Four-Faith FST100 LoRa Humidity and Temperature Sensor Terminal User Manual

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Document Revision History

Date	Version	Note	Author
2022-09-22	V1.0.0	Initial Version	Jonas

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

Copyright Notice

Trademark Notice

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FCC Statements:

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and
(2) This device must accept any interference received, including interference that may cause undesired operation.

NOTE: The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications or changes to this equipment. Such modifications or changes could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.
However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Federal Communication Commission (FCC) Radiation Exposure Statement
When using the product, maintain a distance of 20cm from the body to ensure compliance with RF exposure requirements.

CE Warning

1. The product shall only be connected to a USB interface of version USB2.0 or higher.
2. Adapter shall be installed near the equipment and shall be easily accessible.
3. Supply by specified adapter the operating temperature of the device.can't exceed 40℃ and shouldn't be lower than -10℃. Supply by other power supply the operating temperature of the device.can't exceed 60℃ and shouldn't be lower than -20℃.
4. The plug considered as disconnect device of adapter.

5. The device complies with RF specifications when the device used at 20cm from the body.

   Hereby, Xiamen Four-Faith Communication Technology Co.,Ltd declares that this product is in compliance with essential requirements and other relevant provisions of Directive 2014/53/EU. This product is allowed to be used in all EU member states.

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Product Introduction

Overview

FST100-00 series LoRa humidity and temperature sensor terminal adopt an industrialgrade 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.

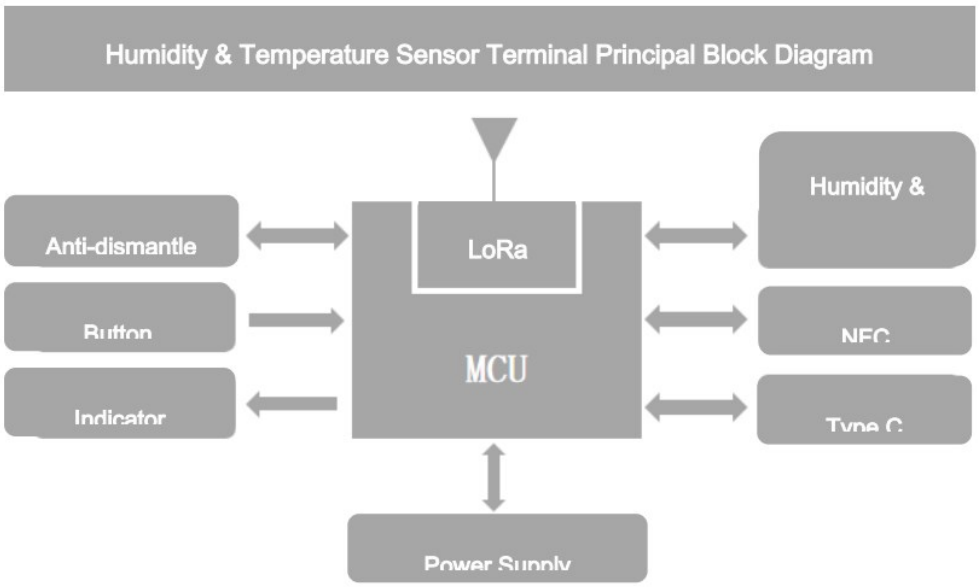
The products support LoRaWAN* and Four-Faith private protocols, adopt ultra-low power design, built-in large capacity lithium battery, and portable battery replacement bin to ensure long-term stable operation of the products. The product adopts a variety of configuration modes to facilitate rapid and 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.

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.
- 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.

Operating Principal Block Diagram



Product Specification

Characteristics	
Items	**Contents**
Sensor Type	Digital Sensor
Sensor temperatureMeasuring Range	-40℃~125℃
Sensor Humidity Measuring Range	0 ~ 100% RH
Temperature Measurement Accuracy	±0.2℃(Typical 0-65℃, minimum or maximum temperature accuracy range does not exceed ±0.8℃)
HumidityMeasurement Accuracy	±1.8% RH(Typical 30-70RH, minimum or maximum humidity accuracy does not exceed ±7%RH)
Operating Temperature	-20℃~60℃
Frequency	Low frequency:410-510MHz High frequency:863-928MHz
Protocol	Private protocol, LoRaWAN® protocol
Indoor CommunicationDistance	Penetrates 6 floors
Outdoor CommunicationDistance	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, protectiongrade IP 67
Dimension	90x65x34.5mm(Excluding antenna and mounting parts)
Installation	Wall mount
FlameResistance	UL94V-0
Weight	365g
OperatingTemperature	-20~+60℃ -4~+140℉
Storage Temperature	-20~+60℃ -4~+140℉
Humidity	95% (No condensation)

Installation

Packing Lists

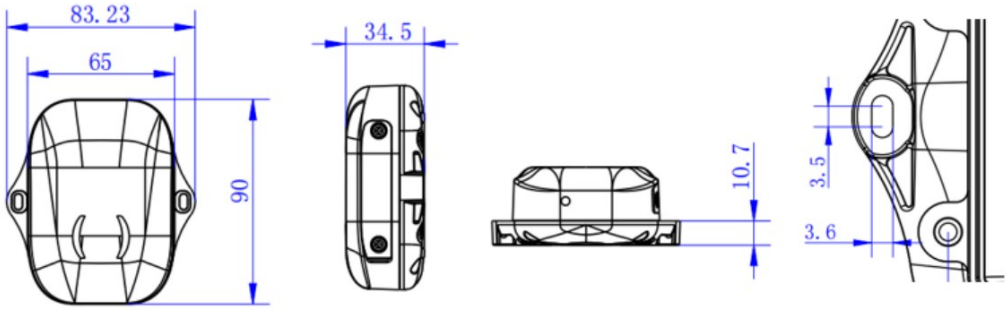
When you unpack, please keep the packing materials in good condition for future transportation. If the following items are damaged or lost, please contact your agent or sales representative in time. The list is as follows:

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

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

Dimension (mm)



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 lightflashing ➡ Off	not activated
Restart	Long press RESET over 1 second and release	Green light flashing	Does not change the activation status of the devicebefore the restart
Confirm On/Off status	Short press ACT button	Light flashing: device turn on Light off: deviceshut 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.

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.

Parameter Configuration

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

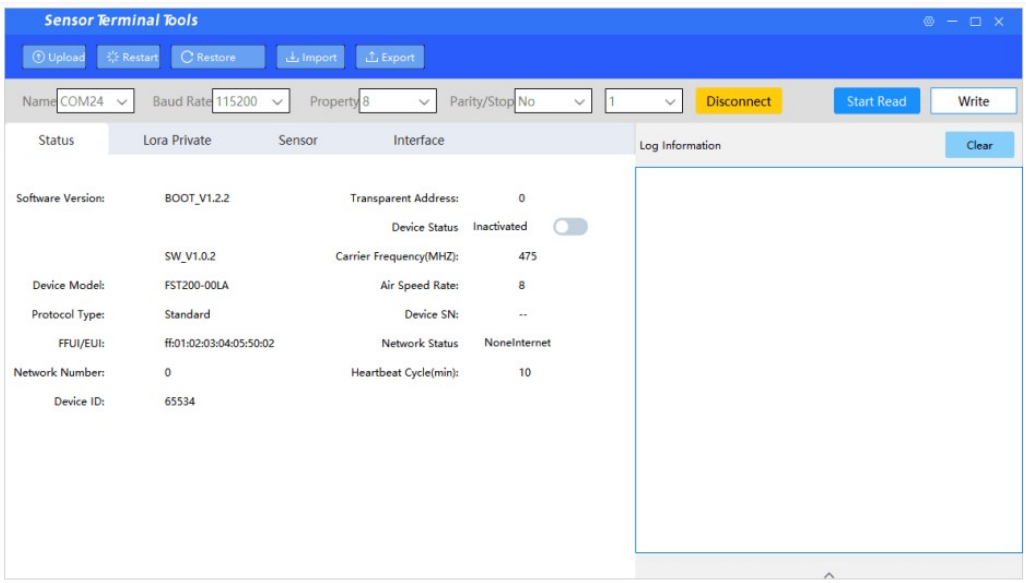


Figure 3.1 Sensor Could APP

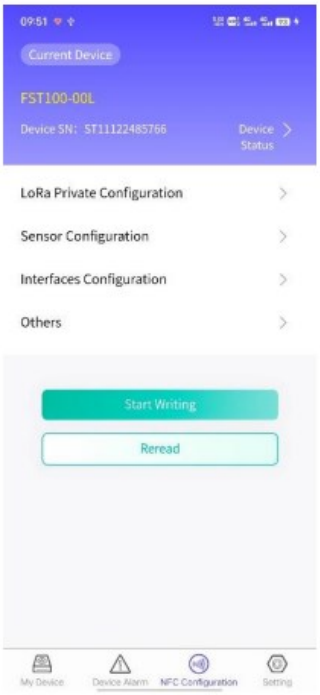
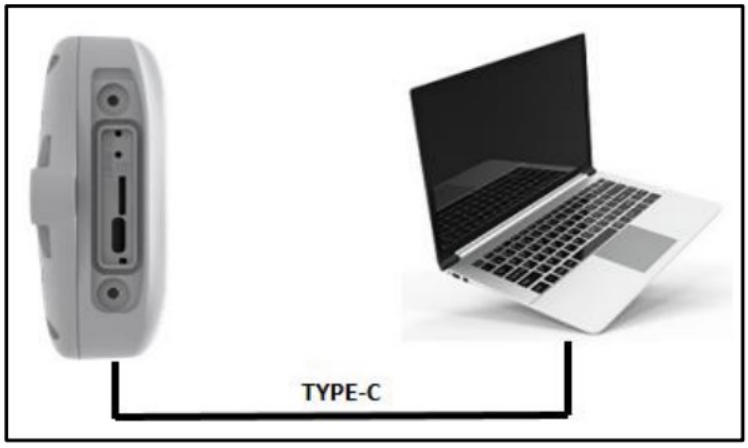


Figure 3.2 Sensor Could APP

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 Could 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 Could 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.

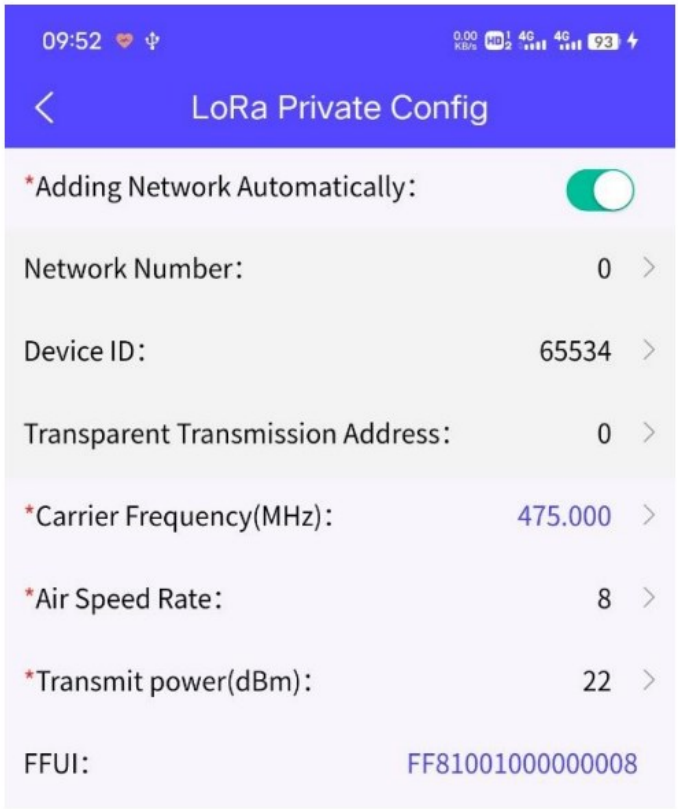
Note:

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.

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	It is divided into automatic add network mode and manual add network mode.Automatic add network mode • 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. Manual add network mode • 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	Automatic add network mode
	• No network access status noticeu No disconnection detection and reconnection mechanism	
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 TransmissionAddress	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 valueaccording to the actual application environment	3
Transmitted Power	Range: 5 to 22dBm. The higher the transmission power, the higher the power consumption and thelonger the transmission distance.	20

Note:

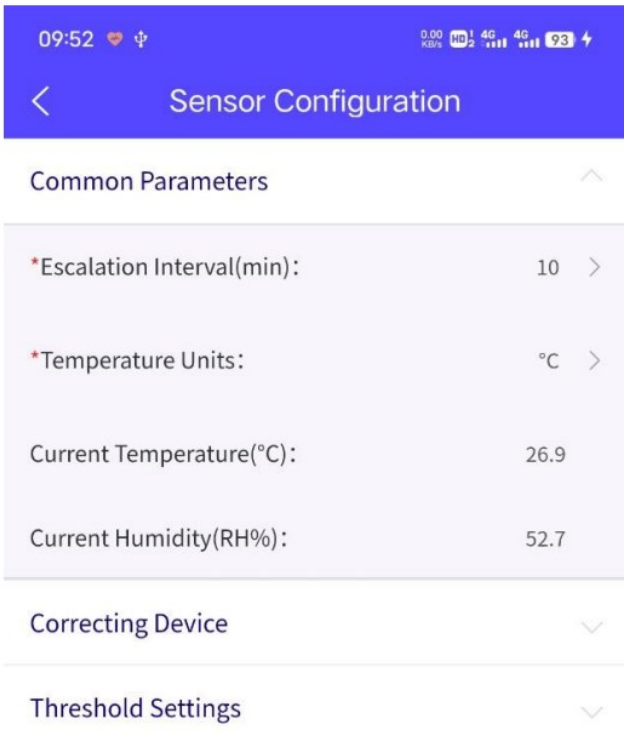
1. If you use the Four-Faith sensor cloud platform to manage FST100-00 series devices, please use the automatic network adding mode.
2. In the add network mode, modify the carrier frequency, and data rate, and estore factory Settings to execute the network request again.
3. If a large amount of equipment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

- LoRaWAN configuration Under developing.

Basic Setting

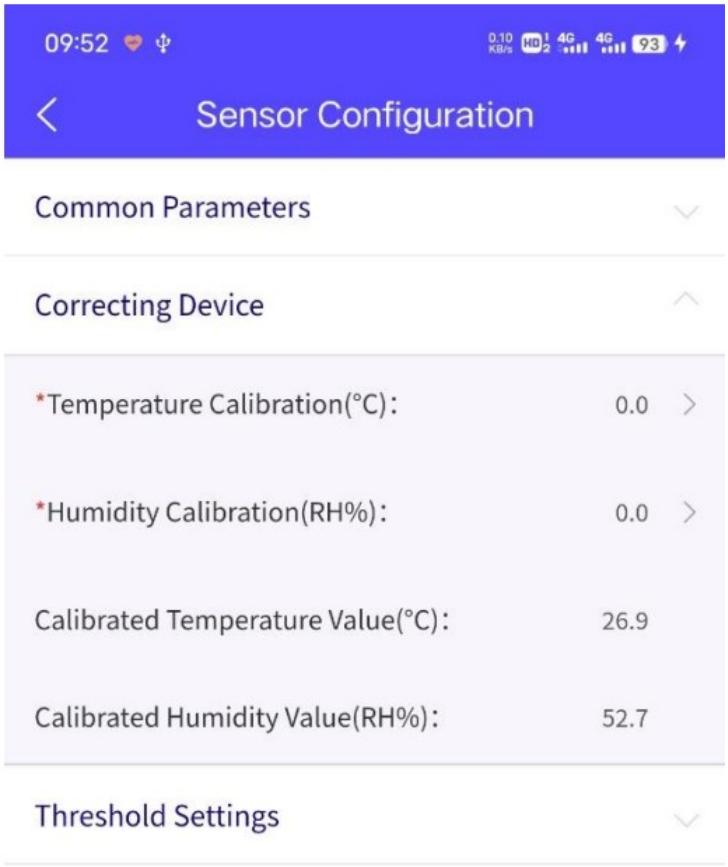
Open the “NFC Configuration > Sensing Configuration” menu in the Sensor Cloud APP, set the common device parameters, calibrate the device, and set the threshold.

- General Parameters



Parameter	**Description**	**Factory Default Value**
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
CalibratedTemperature Value (° C)	Display the calibrated temperature value in real-time	
CalibratedHumidity Value (RH%)	Displays the calibrated humidity in real-time	

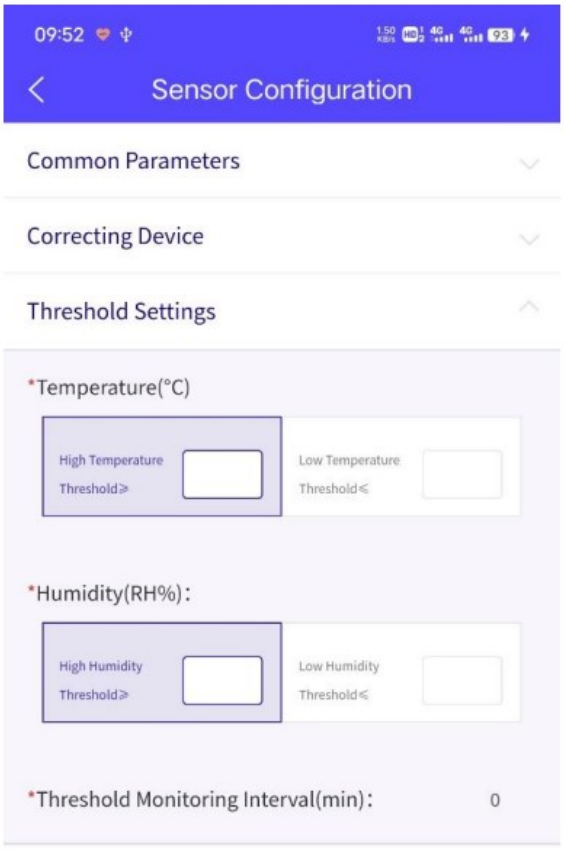
- Correcting device



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
CalibratedTemperature Value (° C)	Display the calibrated temperature value in real-time	
CalibratedHumidity 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.

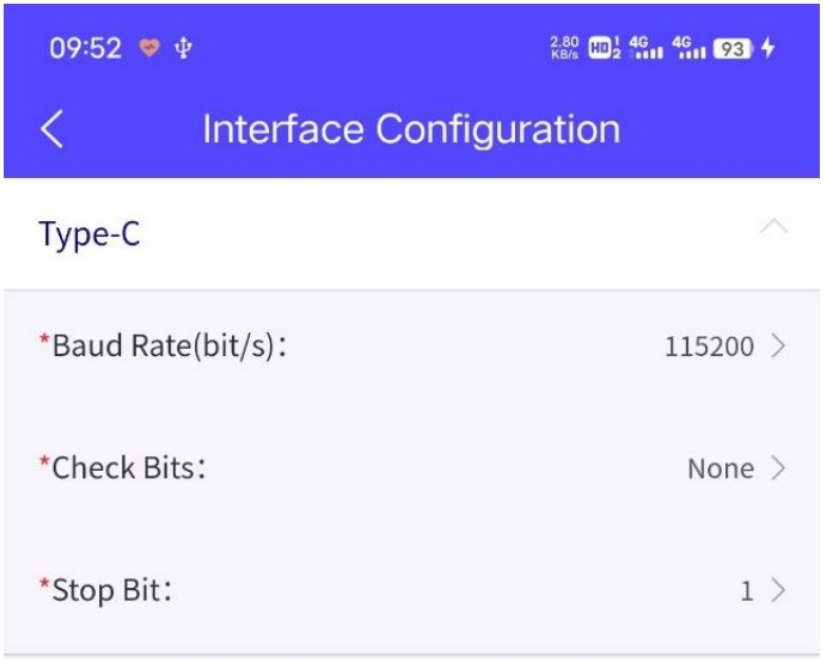
- Threshold Settings


09:52
Sensor Configuration
Common Parameters
Correcting Device
Threshold Settings
*Temperature(°C)
High Temperature Threshold≥
Low Temperature Threshold≤
*Humidity(RH%):
High Humidity Threshold≥
Low Humidity Threshold≤
*Threshold Monitoring Interval(min):
0

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. Fordetails, 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, pleaserefer 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 MonitoringInterval	The interval for the device to wake up for threshold monitoring can be set from 0 to 65535 minutes. Toenable the threshold monitoring interval, you need to	0
	set any of the preceding threshold parameters.	

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

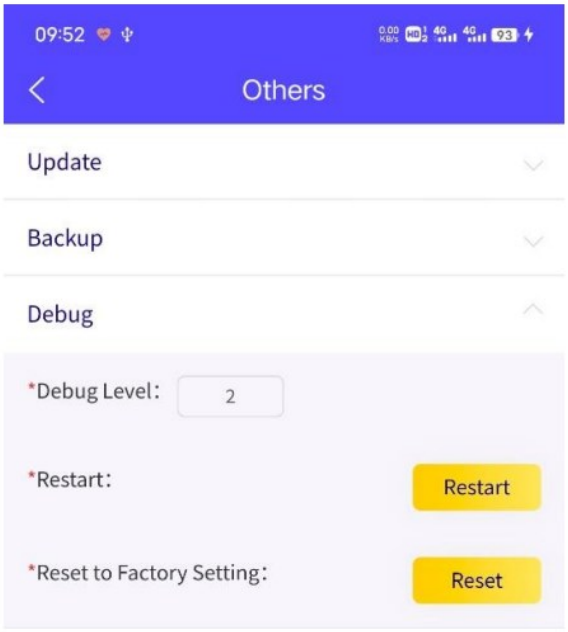
Maintenance

- Upgrade
  FST100-00 series support NFC upgrade of sensor cloud APP, remote upgrade of FourFaith 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	FactoryDefault Value
Debug Level	0 = No log information is generated1 = The key log information is displayed2 = The detailed log information is displayedLog information is output through the type-c interface	0
Restart Device	Actively restart the device	
Reset to FactorySetting	The device parameters are reset to the factory setting	

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.

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.

Data Communication Protocol

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

Four-Faith Private Protocol

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

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	XORChecksum
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
0x00Business Data Package	Temperature (2), Humidity (2), Reporting interval (2), Battery power (1)	The device wakes up and reports at regular intervals
0x03Temperature 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/humidity2 low temperature/humidity0 normal
0x04Device Status Package	Temperature (2), Humidity (2), Abnormal status (1), Warning status (1), Battery power (1)	The device wakes up for detection. If the device is abnormal, it reports the alarm immediately.Abnormal status:1 Device abnormal2 The measured value is abnormal0 no abnormalities Notice status:1 keep2 keep3. Anti-disassembly alarm package0 no hint
0x05Parameter Update Package	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), Addnetwork mode (1)	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 manually1. Automatic add network

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 ℃
- **humidity (02 3d):** 57.3%
- **Reported interval (00 03):** 3 min
- **Battery power (32):** jk50%

Documents / Resources

	Four-Faith FST100 LoRa Humidity and Temperature Sensor Terminal [pdf] User Manual FST100, 2A8OE-FST100, 2A8OEFST100, FST100 LoRa Humidity and Temperature Sensor Terminal, FST100, LoRa Humidity and Temperature Sensor Terminal, Humidity and Temperature Sensor Terminal, Temperature Sensor Terminal, Sensor Terminal, Terminal

References

- Faith
- 5G Routers, 5G CPE, Wireless Modems, Gateways| Four-Faith
- 5G Routers, 5G CPE, Wireless Modems, Gateways| Four-Faith
- 5G Routers, 5G CPE, Wireless Modems, Gateways| Four-Faith