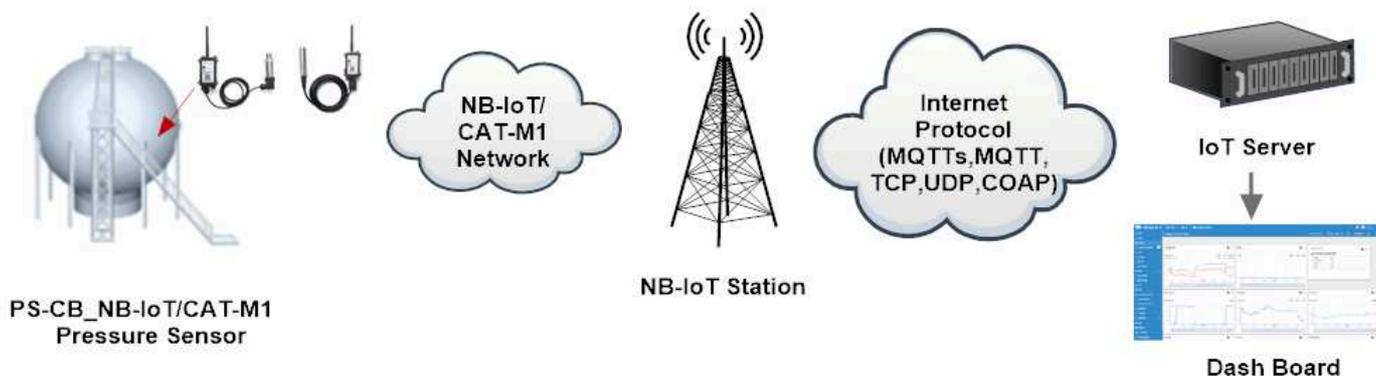
## 2. Use PS-CB/CS to communicate with IoT Server

### 2.1 Send data to IoT server via NB-IoT network

The PS-CB/CS is equipped with a NB-IoT module, the pre-loaded firmware in PS-CB/CS will get environment data from sensors and send the value to local NB-IoT network via the NB-IoT module. The NB-IoT network will forward this value to IoT server via the protocol defined by PS-CB/CS.

Below shows the network structure:

### PS-CB in a NB-IoT/CAT-M1 Network



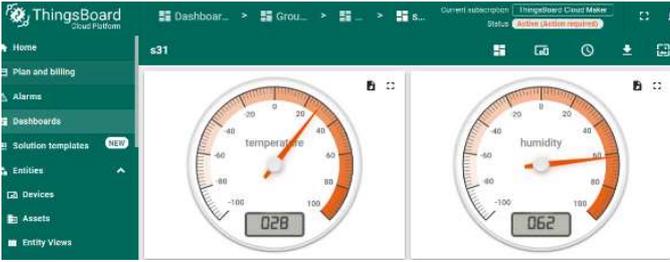
There are two version: **-GE** and **-1T** version of PS-CB/CS.

**GE Version:** This version doesn't include SIM card or point to any IoT server. User needs to use AT Commands to configure below two steps to set PS-CB/CS send data to IoT server.

- Install NB-IoT SIM card and configure APN. See instruction of [Attach Network](#).
- Set up sensor to point to IoT Server. See instruction of [Configure to Connect Different Servers](#).

Below shows result of different server as a glance.

Servers	Dash Board	Comments
<a href="#">Node-Red</a>		
<a href="#">DataCake</a>		
<a href="#">Tago.IO</a>		

<a href="#">General UDP</a>	Raw Payload. Need Developer to design Dash Board	
<a href="#">General MQTT</a>	Raw Payload. Need Developer to design Dash Board	
<a href="#">ThingSpeak</a>		
<a href="#">ThingsBoard</a>		

**1T Version:** This version has 1NCE SIM card pre-installed and configure to send value to ThingsEye. User Just need to select the sensor type in ThingsEyeand Activate PS-CB/CS and user will be able to see data in ThingsEye. See here for [ThingsEye Config Instruction](#).

## 2.2 Payload Types

To meet different server requirement, PS-CB-NA supports different payload type.

### Includes:

- [General JSON format payload](#). (Type=5)
- [HEX format Payload](#). (Type=0)
- [ThingSpeak Format](#). (Type=1)
- [ThingsBoard Format](#). (Type=3)

User can specify the payload type when choose the connection protocol. Example:

- AT+PRO=2,0** // Use UDP Connection & hex Payload
- AT+PRO=2,5** // Use UDP Connection & Json Payload
- AT+PRO=3,0** // Use MQTT Connection & hex Payload
- AT+PRO=3,1** // Use MQTT Connection & ThingSpeak
- AT+PRO=3,3** // Use MQTT Connection & ThingsBoard
- AT+PRO=3,5** // Use MQTT Connection & Json Payload
- AT+PRO=4,0** // Use TCP Connection & hex Payload
- AT+PRO=4,5** // Use TCP Connection & Json Payload

Since firmware V1.1.0, **IMSI** has been added to payload.

Since firmware V1.1.2, [Report on Change Feature](#) has been added to PS-CB, so payload adds **idc\_alarm** and **vdc\_alarm**.

The following describes the latest payload.

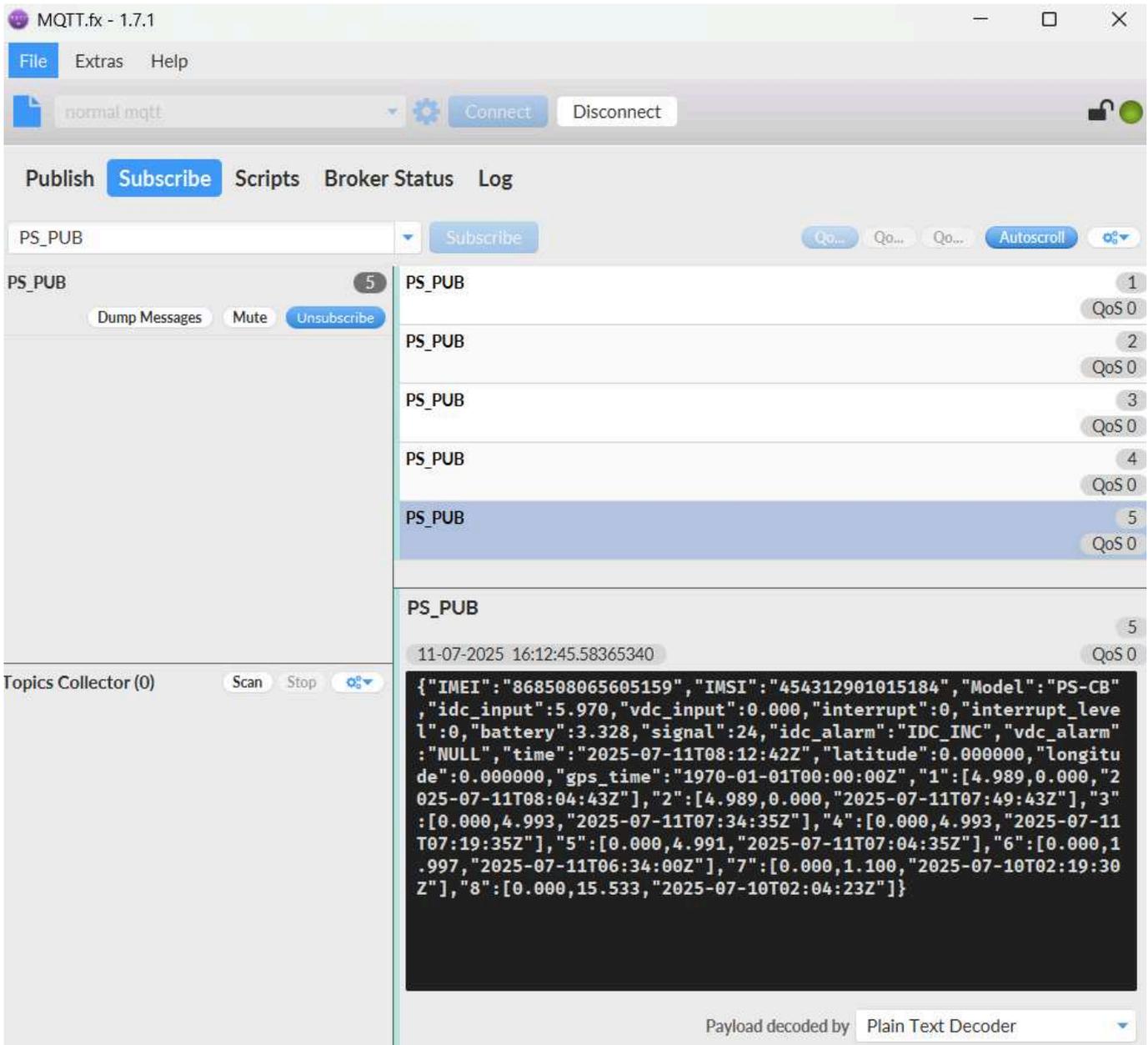
**Note: The default is AT+GPS=0 // The GPS function is not enabled. Therefore, the GPS collection time in the following example payload does not follow the system time, and the latitude and longitude are 0.**

## 2.2.1 General Json Format(Type=5)

This is the General Json Format. As below:

```
{"IMEI":"868508065605159","IMSI":"454312901015184","Model":"PS-CB","idc_input":5.970,"vdc_input":0.000,"interrupt":0,"interrupt_level":0,"battery":3.328,"signal":24,"idc_07-11T08:12:42Z","latitude":0.000000,"longitude":0.000000,"gps_time":"1970-01-01T00:00:00Z","1":[4.989,0.000,"2025-07-11T08:04:43Z"],"2":[4.989,0.000,"2025-07-11T07:49:43Z"],"3":[0.000,4.993,"2025-07-11T07:34:35Z"],"4":[0.000,4.993,"2025-07-11T07:19:35Z"],"5":[0.000,4.991,"2025-07-11T07:04:35Z"],"6":[0.000,1.997,"2025-07-11T06:34:00Z"],"7":[0.000,1.100,"2025-07-10T02:19:30Z"],"8":[0.000,15.533,"2025-07-10T02:04:23Z"]}
```

If we use the MQTT client to subscribe to this MQTT topic, we can see the following information when the CB sensor uplink data.



**Notice, from above payload:**

- idc\_input, vdc\_input, interrupt, interrupt\_level, battery, signal, idc\_alarm, vdc\_alarm, time, latitude, longitude & GPS time are the value at uplink time.
- Json entry 1 ~ 8 are the last 1 ~ 8 sampling data as specify by **AT+CLOCKLOG=1,65535,15,8** Command. Each entry includes (from left to right): Idc\_input, Vdc\_input, Sampling time.
- For **idc\_alarm** and **vdc\_alarm**, there are three possible states:
  - ①When the uplink packet is not triggered by a ROC alarm, the status will be **NULL**.
  - ②When the uplink packet is triggered by a ROC alarm due to incremental change exceeding the threshold, the status will be:
   
"idc\_alarm": **"IDC\_INC"**
  
"vdc\_alarm": **"IDC\_INC"**





### Signal Strength:

NB-IoT Network signal Strength.

**Ex1: 0x13 = 19**

**0** -113dBm or less

**1** -111dBm

**2...30** -109dBm... -53dBm

**31** -51dBm or greater

**99** Not known or not detectable

### IN1 & IN2:

IN1 and IN2 are used as Digital input pins.

#### Example:

01 (H): IN1 or IN2 pin is high level.

00 (L): IN1 or IN2 pin is low level.

### GPIO\_EXTI Level:

GPIO\_EXTI is used as Interrupt Pin.

#### Example:

01 (H): GPIO\_EXTI pin is high level.

00 (L): GPIO\_EXTI pin is low level.

### GPIO\_EXTI Flag:

This data field shows if this packet is generated by **Interrupt Pin** or not.

Note: The Interrupt Pin is a separate pin in the screw terminal.

#### Example:

0x00: Normal uplink packet.

0x01: Interrupt Uplink Packet.

### idc\_alarm

This data field indicates whether the uplink data packets are generated by the IDC's ROC alarm.

#### Example:

0x00: Normal uplink packet.

0x01: Uplink message triggered by ROC alarm due to incremental change exceeding the threshold.

0x02: Uplink message triggered by ROC alarm due to decremental change exceeding the threshold.

## vdc\_alarm

This data field indicates whether the uplink data packets are generated by the VDC's ROC alarm.

### Example:

0x00: Normal uplink packet.

0x01: Uplink message triggered by ROC alarm due to incremental change exceeding the threshold.

0x02: Uplink message triggered by ROC alarm due to decremental change exceeding the threshold.

### Probe Model:

PS-CB-NA might connect to different kind of probes, 4~20mA represent the full scale of the measuring range. So a 12mA output means different meaning for different probe.

For example.

Probe Type	4~20mA scale for this probe	Example: 12mA actually meaning for this probe
PH Combination Electrodes	0 ~ 14 pH	PH Value: 7
Water Pressure Sensor	0~5 meters	2.5 meters pure water
Pressure transmitter probe	0~1MPa	0.5MPa air / gas or water pressure

User can set different probe model for above probes. So IoT server is able to see identical how it should parse the 4~20mA or 0~30v sensor value and get the correct value.

### Latitude:

EX1: 0x00000000 // Locating fails or is not enabled.

EX2: 0x015a771e(H)=22705950(D)=22.705950

### Longitude:

EX1: 0x00000000 // Locating fails or is not enabled.

EX2: 0x114242500(H)=114242500(D)=114.242500

### GPS\_Timestamp:

EX1: 0x00000000 // The value is "1970-01-01T00:00:00Z" in JSON format. The initial GPS time is not refreshed if GPS positioning is disabled or fails.

EX2: 0x6682595d = 1719818589 = 2024-07-01 15:23:09

### 0~20mA:

#### Example:

27AE(H) = 10158 (D)/1000 = 10.158mA.

4~20mA Sensor Type	Connection to PS-NB-NA
2-wire Type	VCC(12v)<-->+12v_OUT
	OUT<-->IDC_IN
3-wire Type	VCC(12v)<-->+12v_OUT
	OUT<-->IDC_IN
	GND<-->GND

Connect to a 2 wire 4~20mA sensor.



### 0~30V:

Measure the voltage value. The range is 0 to 30V.

### Example:

$$138E(H) = 5006(D)/1000 = 5.006V$$

### TimeStamp:

Unit TimeStamp Example: 66A31694(H) = 1721964180(D)

Put the decimal value into this link(<https://www.epochconverter.com>) to get the time.

## 2.2.3 ThingsBoard Payload(Type=3)

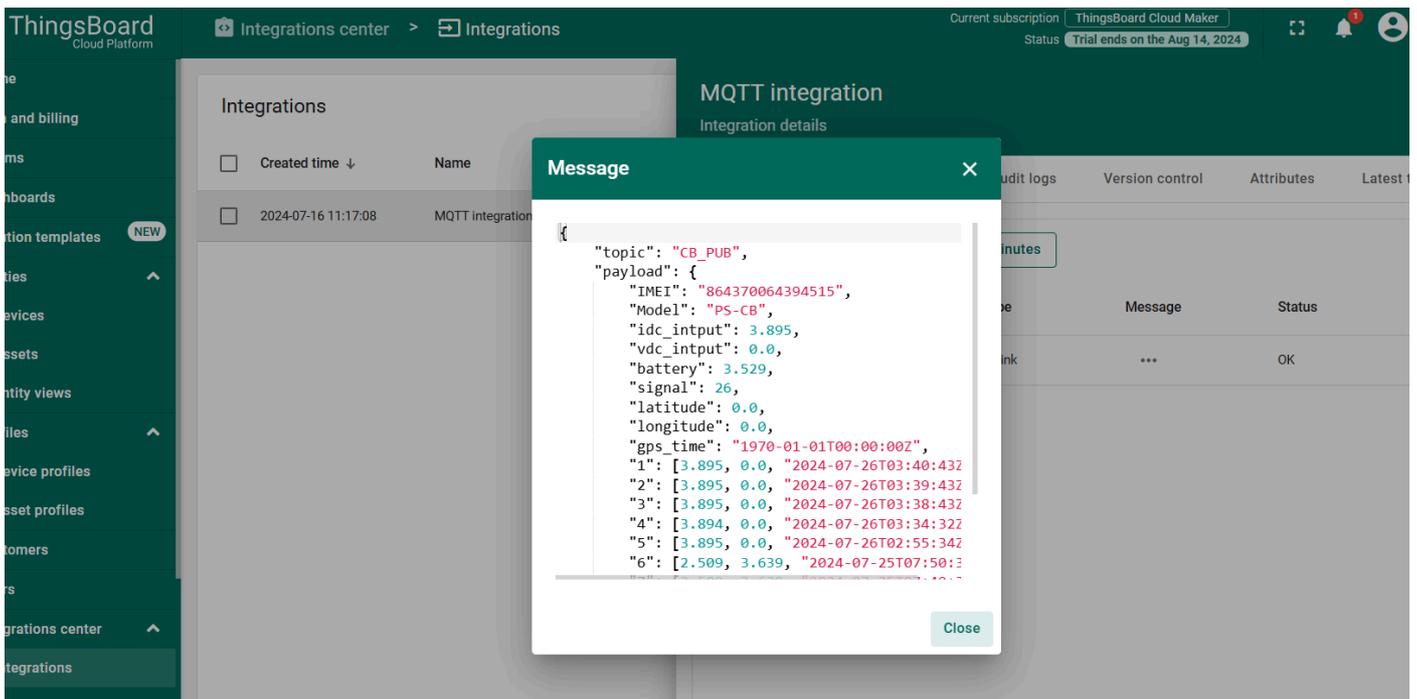
Type3 payload special design for ThingsBoard, it will also configure other default server to ThingsBoard.

```
{
  "topic": "CB_PUB",
  "payload": {
```

```

"IMEI": "864370064394515",
"Model": "PS-CB",
"idc_input": 3.895,
"vdc_input": 0.0,
"battery": 3.529,
"signal": 26,
"latitude": 0.0,
"longitude": 0.0,
"gps_time": "1970-01-01T00:00:00Z",
"1": [3.895, 0.0, "2024-07-26T03:40:43Z"],
"2": [3.895, 0.0, "2024-07-26T03:39:43Z"],
"3": [3.895, 0.0, "2024-07-26T03:38:43Z"],
"4": [3.894, 0.0, "2024-07-26T03:34:32Z"],
"5": [3.895, 0.0, "2024-07-26T02:55:34Z"],
"6": [2.509, 3.639, "2024-07-25T07:50:36Z"],
"7": [2.509, 3.639, "2024-07-25T07:49:36Z"],
"8": [2.509, 3.64, "2024-07-25T07:48:36Z"]
}
}

```



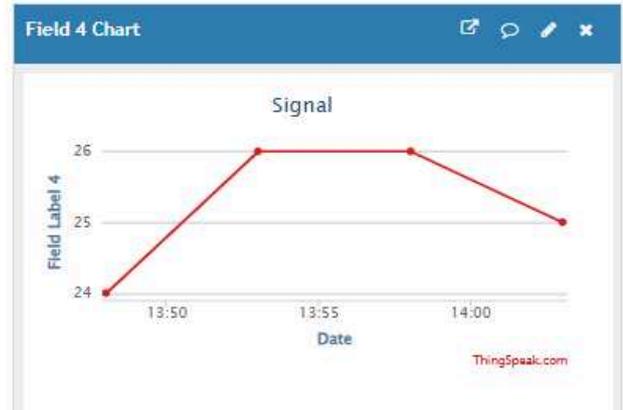
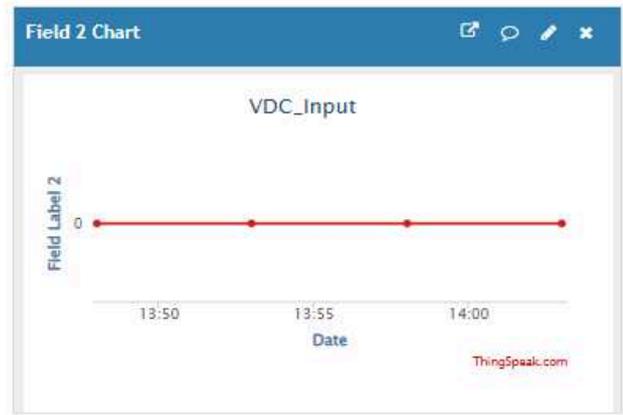
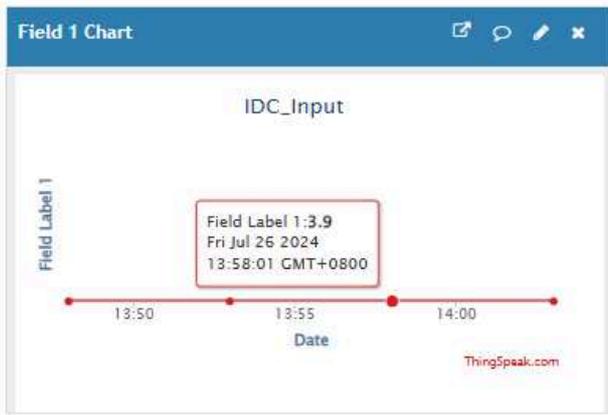
## 2.2.4 ThingSpeak Payload(Type=1)

This payload meets ThingSpeak platform requirement. It includes only four fields. Form 1~4 are:

Idc\_input , Vdc\_input , Battery & Signal. This payload type only valid for ThingsSpeak Platform

As below:

**field1=idc\_input value&field2=vdc\_input value&field3=battery value&field4=signal value&field5=Interrupt value&field6=Interrupt\_level value**



## 3. Configure PS-CB/CS

### 3.1 Configure Methods

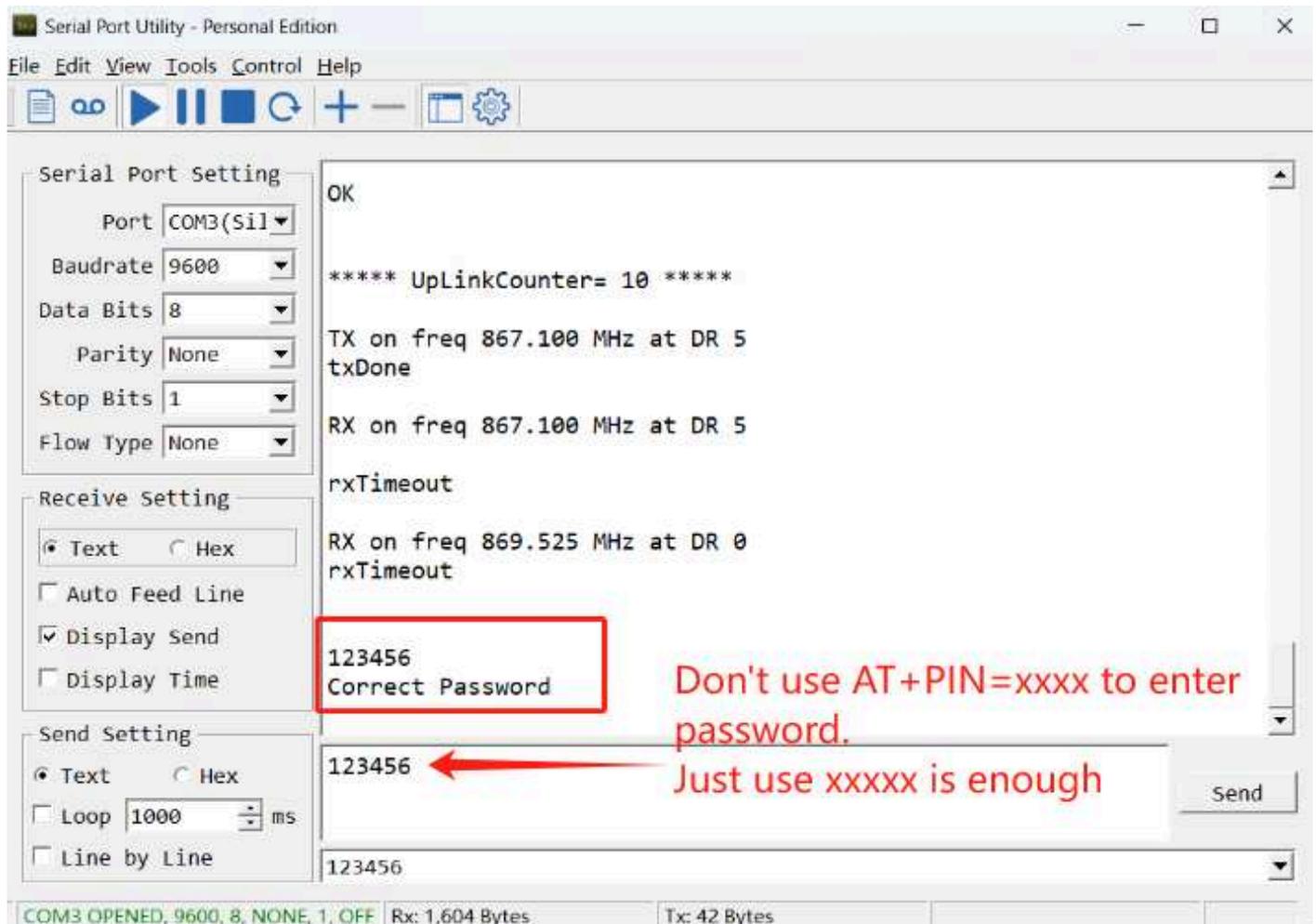
PS-CB/CS supports below configure method:

- AT Command via Bluetooth Connection (**Recommended**): [BLE Configure Instruction](#)
- AT Command via UART Connection : See [UART Connection](#)

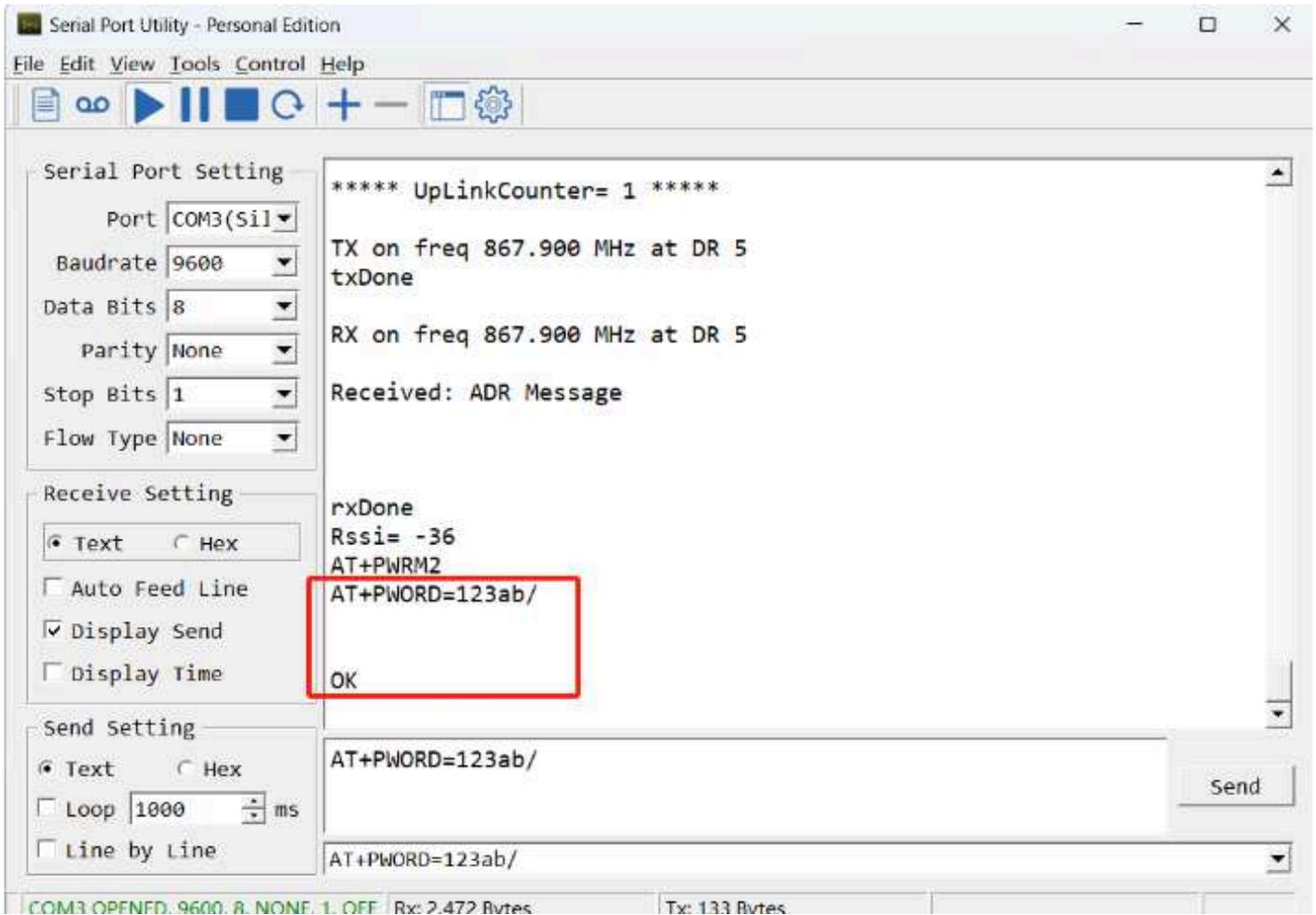
### 3.2 Serial Access Password

After the Bluetooth or UART connection is successful, use the Serial Access Password to enter the AT command window.

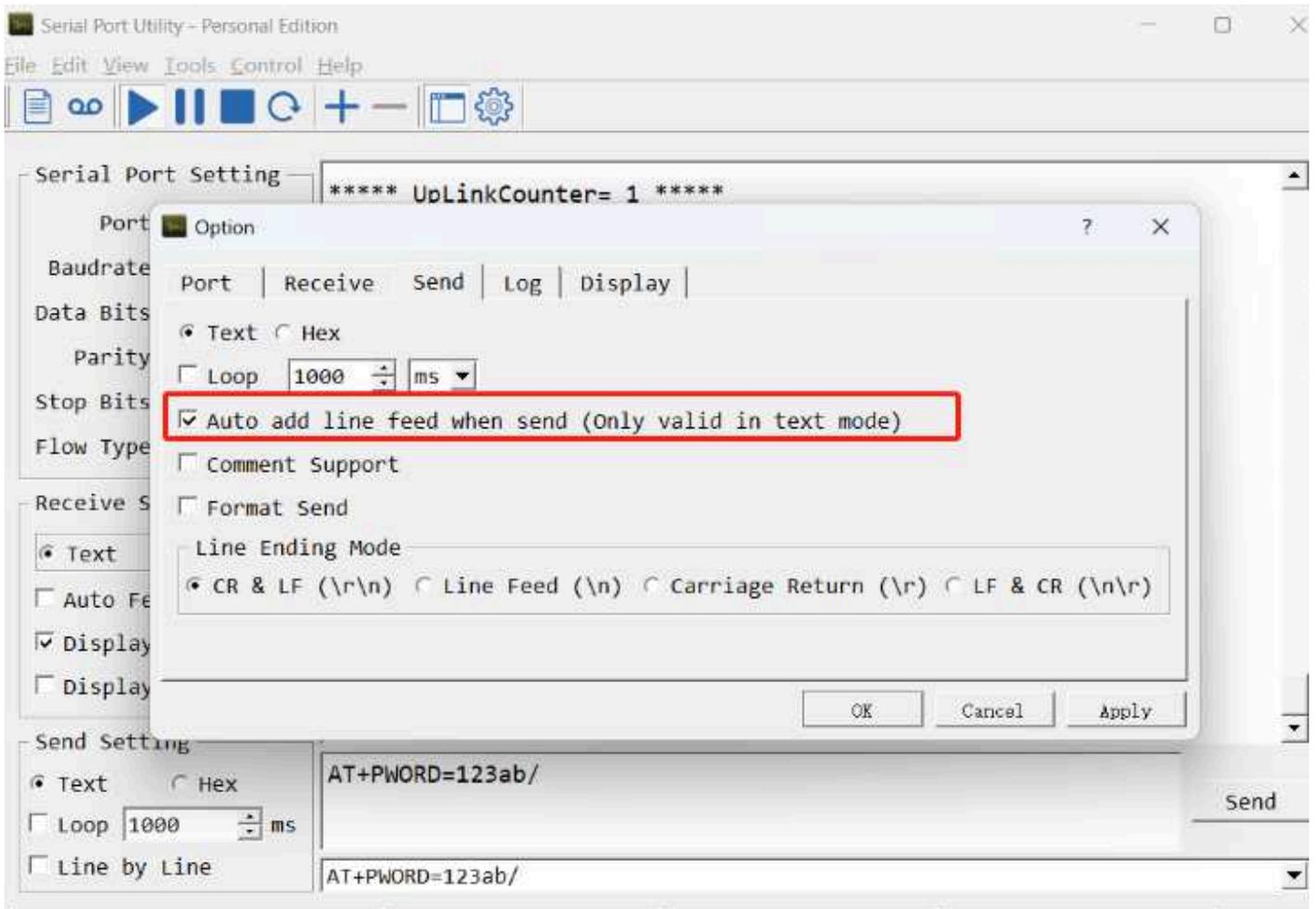
The label on the box of the node will print the initial password: AT+PIN=xxxxxx, and directly use the six-digit password to access the AT instruction window.



If you need to change the password, use **AT+PWD=xxxxxx** (6 characters), NB nodes only support lowercase letters.



**Note:** After entering the command, you need to add a line break, and you can also set automatic line breaks in the Bluetooth tool or UART connection tool.



### 3.3 AT Commands Set

AT+<CMD>? : Help on <CMD>

AT+<CMD> : Run <CMD>

AT+<CMD>=<value> : Set the value

AT+<CMD>=? : Get the value

#### General Commands

AT : Attention

AT? : Short Help

AT+MODEL : Get module information

ATZ : Trig a reset of the MCU

AT+DEUI : Get or set the Device ID

AT+SLEEP : Get or set the sleep status

AT+DEBUG : Set more info output

AT+CFG : Print all settings

AT+SERVADDR: Get or Set the Server address

AT+TDC : Get or set the application data transmission interval in s

AT+INTMOD : Get or Set the trigger interrupt mode (0:input,1:falling or rising,2:falling,3:rising)

AT+APN : Get or set the APN

AT+3V3T : Get or Set extend the time of 3V3 power

AT+5VT : Get or Set extend the time of 5V power

AT+12VT : Get or Set extend the time of 12V power

AT+PROBE : Get or Set the probe model

AT+PRO : Get or Set usage agreement (1:COAP,2:UDP,3:MQTT,4:TCP)

AT+RXDL : Get or Set the receiving time

AT+GETSENSORVALUE : Returns the current sensor measurement

AT+DNSCFG : Get or Set DNS Server

AT+CSQTIME : Get or Set the time to join the network

AT+GDNS : Get or Set the DNS

AT+TLSMOD : Get or Set the TLS mode

AT+IPTYPE : Set the IPv4 or IPv6

AT+QSW : Power on and power off BG95 module

AT+CLOCKLOG: Enable or Disable Clock Logging

AT+TIMESTAMP : Get or Set UNIX timestamp in second

AT+GETLOG : Print serial port logs

## **MQTT Management**

AT+CLIENT : Get or Set the MQTT clientID

AT+UNAME : Get or Set the MQTT Username

AT+PWD : Get or Set the MQTT password

AT+PUBTOPIC: Get or set MQTT publishing topic

AT+SUBTOPIC: Get or set MQTT subscription topic

AT+MQOS : Set the QoS level of MQTT

## **Coap Management**

AT+URI1: Get or set CoAP option 1

AT+URI2: Get or set CoAP option 2

AT+URI3: Get or set CoAP option 3

AT+URI4: Get or set CoAP option 4

AT+URI5: Get or set CoAP option 5

AT+URI6: Get or set CoAP option 6

AT+URI7: Get or set CoAP option 7

AT+URI8: Get or set CoAP option 8

## GPS

AT+GNSST : Extend the time to turn on GNSS

AT+GPS : Turn off and on GPS

AT+GTDC : Get or set GPS positioning interval in units of h

## Information

AT+FDR1 : Reset parameters to factory default values except for passwords

AT+FDR : Reset Parameters to Factory Default

AT+PASSWORD : Get or set the System password

AT+CDP : Read or Clear cached data

AT+LDATA : Get the last upload data

## 3.4 Triggier an uplink by external interrupt

PS-CB/CS has an external trigger interrupt function. Users can use the GPIO\_EXTI pin to trigger the upload of data packets.

### AT command:

- **AT+INTMOD** // Set the trigger interrupt mode
- **AT+INTMOD=0** // Disable Interrupt,as a digital input pin
- **AT+INTMOD=1** // Trigger by rising and falling edge
- **AT+INTMOD=2** // Trigger by falling edge
- **AT+INTMOD=3** // Trigger by rising edge

### Downlink Command: 0x06

Format: Command Code (0x06) followed by 3 bytes.

This means that the interrupt mode of the end node is set to 0x000003=3 (rising edge trigger), and the type code is 06.

- Example 1: Downlink Payload: 06000000 // Turn off interrupt mode
- Example 2: Downlink Payload: 06000003 // Set the interrupt mode to rising edge trigger

## 3.5 Set Power Output Duration

Control the output duration 3V3 , 5V or 12V. Before each sampling, device will

1. first enable the power output to external sensor,
2. keep it on as per duration, read sensor value and construct uplink payload
3. final, close the power output.

#### AT Command: AT+3V3T

Command Example	Function	Response
AT+3V3T=?	Show 3V3 open time.	0 OK
AT+3V3T=0	Normally open 3V3 power supply.	OK default setting
AT+3V3T=1000	Close after a delay of 1000 milliseconds.	OK
AT+3V3T=65535	Normally closed 3V3 power supply.	OK

#### AT Command: AT+5VT

Command Example	Function	Response
AT+5VT=?	Show 5V open time.	0 OK
AT+5VT=0	Normally closed 5V power supply.	OK default setting
AT+5VT=1000	Close after a delay of 1000 milliseconds.	OK
AT+5VT=65535	Normally open 5V power supply.	OK

#### AT Command: AT+12VT

Command Example	Function	Response
AT+12VT=?	Show 12V open time.	0 OK
AT+12VT=0	Normally closed 12V power supply.	OK
AT+12VT=500	Close after a delay of 500 milliseconds.	OK

### Downlink Command: 0x07

Format: Command Code (0x07) followed by 3 bytes.

The first byte is which power, the second and third bytes are the time to turn on.

- Example 1: Downlink Payload: 070101F4 ---> AT+3V3T=500
- Example 2: Downlink Payload: 0701FFFF ---> AT+3V3T=65535
- Example 3: Downlink Payload: 070203E8 ---> AT+5VT=1000
- Example 4: Downlink Payload: 07020000 ---> AT+5VT=0
- Example 5: Downlink Payload: 070301F4 ---> AT+12VT=500
- Example 6: Downlink Payload: 07030000 ---> AT+12VT=0

## 3.6 Set the Probe Model

Users need to configure this parameter according to the type of external probe. In this way, the server can decode according to this value, and convert the current value output by the sensor into water depth or pressure value.

### AT Command: AT +PROBE

AT+PROBE=aabb

When aa=00, it is the water depth mode, and the current is converted into the water depth value; bb is the probe at a depth of several meters.

When aa=01, it is the pressure mode, which converts the current into a pressure value;

bb represents which type of pressure sensor it is.

(A->01,B->02,C->03,D->04,E->05,F->06,G->07,H->08,I->09,J->0A,K->0B,L->0C)

Command Example	Function	Response
AT +PROBE =?	Get or Set the probe model.	0 OK
AT +PROBE =0003	Set water depth sensor mode, 3m type.	OK
AT +PROBE =000A	Set water depth sensor mode, 10m type.	OK
AT +PROBE =0101	Set pressure transmitters mode, first type(A).	OK
AT +PROBE =0000	Initial state, no settings.	OK

### Downlink Command: 0x08

Format: Command Code (0x08) followed by 2 bytes.

- Example 1: Downlink Payload: 080003 ---> AT+PROBE=0003
- Example 2: Downlink Payload: 080101 ---> AT+PROBE=0101

### 3.7 Multiple VDC /IDC collections in one uplink

Added AT+STDC command to collect the voltage of **VDC\_INPUT/IDC\_INPUT** multiple times and upload it at one time.

#### AT Command: AT +STDC

AT+STDC=aa,bb,bb

#### aa:

**0:** means disable this function and use TDC to send packets.

**1:** means that the function is enabled to send packets by collecting VDC data for multiple times

**2:** means that the function is enabled to send packets by collecting IDC data for multiple times

**bb:** Each collection interval (s), the value is 1~65535

**cc:** the number of collection times, the value is 1~120

Command Example	Function	Response
AT+STDC=?	Get the mode of multiple acquisitions and one uplink.	1,10,18 OK
AT+STDC=1,10,18	Set the mode of multiple acquisitions and one uplink, collect once every 10 seconds, and report after 18 times.	Attention:Take effect after ATZ OK
AT+STDC=0, 0,0	Use the TDC interval to send packets. (default)	Attention:Take effect after ATZ OK

#### Downlink Command: 0xAE

Format: Command Code (0xAE) followed by 4 bytes.

- Example 1: Downlink Payload: AE 01 02 58 12 ---> AT+STDC=1,600,18

### 3.8 Clock logging

Sometimes when we deploy lots of end nodes in field. We want all sensors sample data at the same time, and upload these data together for analyze. In such case, we can use clock logging feature.

We can use this command to set the start time of data recording and the time interval to meet the requirements of the specific collection time of data.

- **AT Command: AT +CLOCKLOG=a,b,c,d**

**a: 0:** Disable Clock logging. **1:** Enable Clock Logging

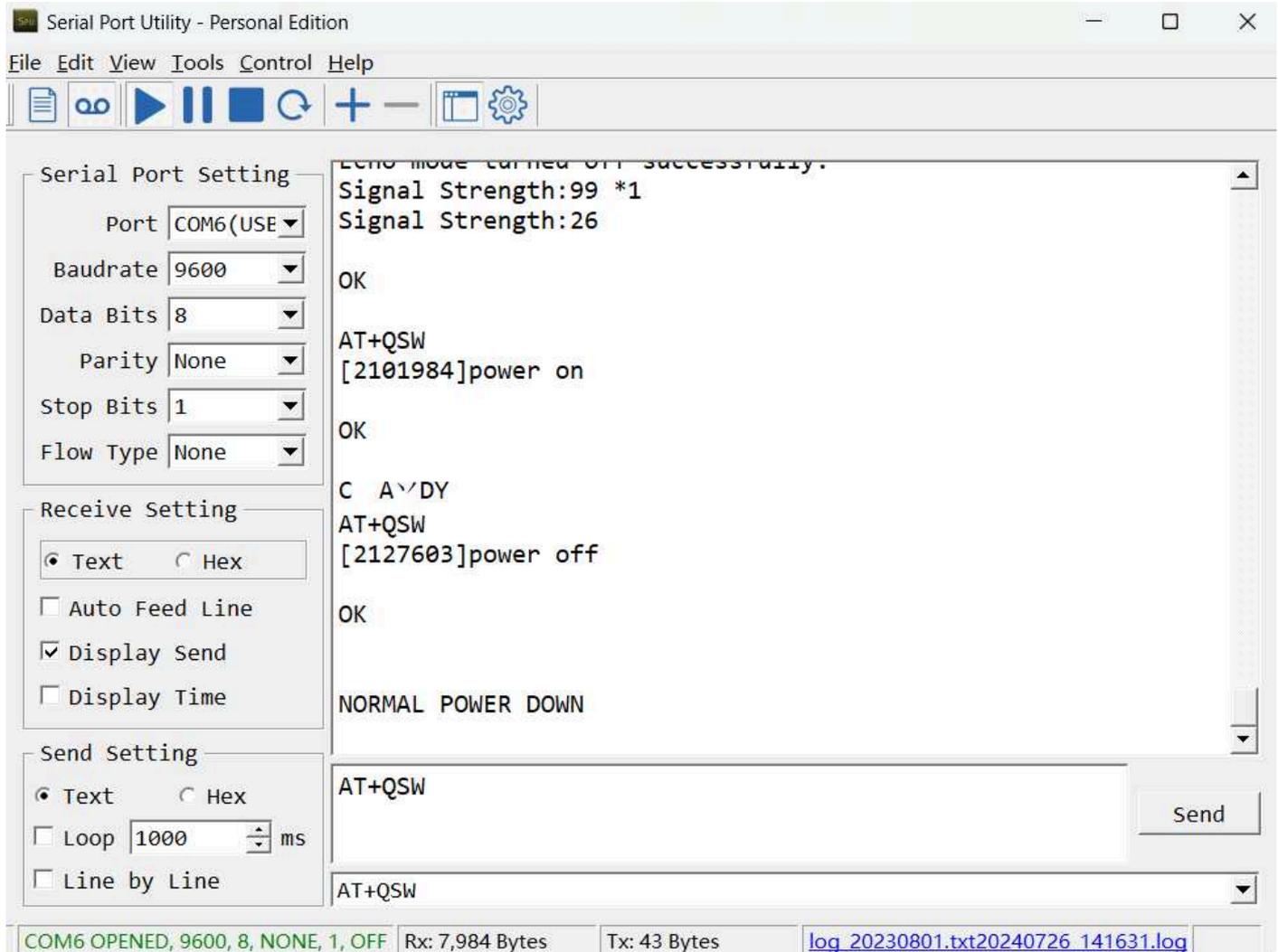
**b:** Specify First sampling start second: range (**0 ~ 3599, 65535**) // **Note:** If parameter b is set to 65535, the log period starts after the node accesses the network and sends packets.



This command is used to power on and power off BG95 module.

- **AT command: AT+QSW**

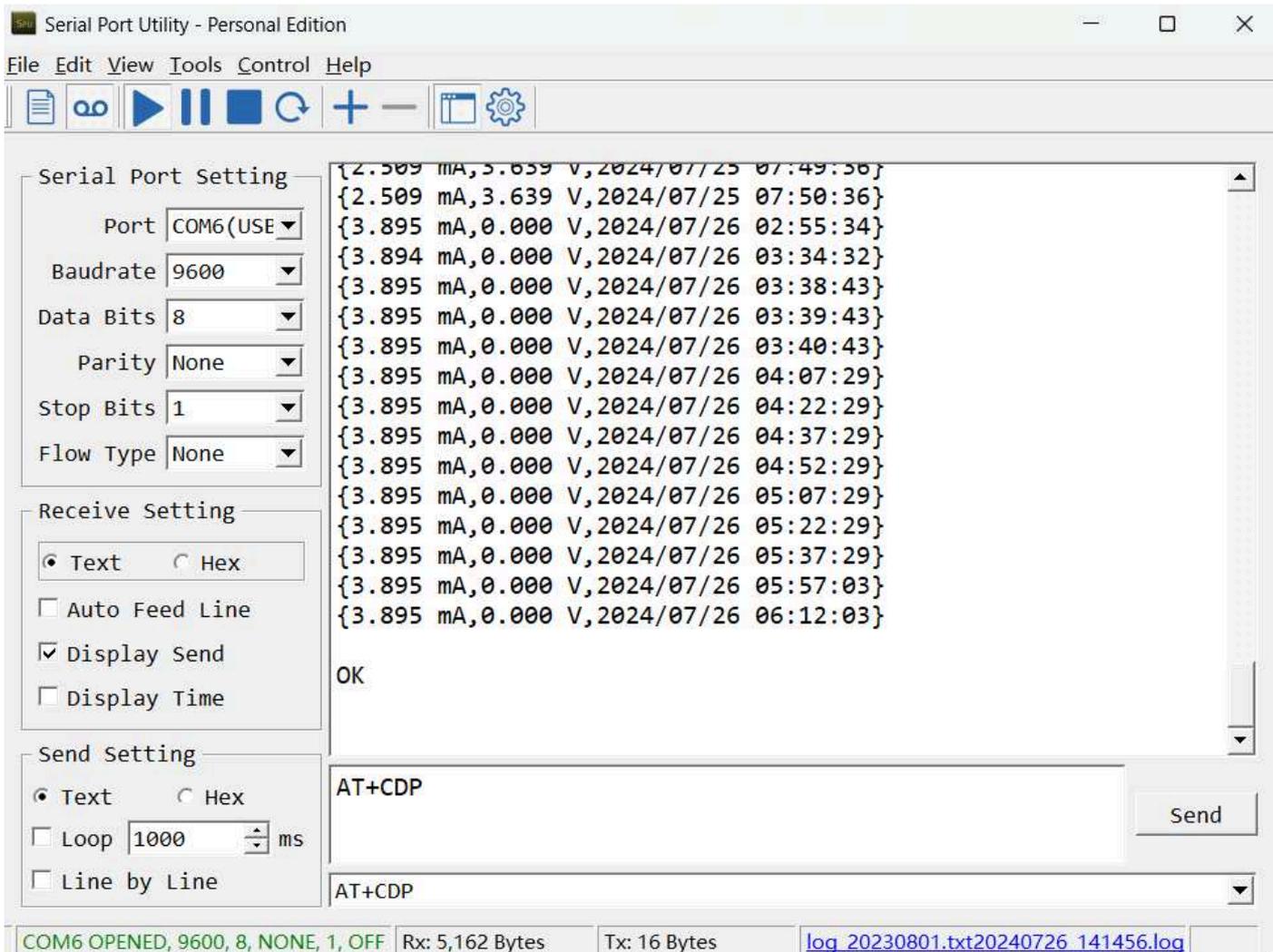
The module is powered on after the command is sent for the first time, and powered off after the command is sent again.



### 3.10 Example Query saved historical records

- **AT command: AT+CDP**

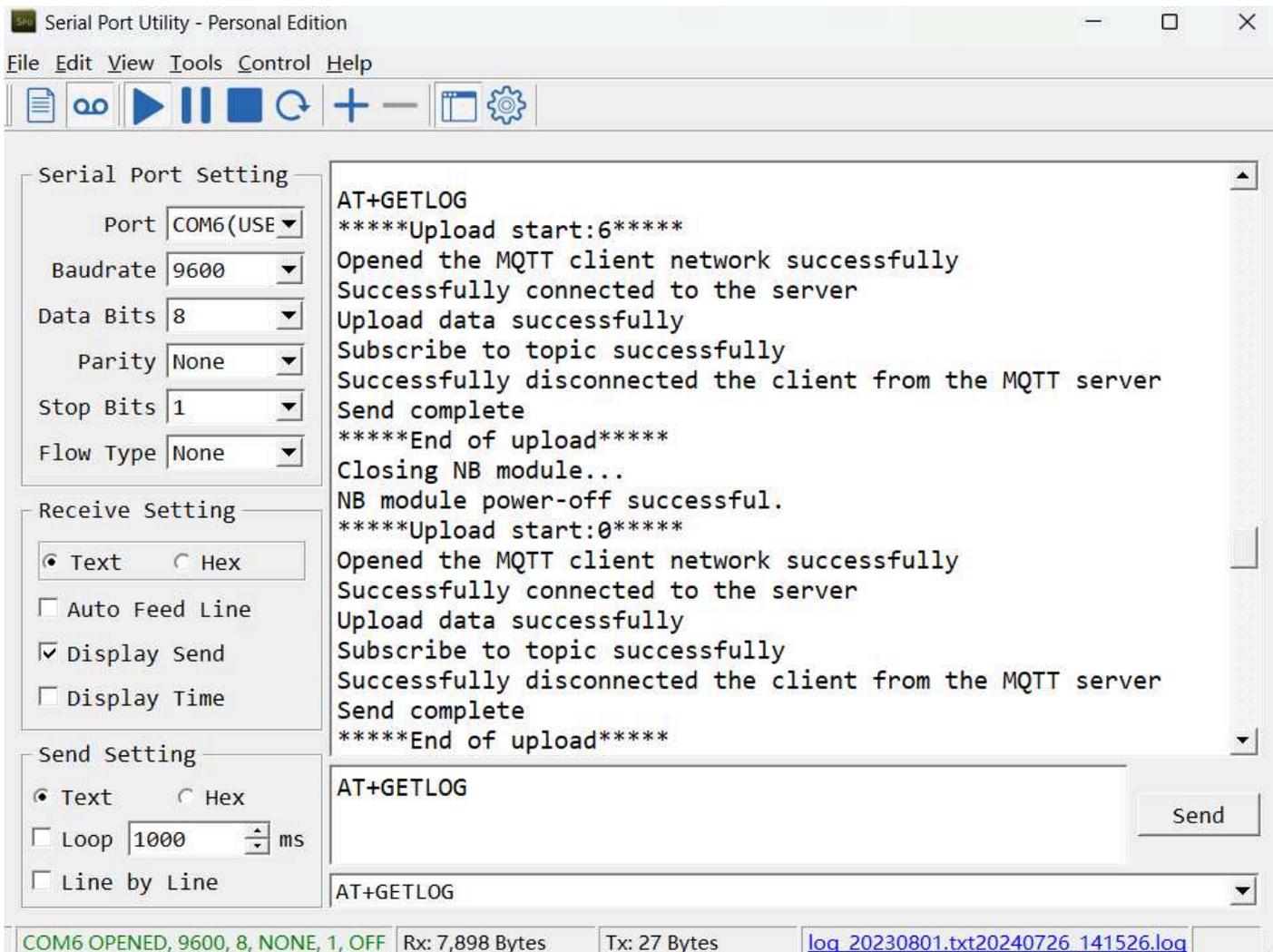
This command can be used to search the saved history, recording up to 32 groups of data, each group of historical data contains a maximum of 100 bytes.



### 3.11 Uplink log query

- **AT command: AT+GETLOG**

This command can be used to query upstream logs of data packets.



### 3.12 Set CoAP option

Feature: Set CoAP option, follow this link to set up the CoAP protocol.

**AT command: AT+URI1~AT+URI8**

**AT+URI1=11,"i"** // "i" indicates that the endpoint supports observation mode. In -CB products, fixed setting AT+URI1=11,"i"

**AT+URI2=11,"CoAP endpoint URI"** // 11 is a fixed parameter.

**Example:** i/13a35fbe-9515-6e55-36e8-081fb6aacf86

AT+URI1=11,"i"

AT+URI2=11,"13a35fbe-9515-6e55-36e8-081fb6aacf86"

--> If multiple groups of CoAP endpoint urls:

AT+URI3=11,"i"

AT+URI4=11,"CoAP endpoint URI"

## 3.12 Set the downlink debugging mode(Since firmware v1.1.0)

Feature: Enable or disable downlink debugging mode. (Since TE platform update, the platform version selection is no longer needed; only downlink debugging can be toggled.)

**AT command: AT+DOWNTE**

Command Example	Function/Parameters	Response/Explanation
AT+DOWNTE=?	Get current Settings	0,0 (default) OK
AT+DOWNTE=0,a	a: Enable/Disable downlink debugging	0: Disable downlink debugging mode. 1: Enable downlink debugging mode (users can view original downlink messages).

**(Note: The first parameter is fixed to 0 and only the second parameter is configurable.)**

**Example:**

- AT+DOWNTE=0,1 → Enable downlink debugging mode.
- AT+DOWNTE=0,0 → Disable downlink debugging mode.

**Downlink Command:**

No downlink commands for feature

## 3.13 Report on Change Feature(Since v1.1.2)

**Function Overview**

The ROC feature monitors changes in IDC (current) and VDC (voltage) by setting a detection interval and change thresholds. When changes exceed the configured thresholds, the device sends an ROC uplink message and refreshes the comparison value.

**AT Command Syntax**

- AT+ROC=? // Query current ROC settings
- AT+ROC=0,0,0,0 // Disable ROC function
- AT+ROC=1,[interval],[idc\_threshold],[vdc\_threshold] // Enable ROC mode 1
- AT+ROC=2,[interval],[idc\_threshold],[vdc\_threshold] // Enable ROC mode 2

**Parameters**

**Mode (first parameter)**

**0:** Function disabled.

**1:** ROC mode 1 - Sends ROC uplink and refreshes comparison value when change exceeds threshold.

**2: ROC mode 2** - Additionally refreshes comparison value during regular transmissions (TDC, manual, etc.).

### interval

Detection interval in seconds (0~65535).

### idc\_threshold

Current change threshold in microamperes ( $\mu\text{A}$ ).

### vdc\_threshold

Voltage change threshold in millivolts (mV).

## Mode Differences

Mode 1: Only updates comparison value when ROC threshold is exceeded.

Mode 2: Updates comparison value both when threshold is exceeded and during regular transmissions (TDC, manual, etc.).

## AT Command Examples

- `AT+ROC=1,60,3000,500` //Checks every 60 seconds. Sends ROC uplink if current changes  $>3000\mu\text{A}$  (3mA) or voltage changes  $>500\text{mV}$ , then refreshes comparison values.
- `AT+ROC=1,60,3000,0` //Checks every 60 seconds. Only monitors current changes ( $>3\text{mA}$ ). Setting `vdc_threshold=0` disables voltage monitoring.
- `AT+ROC=2,120,3000,500` //Checks every 120 seconds. Sends ROC uplink if current changes  $>3000\mu\text{A}$  (3mA) or voltage changes  $>500\text{mV}$ . Refreshes comparison value both when threshold is exceeded and during regular transmissions.
- `AT+ROC=2,120,0,500` //Checks every 120 seconds for voltage changes ( $>500\text{mV}$ ). Refreshes comparison value both when threshold is exceeded and during regular transmissions.

## Downlink Command Format(8 bytes)

Structure: `0x09 aa bb bb cc cc dd dd`

Byte Position	Field	Description	Example Values
1	Function Code	Always 0x09 for ROC configuration.	09
2	a: Mode	00: OFF 01: Mode 1 02: Mode 2	01 //ROC mode 1
3-4	b: Interval	Detection interval in seconds.	00 3C //60s
5-6	c: IDC Threshold	Current change threshold in $\mu\text{A}$ .	0B B8 //3000 $\mu\text{A}$
7-8	d: VDC Threshold	Voltage change threshold in mV.	01 F4 //500mV

## Downlink Examples

- 09 01 00 3C 0B B8 01 F4 //Equivalent to AT+ROC=1,60,3000,500
- 09 02 00 78 00 00 01 F4 //Equivalent to AT+ROC=2,120,0,500
- 09 02 00 78 0B B8 01 F4 //Equivalent to AT+ROC=2,120,3000,500

## AT Command: AT+ROC=3,a,b,c,d,e(Since v1.1.3)

Command Example	Parameters	Response/Explanation
AT+ROC=?	Show current ROC setting	0,0,0,0(default) OK
AT+ROC=3,a,b,c,d,e	<b>a:</b> Set the detection interval	Range: 0~65535s
	<b>b:</b> Set the IDC alarm trigger condition	<b>0:</b> Less than the set IDC threshold, Alarm <b>1:</b> Greater than the set IDC threshold, Alarm
	<b>c:</b> IDC alarm threshold	Unit: uA
	<b>d:</b> Set the VDC alarm trigger condition	<b>0:</b> Less than the set VDC threshold, Alarm <b>1:</b> Greater than the set VDC threshold, Alarm
	<b>e:</b> VDC alarm threshold	Unit: mV

### Example:

- AT+ROC=3,60,0,3000,0,5000 // The data is checked every 60 seconds. If the IDC is less than 3mA or the VDC is less than 5000mV, an alarm is generated.
- AT+ROC=3,180,1,3000,1,5000 // The data is checked every 180 seconds. If the IDC is greater than 3mA or the VDC is greater than 5000mV, an alarm is generated.
- AT+ROC=3,300,0,3000,1,5000 // The data is checked every 300 seconds. If the IDC is less than 3mA or the VDC is greater than 5000mV, an alarm is generated.

## Downlink Command: 0x09 03 aa bb cc dd ee

Format: Function code (0x09) followed by 03 and the remaining 5 bytes.

**aa: 2 bytes;** Set the detection interval.(second)

**bb: 1 byte;** Set the IDC alarm trigger condition.

**cc: 2 bytes;** IDC alarm threshold.(uA)

**dd: 1 byte;** Set the VDC alarm trigger condition.

ee: 2 bytes; VDC alarm threshold.(mV)

#### Example:

- Downlink Payload: **09 03 00 3C 00 0B B8 00 13 38** // Equal to AT+ROC=3,60,0,3000,0,5000
- Downlink Payload: **09 03 00 b4 01 0B B8 01 13 38** // Equal to AT+ROC=3,180,1,3000,1,5000
- Downlink Payload: **09 03 01 2C 00 0B B8 01 13 38** // Equal to AT+ROC=3,300,0,3000,1,5000

## 4. Battery & Power Consumption

PS-CB use ER26500 + SPC1520 battery pack and PS-CS use 3000mAh Recharable Battery with Solar Panel. See below link for detail information about the battery info and how to replace.

[Battery Info & Power Consumption Analyze](#) .

Please refer to the following instructions to ask the AI to let the AI intelligence help the user to calculate the battery life.

Ex1:

The PS-CB using ER26500 + SPC1520 8500mAh battery packs.

Device (communication protocols)	sleep current	Sending and receiving current	Package acceptance time	Sampling power	Sampling time	GPS positioning current	GPS positioning time	Interrupt trigger current	Interrupt Trigger Time	Timed current collection	Timed acquisition time	Watchdog power	Watchdog time
PS-CB(UDP)	20.272uA	57.9943mA	35.664s	67.8788mA	8.999s	44.162s	87.0756mA	0	0	1.868s	25.1879mA	0.795898mA	0.001s
PS-CB(TCP)	20.272uA	61.6228mA	40.673s	67.8788mA	8.999s	44.162s	87.0756mA	0	0	1.868s	25.1879mA	0.795898mA	0.001s
PS-CB(MQTT)	20.272uA	63.0371mA	40.591s	67.8788mA	8.999s	44.162s	87.0756mA	0	0	1.868s	25.1879mA	0.795898mA	0.001s

Follow the instructions in the link below to modify the calculation parameters and let AI help calculate the battery life.

[AI Calculation Explanation](#)

## 5. Firmware update

User can change device firmware to:

- Update with new features.
- Fix bugs.

Firmware and changelog can be downloaded from : [Firmware download link](#)

Methods to Update Firmware:

- (Recommended way) OTA firmware update via BLE: [Instruction](#).
- Update through UART TTL interface : [Instruction](#).

## 6. FAQ

### 6.1How can I access the BG95-NGFF AT Commands?

User can access to BG95-NGFF directly and send AT Commands.

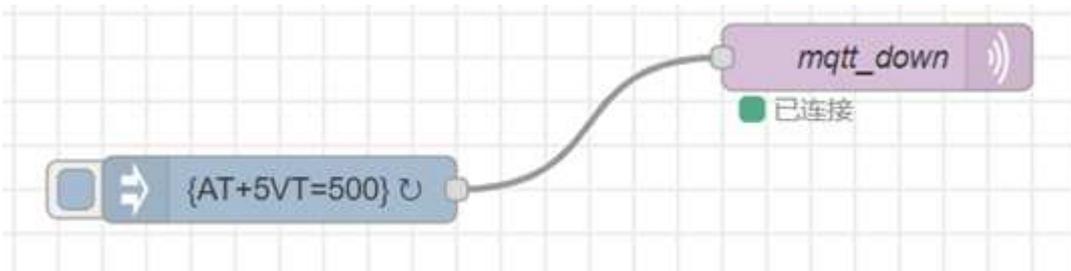
[See BG95-NGFF AT Command set](#)

## 6.2 How to configure the device through the MQTT subscription function?

Subscription content: {AT COMMAND}

### Example:

Setting AT+5VT=500 through Node-RED requires MQTT to send the content {AT+5VT=500}.



The serial port displays:

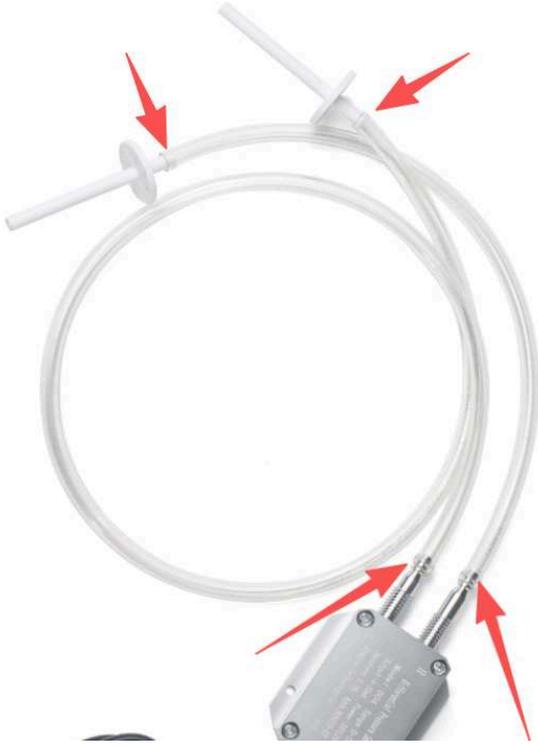
```
[42203]BAT:3.584 V
[47629]Opened the MQTT client network successfully
[51187]Successfully connected to the server
AT+PWRM2
[54905]Upload data successfully
[58443]Received downlink data: AT+5VT=500
[59330]Subscribe to topic successfully
[62877]Close the port successfully
[63916]Send complete
[64940]*****End of upload*****
```

## 6.3 Differential pressure sensor tubing fitting installation

Our accessories will come with a long air tube and two white plastic installation parts.

The air tube can be divided into two according to the on-site situation.

High temperature is needed to reinforce the connection between the air tube and the equipment.



## 6.4 Why is there no LED response when I press the button on the solar panel model?

If the LED does not light up when you press the button, it may be because the battery has entered protection mode.

**Solution:** To reactivate the battery, simply expose the solar panel to direct sunlight.

For more details, please refer to: [Battery Protection State \(Apply to Solar Panel + Li-ion battery\)](#)

## 7. Order Info

### 7.1 Thread Installation Type & Immersion Type Pressure Sensor

Part Number: [PS-CB/CS-Txx-YY](#) or [PS-CB/CS-lxx-YY](#)

**XX: Pressure Range and Thread Type**

**YY:**

- **GE:** General version ( Exclude SIM card)
- **1T:** with 1NCE \* 10 years 500MB SIM card and Pre-configure to ThingsEye server

PS : Pressure Sensor Series Prefix

Wireless Tech: L: LoRaWAN; N: NB-IoT; C: CAT-M1

Battery Type: B: 8500mAH LI-SOIC2 Battery ; S: Solar Panel + Li-ion Battery

Probe Type:	T20	Thread Type - M20 x 1.5
	T14	Thread Type - M14 x 1.5
	T27	Thread Type - M27 x 2
	TG2	Thread Type - G1/2
	TG4	Thread Type - G1/4
	TN4	Thread Type - NPT1/4
	TP4	Thread Type - PT1/4
	I1	Immersion Version - 1 meter cable
	I2	Immersion Version - 2 meter cable
	I3	Immersion Version - 3 meter cable
	I4	Immersion Version - 4 meter cable
	Ixx	Immersion Version - xx meter cable
	I100	Immersion Version - 100 meter cable

PRESSURE -- Only for Thread Type	
A	0~0.6MPa
B	0~1MPa
C	0~1.6MPa
D	0~2.5MPa
E	0~10MPa
F	0~40MPa
G	0~60MPa
H	-0.1~0MPa
I	-0.1~0.1MPa
J	0~5KPa
K	0~50KPa
L	0~100KPa

Frequency or SIM Version	CN470/EU433/KR920/US915/ EU868/AS923/AU915/IN865 GE -- General version ( Exclude SIM card) 1T -- With 1NCE & ThingsEye Pre-configured
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PS	-	L	B	-	T20	B	-	EU868	Example: PS-LB-T20-B-EU868
PS	-	L	S	-	I5		-	CN470	Example: PS-LS-I5-CN470
PS	-	N	B	-	T20	B	-	GE	Example: PS-NB-T20-B-GE
PS	-	N	S	-	I5		-	1T	Example: PS-NS-I5-1T
PS	-	C	B	-	T20	B	-	GE	Example: PS-CB-T20-B-GE
PS	-	C	S	-	I5		-	1T	Example: PS-CS-I5-1T

## 7.2 Wireless Differential Air Pressure Sensor

Part Number: **PS-CB-Dxx-YY** or **PS-CS-Dxx-YY**

**XX: Differential Pressure Range**

**YY:**

- **GE:** General version ( Exclude SIM card)
- **1T:** with 1NCE \* 10 years 500MB SIM card and Pre-configure to ThingsEye server

PS : Pressure Sensor Series Prefix			
Wireless Tech: L : LoRaWAN , N : NB-IoT , C : CAT-M1			
Battery Type: B: 8500mAH LI-SOIC2 Battery ; S: Solar Panel + Li-ion Battery			
Probe Type: D Differential Pressure Sensor			
PRESSURE -- Only for Thread Type			
✓	01	0-100Pa	
✓	02	0-200Pa	
✓	03	0-300Pa	
✓	04	0-1KPa	
✓	05	0-2KPa	
✓	06	0-3KPa	
✓	07	0-4KPa	
✓	08	0-5KPa	
✓	09	0-10KPa	
✓	10	-100- 100Pa	
✓	11	-200- 200Pa	
✓	12	-1-1KPa	
✓	13	0- 100KPa	
Frequency or SIM Version		CN470/EU433/KR920/US915/ EU868/AS923/AU915/IN865 GE -- General version ( Exclude SIM card) 1T -- With 1NCE & ThingsEye Pre-configured	
PS	- L	B - D	✓ 01 - EU868 Example: PS-LB-D01-EU868
PS	- L	S - D	✓ 01 - CN470 Example: PS-LS-D01-CN470
PS	- N	B - D	✓ 02 - GE Example: PS-NB-D02-GE
PS	- N	S - D	✓ 02 - 1T Example: PS-NS-D02-1T
PS	- C	B - D	✓ 03 - GE Example: PS-CB-D03-GE
PS	- C	S - D	✓ 03 - 1T Example: PS-CS-D03-1T

## 8. Packing Info

### Package Includes:

- PS-CB/CS-Txx/lxx NB-IoT/LTE-M Air/Water Pressure Sensor x 1 **or** PS-CB/CS-Dxx NB-IoT/LTE-M Differential Pressure Sensor
- External antenna x 1

### Dimension and weight:

- Device Size: cm
- Device Weight: g
- Package Size / pcs : cm
- Weight / pcs : g

# DIREKTRONIK

