



LoRa Humidity & Temperature Sensor Terminal FST100

User Manual

V1.0.0

This manual is applicable to the following products: FST100-00L, FST100-00H

Xiamen Four-Faith Communication Technology Co., Ltd.
<https://www.fourfaith.com>

Document Revision History

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Note: There may be differences between models of accessories and interfaces, actual products shall prevail.

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Chapter 1 Product Introduction

1.1 Overview

FST100-00 series LoRa humidity and temperature sensor terminal adopt an industrial-grade 32-bit communication processor, integrated with Four-Faith's self-developed LoRa module, equipped with temperature and humidity collection, threshold alarm, NFC configuration, and other sensors, combined with IP67 high protection grade waterproof and dustproof housing, suitable for all kinds of the harsh external environment.

The products support LoRaWAN* and Four-Faith private protocols, adopt ultra-low power design, built-in large capacity lithium battery, and portable battery replacement bin to ensure long-term stable operation of the products. The product adopts a variety of configuration modes to facilitate rapid and flexible deployment. It can also be combined with the Four-Faith sensor cloud platform and APP to realize remote real-time data monitoring.

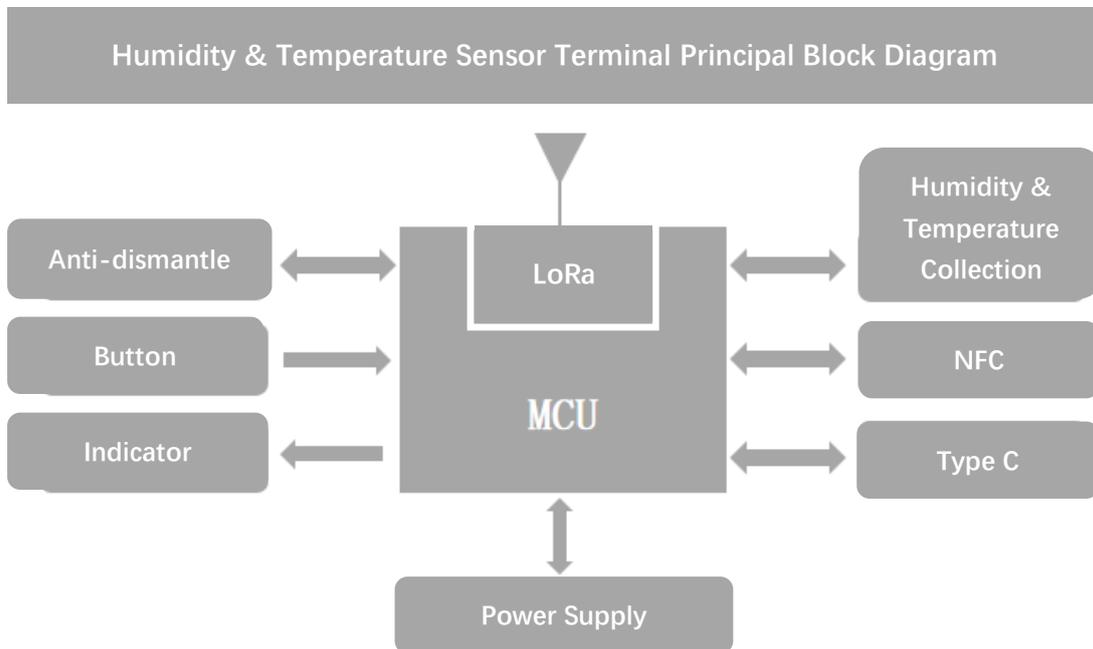
The products are widely used in the M2M industry in the industrial chain of the Internet of Things, such as the tobacco industry, computer room monitoring, factory monitoring, drug monitoring, venue monitoring, warehouse monitoring, agricultural greenhouses, smart buildings, and other fields. Typical applications of temperature and humidity sensors are shown as below.



1.2 Product Features

- Industrial design: using high precision sensor chip and industrial high performance wireless LoRa module.
- Battery life: Four-Faith self-developed LoRa module, ultra-low power design, built-in 8100mA ultra-large capacity lithium sub-battery.
- Shell: ABS+PC, anti-UV, flame retardant materials and other exquisite integrated appearance design.
- Protection level: IP67 protection level.
- Communication distance: kilometer-level transmission distance, good penetration.
- Configuration mode: The NFC APP, configuration tool, and sensor cloud platform can be configured in various modes to facilitate rapid and flexible deployment.
- Protocol: Support Four-Faith private protocol and standard LoRaWAN protocol *.
- Upgrade mode: NFC upgrade, local serial port upgrade, and remote upgrade.
- Installation: wall mounted installation.
- All-in-one solution: supporting sensor cloud platform and APP, remote real-time data monitoring.

1.3 Operating Principal Block Diagram



1.4 Product Specification

| Characteristics | |
|------------------------------------|--|
| Items | Contents |
| Sensor Type | Digital Sensor |
| Sensor temperature Measuring Range | -40°C~125°C |
| Sensor Humidity Measuring Range | 0 ~ 100% RH |
| Temperature Measurement Accuracy | ±0.2°C (Typical 0-65°C, minimum or maximum temperature accuracy range does not exceed ±0.8°C) |
| Humidity Measurement Accuracy | ±1.8% RH (Typical 30-70RH, minimum or maximum humidity accuracy does not exceed ±7%RH) |
| Operating Temperature | -20°C~60°C |
| Frequency | Low frequency:410-510MHz High frequency:863-928MHz |
| Protocol | Private protocol, LoRaWAN [®] protocol |
| Indoor Communication Distance | Penetrates 6 floors |
| Outdoor Communication Distance | 4.2 Km |
| Operating Voltage | Built-in 3.6V/8200mAh lithium battery (Disposable) |
| Transmitting Current | ≤86.2mA, duration less than 0.53second, (SF=9@20dBm) |
| Receiving Current | ≤11.3mA, (SF=9@20dBm) |
| Sleep Mode Current | ≤15.3uA, (SF=9@20dBm) |

Note: The smaller the SF (the higher the rate), the shorter the transmission distance, the shorter the launch time, and the less the function

| Battery Life | | | |
|-------------------|-----------------|-----------------------------------|---|
| Item | Voltage/Current | Data Rate | Collection Interval (Time) |
| Deep Sleep | <15.3uA | Level 3 (Further transmission) | 5 minutes: about 1400 days (4 years) 10 minutes: about 3000 days (8 years) |
| Receiving Data | <11.3mA | | |
| Transmitting Data | <86.2mA | | |
| Deep Sleep | <15.2uA | Level 4 (Closer transmission) | 5 minutes: about 1600 days (4.5 years) 10 minutes: about 3200 days (9 years) |
| Receiving Data | <11.3mA | | |
| Transmitting Data | <86.2mA | | |

Note: The battery working time is the theoretical day. The theoretical day is also affected by wireless signals and working temperature and humidity. The battery working time may be slightly shorter or longer.

| Hardware | |
|----------|---|
| Item | Content |
| CPU | Industrial grade 32-bit communication processor |
| Flash | 128KB |
| SRAM | 16KB |

| Other | |
|-----------------------|---|
| Item | Content |
| Shell | PC+ABS material, anti-exposure, anti UV, anti-aging, impact resistance, protection grade IP67 |
| Dimension | 90x65x34.5mm (Excluding antenna and mounting parts) |
| Installation | Wall mount |
| Flame Resistance | UL94V-0 |
| Weight | 365g |
| Operating Temperature | -20~+60°C (-4~+140°F) |
| Storage Temperature | -20~+60°C (-4~+140°F) |
| Humidity | 95% (No condensation) |

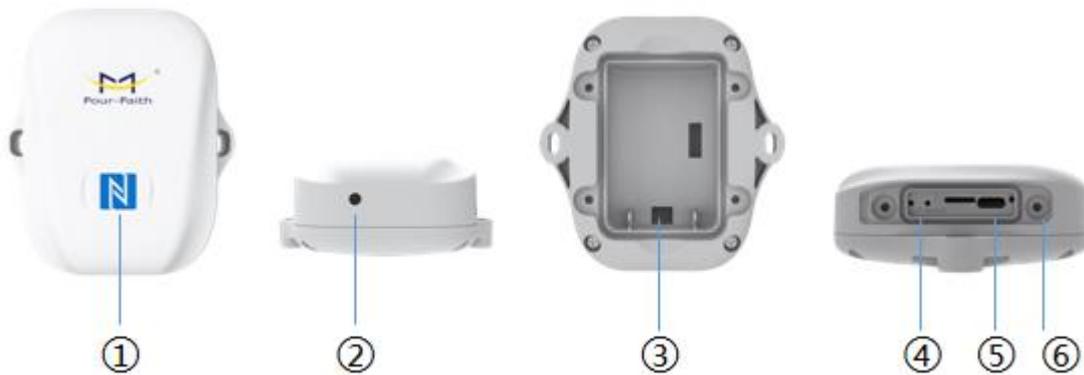
Chapter 2 Installation

2.1 Packing Lists

When you unpack, please keep the packing materials in good condition for future transportation. If the following items are damaged or lost, please contact your agent or sales representative in time. The list is as follows:

- 1 x LoRa temperature and humidity sensor terminal
- 1 x wall mounting screw kit
- Product qualification certificate
- Product warranty card

2.2 Appearance



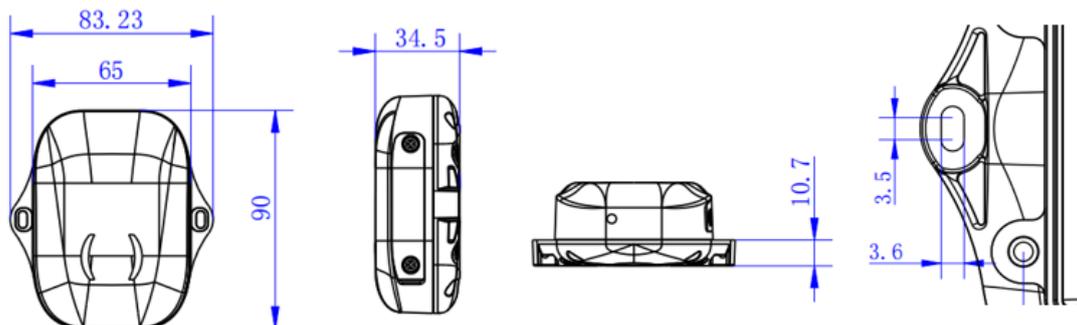
Front panel: ① NFC induction zone

Bottom: ② Temperature and humidity induction zone

Back side: ③ Portable battery compartment

Right side: ④ On/Off button and restart button, ⑤ TYPE-C interface, ⑥ indicator

2.3 Dimension (mm)



2.4 Button Instruction

| Function | Operation | LED Status | Device Status |
|-----------------------|--|---|--|
| Power on | Long press ACT button over 3 seconds | Off ➔ Green light flashing | activated |
| Power off | Long press ACT button over 3 seconds | Green light flashing ➔ Off | not activated |
| Restart | Long press RESET over 1 second and release | Green light flashing | Does not change the activation status of the device before the restart |
| Confirm On/Off status | Short press ACT button | Light flashing: device turn on Light off: device shut down | |

Note: Buttons are provided to facilitate debugging and emergency power-off restart. Under normal circumstances, NFC APP or PC configuration tool can be used to switch on and off the machine and restore factory settings.

2.5 Product Installation

- Attach the humidity and temperature sensor terminal to the wall, mark two-hole positions on the wall according to the circular hole positions and remove the sensor.
- Use an electric drill to drill 2 holes in the holes marked on the wall.
- Drive the two expansion bolts into the two holes.
- Insert two wall mounting screws into the expansion bolt through the wall mounting hole of the humidity and temperature sensor terminal.

Chapter 3 Parameter Configuration

3.1 Configuration Tool

The FST100-00 series supports Type-C configuration tool (Sensor Terminal Tools) and NFC configuration (Sensor Cloud APP), as shown in Figures 3.1 and 3.2. The following chapters mainly describe the parameter configuration of the sensor cloud APP NFC configuration, except for the Configuration procedure.

Note: The Four-Faith sensor cloud platform described in Chapter 4 can also be configured with the following parameters. For details, refer to the instruction manual of the Four-Faith sensor cloud

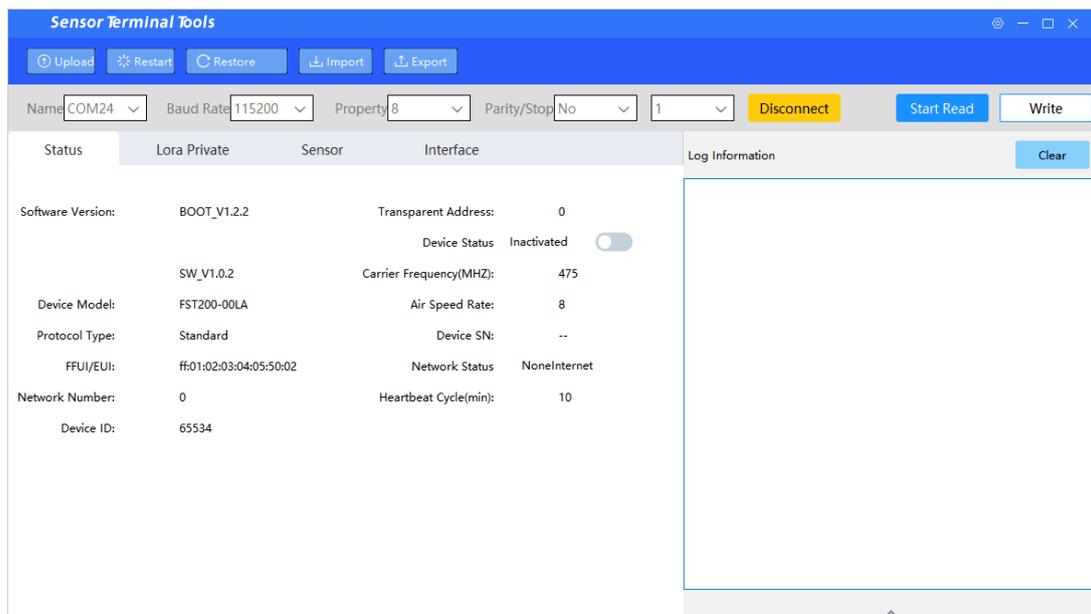


Figure 3.1 Sensor Cloud APP

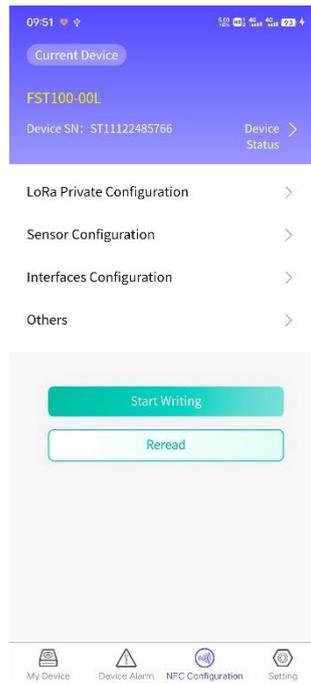


Figure 3.2 Sensor Cloud APP

3.2 Configuration Steps

1. Download and install PC configuration tools corresponding to FST100-00 series and Android APP from Four-Faith official website.

2. Connect and loading

◆ Sensor Terminal Tool



Use type-C to connect the computer to the device. Open the serial port and click Start to Read to obtain the device parameter information.

◆ Sensor Cloud APP

After enabling the NFC function of the mobile phone, open the sensor cloud APP, enter the registered account and password (the same as the account information of the sensor cloud in Chapter 4), select the 'NFC Configuration' TAB, paste the NFC area of the mobile phone on the NFC sensing area on the front of the device for a few seconds, and keep the device parameter information synchronized to the sensor cloud APP until it is read successfully.

3. Parameter write update

◆ Sensor Terminal Tool

Use the configuration tool to modify and obtain device parameters, such as powering on or off the device and parameter values. Click the "Start Write" button. After the data is successfully written, click the "Restart" button to immediately take effect.

◆ Sensor Cloud APP

Modify the acquired parameter information through the sensor cloud APP, such as switch on and off, parameter values, etc. Click the "Start writing" button and stick it in the NFC sensing area of the device until the configuration is complete. Then update and obtain the real-time parameter information of the device through the "Re-read" button.

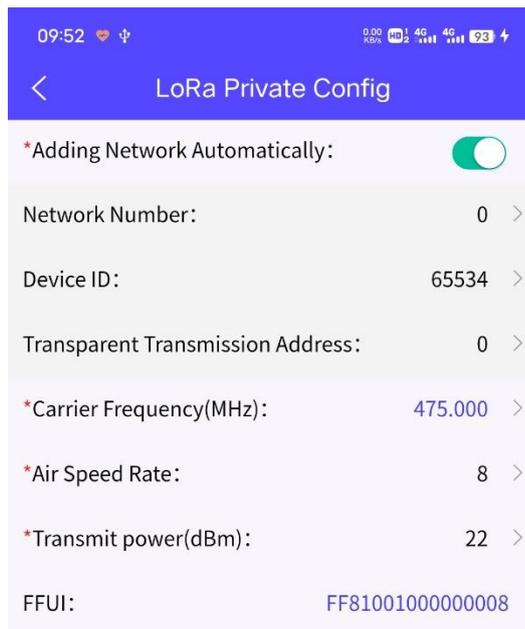
Note:

1. **There are model differences in the NFC area of Android phones, which are generally located near the back camera. For details, please refer to the manual of the phone.**
2. **After the NFC read/write succeeds or fails, keep the mobile phone away from the device temporarily and attach it to the NFC sensing area of the device for the next operation.**

3.3 LoRa Configuration

FST100-00 series devices support LoRaWAN configuration * and LoRa private configuration (Four-Faith private protocol). The PC configuration tool and sensor cloud APP are used to automatically distinguish the protocol types supported by the device.

◆ LoRa private protocol configuration



Open the "NFC Configuration --> LoRa Private Configuration" menu in the Sensor Cloud APP, and set the network mode, network number, device ID, pass-through address, carrier frequency, data rate, and transmit power of the device.

| Parameter | Description | Factory Default Value |
|----------------------------------|--|----------------------------|
| Add Network Model | <p>It is divided into automatic add network mode and manual add network mode.</p> <p>Automatic add network mode:</p> <ul style="list-style-type: none"> ◆ The network ID, device ID, and transparent transmission address are assigned by the gateway, and the device cannot be changed. The carrier frequency and air rate must be consistent with the LoRa gateway. ◆ After the device is powered on, it determines whether the network has been added. If the network has been added, the network request is not executed. If the network has not been added, the network request is executed. ◆ After the network is added successfully, the network will be displayed in the "network status" of "device status". ◆ If the device does not receive a response from the gateway and reaches a certain number, it will reconnect to the network. <p>Manual add network mode:</p> <ul style="list-style-type: none"> ◆ The network number, device ID, transparent transmission address, carrier frequency, and air rate must be consistent with the LoRa gateway. ◆ After the device is powered on, the network adding request is not executed ◆ No network access status notice ◆ No disconnection detection and reconnection mechanism | Automatic add network mode |
| Network ID | The network ID is used to distinguish different LoRa networks. LoRa devices using the same network number are allowed to communicate with each other. | 0 |
| Device ID | Device address, use for distinguishing different devices | 65534 |
| Transparent Transmission Address | Gateway address, use for distinguishing different gateways | 0 |
| Carrier Frequency | The LoRa frequency band used by the device for sending and receiving data must match that used by the gateway | 475.000 |
| Data Rate | The data transmission rate in the air can be divided into eight levels. The higher the level, the higher the rate, and the closer the transmission distance, and vice versa. Therefore, you need to adjust the value according to the actual application environment | 3 |
| Transmitted Power | Range: 5 to 22dBm. The higher the transmission power, the higher the power consumption and the longer the transmission distance. | 20 |

Note:

1. If you use the Four-Faith sensor cloud platform to manage FST100-00 series devices, please use the automatic network adding mode.
2. In the add network mode, modify the carrier frequency, and data rate, and restore factory Settings to execute the network request again.
3. If a large amount of equipment is to be purchased, please contact Four-Faith to obtain FFUI/EUI and other parameters of the equipment.

- ◆ LoRaWAN configuration
Under developing.

3.4 Basic Setting

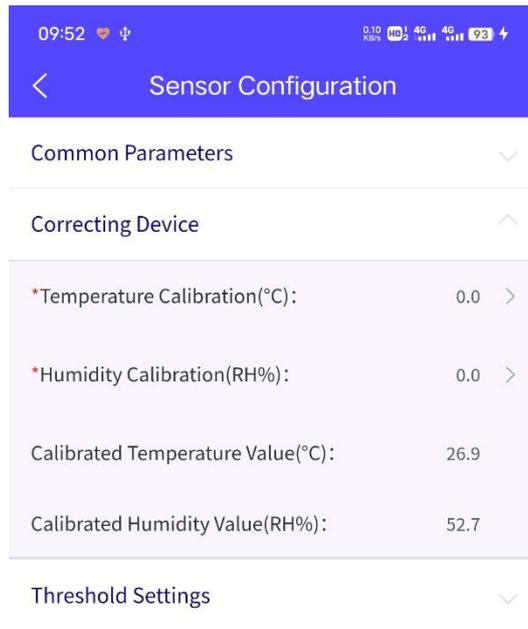
Open the "NFC Configuration > Sensing Configuration" menu in the Sensor Cloud APP, set the common device parameters, calibrate the device, and set the threshold.

- ◆ General Parameters



| Parameter | Description | Factory Default Value |
|---------------------|---|-----------------------|
| Reporting Interval | The value ranges from 1 to 65535 minutes. For details, please refer to the section "Data Communication Protocols" below. | 10min |
| Temperature Unit | Set the temperature unit (° C / ° F) displayed on the sensor cloud APP. The temperature of the device only supports ° C report. | °C |
| Current Temperature | The temperature value obtained after the NFC configuration of the sensor cloud APP is re-read | |
| Current Humidity | The humidity value obtained after the NFC configuration of the sensor cloud APP is read again. | |

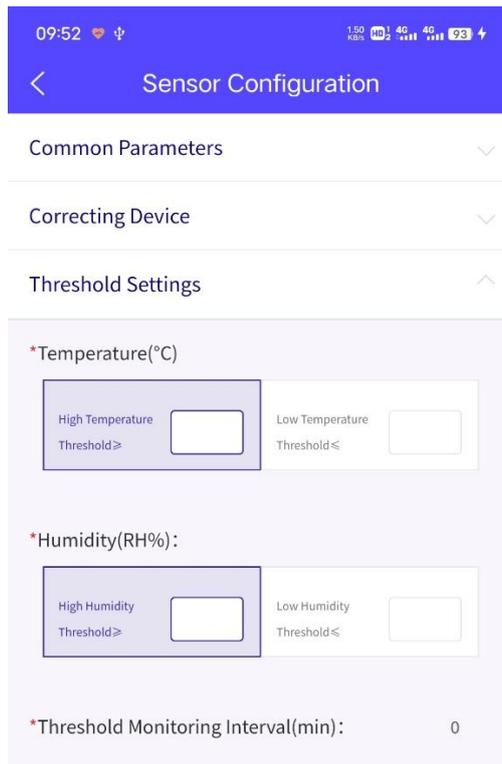
◆ Correcting device



| Parameter | Description | Factory Default Value |
|------------------------------------|--|-----------------------|
| Temperature Calibration (° C) | The device will add the calibration value to the original data, and after confirming the writing, it will be reported as the final measurement result. | 0.0 |
| Humidity Calibration (RH%) | The device will add the calibration value to the original data, and after confirming the writing, it will be reported as the final measurement result. | 0.0 |
| Calibrated Temperature Value (° C) | Display the calibrated temperature value in real-time | |
| Calibrated Humidity Value (RH%) | Displays the calibrated humidity in real-time | |

Note: Calibrate the device in a stable external environment. Ensure that the calibrated temperature and humidity values are consistent with the target values as far as possible after the calibration parameters are written.

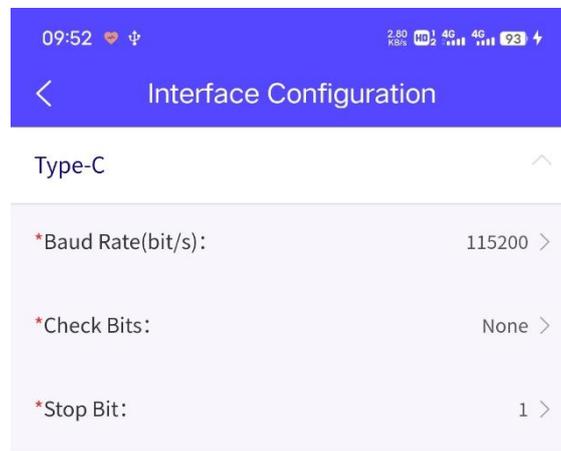
◆ Threshold Settings



| Parameter | Description | Factory Default Value |
|-------------------------------|---|-----------------------|
| High Temperature Threshold | Data will be collected periodically at a threshold monitoring interval. When the temperature is greater than or equal to the set high temperature threshold, the data will be reported as a confirmation packet. For details, please refer to the Chapter "Data Communication Protocols" below. | None |
| Low Temperature Threshold | Data will be collected periodically at the threshold monitoring interval. When the temperature is less than or equal to the set low temperature threshold, the data will be reported as a confirmation packet. For details, please refer to the chapter "Data Communication Protocols" below. | None |
| High Humidity Threshold | Data is collected periodically at the threshold monitoring interval. When the humidity is greater than or equal to the set high humidity threshold, the data is reported as a confirmation packet. For details, please refer to the chapter "Data Communication Protocols" below. | None |
| Low Humidity Threshold | Data is collected periodically at the threshold monitoring interval. When the humidity is less than or equal to the set high humidity threshold, the data is reported as a confirmation packet. For details, please refer to the chapter "Data Communication Protocols" below. | None |
| Threshold Monitoring Interval | The interval for the device to wake up for threshold monitoring can be set from 0 to 65535 minutes. To enable the threshold monitoring interval, you need to set any of the preceding threshold parameters. | 0 |

3.5 Interfaces Setting

On the Sensor cloud APP, choose NFC Configuration > Interface Configuration and set the TYPE-C serial port parameters.



| Parameter | Description | Factory Default Value |
|-----------|---|-----------------------|
| Baud Rate | 600-115200 | 115200 |
| Check Bit | NONE (No check bit) EVEN (even check) ODD (odd check) | No check bit |
| Stop Bit | 1, 2 | 1 |

3.6 Maintenance

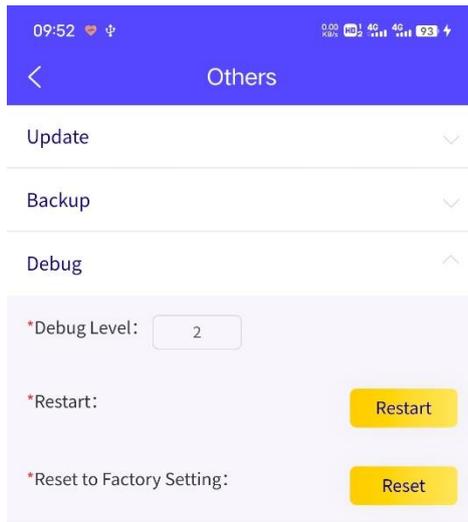
◆ Upgrade

FST100-00 series support NFC upgrade of sensor cloud APP, remote upgrade of Four-Faith sensor cloud platform, and PC configuration tool upgrade. The detailed steps are as follows:

1. To obtain the latest software upgrade package from the official website of Four-Faith, it is required to clearly inform how to upgrade (NFC upgrade if the upgrade package name contains Modified information and remote upgrade of sensing cloud platform, PC configuration tool upgrade if the upgrade package name does not contain Modified information).
2. Import the upgrade package (the NFC upgrade package must be first imported to the Four-Faith sensor cloud platform) and start the upgrade.
3. A message is displayed indicating whether the upgrade is successful or not. If the upgrade fails, perform the upgrade again.

Note: During the upgrade, do not perform any other operations on the App or device.

◆ Debugging and resetting



| Parameter | Description | Factory Default Value |
|--------------------------|--|-----------------------|
| Debug Level | 0 = No log information is generated 1 = The key log information is displayed 2 = The detailed log information is displayed Log information is output through the type-c interface | 0 |
| Restart Device | Actively restart the device | |
| Reset to Factory Setting | The device parameters are reset to the factory setting | |

Chapter 4 Four-Faith Sensor Cloud Platform

Four-Faith Sensor Cloud is a data management platform independently developed by Four-Faith. It provides unified data management, analysis, visualization, and other services for devices through data analysis and modeling, enabling efficient management of enterprises.

4.1 Quick Adding Devices

◆ Adding Four-Faith Gateway

1. Choose F8926-L customize version
2. Check with F8926-L Series LoRa Gateway User Manual to ensure that the gateway network is online.
3. Enable the LORA application in the gateway application module. The default parameters match the factory parameters of FST100-00 series devices. If parameters need to be modified, the gateway and the device need to be updated simultaneously.
4. Add a gateway device on the Four-Faith sensor cloud platform.

| Parameter | Description | Factory Default Value |
|------------------|---|-----------------------|
| Product Category | Add gateway product categories. (For details, check the Four-Faith Sensor Cloud User Manual.) | |
| Gateway Name | User defined | |
| Gateway Mac | Obtain the LAN MAC address from the gateway | |

5. Wait for the heartbeat interval (1min by default). The Four-Faith sensor cloud platform displays that the gateway is online.

◆ Add device

1. Add the device through the Four-Faith sensor cloud platform, and the device displays the inactive state (or scan the QR code of the device through the sensor cloud APP for quick input).

| Parameter | Description | Factory Default Value |
|------------------|---|-----------------------|
| Product Category | FST100-00 series, select the FST100 default model | |
| Gateway Name | User defined | |
| Device ID | Specifies the character string of the FFUI/EUI identifier on the device | |

2. Use the PC configuration tool, sensor cloud APP NFC configuration, or switch on and

off to activate the device.

3. After the device is activated successfully and the online status is displayed, you can view the device data in real-time on the Four-Faith sensor cloud platform or sensor cloud App.

Chapter 5 Data Communication Protocol

The FST100-00 series supports the LoRaWAN* protocol and the Four-Faith private protocol.

5.1 Four-Faith Private Protocol

For details, please check the "FST100-00 Series API Command Manual".

1. Common format of the data frame (data are based on hexadecimal format, little endian mode).

Frame start byte: fixed at 0xFE.

Length field: The length of a data field.

Command domain: see each command for details.

Data field: data content corresponding to each command.

XOR checksum: X or sum of length domain, command domain, and data domain.

| Frame Start Byte | Length Field | Command Domain | Data Field | XOR Checksum |
|------------------|--------------|----------------|------------------|--------------|
| 1 Byte | 1 Byte | 2 Bytes | xx Bytes (xx<82) | 1 Byte |

The uplink device data is contained in the data field in the following format

| Package Type | Contents | Description |
|--|---|---|
| 0x00 Business Data Package | Temperature (2), Humidity (2), Reporting interval (2), Battery power (1) | The device wakes up and reports at regular intervals |
| 0x03 Temperature and Humidity Threshold Alarm Package | Temperature (2), Humidity (2), Temperature status (1), Humidity status (1), Battery power (1) | The device wakes up periodically at the threshold monitoring interval and reports immediately if the threshold is exceeded. Temperature and humidity condition: 1 high temperature/humidity 2 low temperature/humidity 0 normal |

| | | |
|--|--|--|
| <p>0x04 Device Status Package</p> | <p>Temperature (2), Humidity (2), Abnormal status (1), Warning status (1), Battery power (1)</p> | <p>The device wakes up for detection. If the device is abnormal, it reports the alarm immediately. Abnormal status: 1 Device abnormal 2 The measured value is abnormal 0 no abnormalities Notice status: 1 keep 2 keep 3. Anti-disassembly alarm package 0 no hint</p> |
| <p>0x05 Parameter Update Package</p> | <p>Reporting interval (2), Temperature calibration (1), humidity calibration (1), high temperature threshold (1), Low temperature threshold (1), high humidity threshold (1), Low humidity threshold (1), threshold detection interval (2), Transmit power (1), Add network mode (1)</p> | <p>In the case of network connection, restart, and related parameter modification, the RF parameter information must be obtained from the gateway. Net adding mode: 0 Add network manually 1. Automatic add network</p> |

Attention:

1. When the temperature and humidity threshold alarm packet or device status packet is reported, the service data packet is reported in the next period.
2. When the temperature and humidity threshold alarm packet or device status packet recovers, the recovered temperature and humidity threshold alarm packet or device status packet is reported.

Example:

Report business package: 00 00 00 ff 02 3d 03 00 03 32

Temperature (00 ff): 25.5 °C

humidity (02 3d): 57.3%

Reported interval (00 03): 3 min

Battery power (32): jk50%