Handheld speed tester instruction manual

Catalogue

1. Introduction

Handheld Speed Tester

The handheld speed tester is connected to different water quality sensors. It can measure CO_2, PH, conductivity, turbidity, dissolved oxygen and other elements in water. The device uses a large full-color LCD screen, which can display the real-time data. It has high sensitivity as well as excellent repeatability. The device also has a data storage function that can be set to automatically store the storage time inside the device. Plugged into the computer via USB, the computer will recognize the U disk and can output the data. It is widely used in aquaculture, environmental monitoring and other industries.

2. Main functions

● Real-time display of measurement results, fast speed and easy operation；

● U-disk storage of output data；

● USB debugging and upgrading of equipment；

● Full-color LCD display with beautiful interface；

● Large storage space. Up to hundreds of millions of data according to the selected SD card；

3. Product information

3.1 Technical parameters

Operating Voltage	DC3.7V (Li-ion battery 7000mAh)
Dimension	165(L)×80(W)×30(H)mm
Display method	3.2 inch LCD display
Standby time	More than 10 hours (continuous operation)
Charge time	<5 hours
Communication Protocol	Modbus RTU
Weight	329g
SD Storage	≤32G
Elevation	<2500m
Temperature	-20℃ - +50℃
Humidity	<95%RH，no water droplets condensation
Vibration	<0.6g

Technical parameters of handheld speed tester

3.2 Dimension
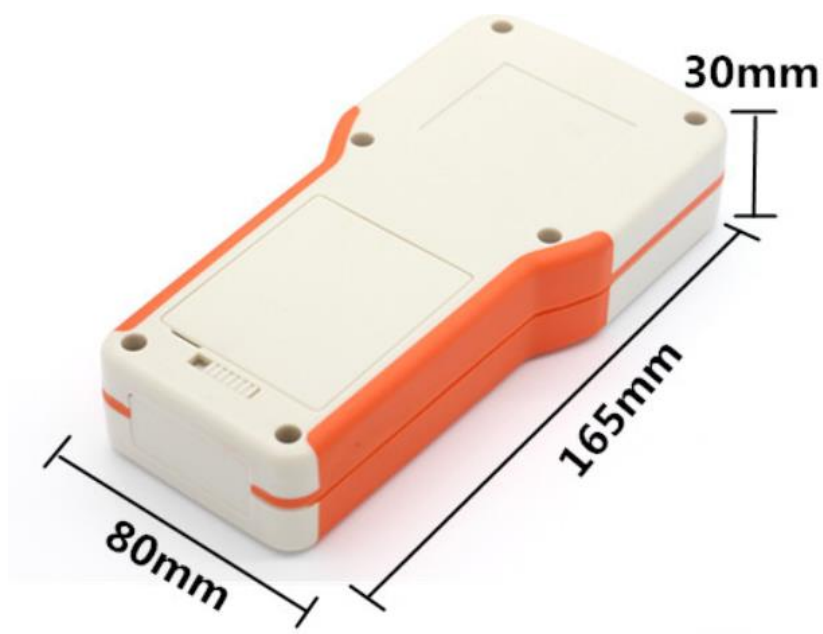
Equipment size diagram(Unit: mm)

4. Operation display and application instructions

4.1 Button description

Button	Name	Description
▲	Up button	Short press the upward button on the menu interface to select the menu upwards. Display numerical mode with increasing values;
▼	Down button	Short press the down button on the menu interface to select the menu. Display numerical mode with reduced values;
◀	Left button	Short press the left button on the menu interface to select the menu to the left. Display numerical mode, select numerical digits to the left;
▶	Right button	Short press the right button on the menu interface to select the menu to the right. Display the numerical mode and select the numerical digit to the right;
ESC	Back button	Short press to return to the previous menu level in the menu interface;
OK	OK button	Short press on the main interface to enter the settings menu interface; Short press to enter the corresponding menu setting interface in the setting menu interface; Numerical setting interface, short press OK to exit the current setting;
PWR	Power button	Short press to turn on the device when it is turned off; Press and hold for 5 seconds in the power on state to turn off the device;
SET	Set button	Short press on the main interface to enter the configuration interface; Short press on the menu interface to set the corresponding menu;

Button Description

4.2 Real-time data

After the system is powered on, it enters the "Real-time Data Display" interface

Real-time data display interface

The real-time data display interface displays the current time, battery level, and real-time data collected from water quality.

4.3 Authorization password

The authorization password defaults to "0000". There is no need to set a password to enter the menu. If an authorization password is set, it is necessary to operate the "Up", "Down", "Left", and "Right" buttons and enter the correct authorization password to enter the configuration menu. After entering the menu correctly, as long as the screen remains silent during the display time, it does not require entering the authorization password again if entering the configuration menu again. If the screen display time is exceeded, the screen will shut down. At this time if you enter the configuration menu again, you need to enter the authorization password again.If you forget your password, press and hold the "ESC" button for more than 5 seconds, then release the button to skip the authorization password and enter the configuration menu.
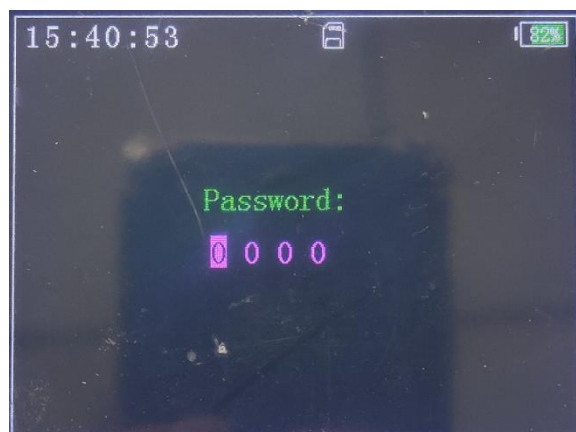
Field data monitoring interface

The password can be modified in the "Main Interface/SET/System/Password". Adjust the number by "up" or "down", and select the password bit by "left" or "right". Press "OK" to confirm that the password has been set successfully.

4.4 Function menu

1) Running menu

Short press the "up" or "down" button to select the menu. After selecting the menu, briefly press the "OK" button to enter the configuration state, and the corresponding numerical value will be displayed in reverse. In configuration mode, short press "up" to increase the value, and short press "down" to decrease the value. Short press the "Left" or "Right" button to select the numerical digit that needs to be modified. After setting, short press "OK" to complete the setting.
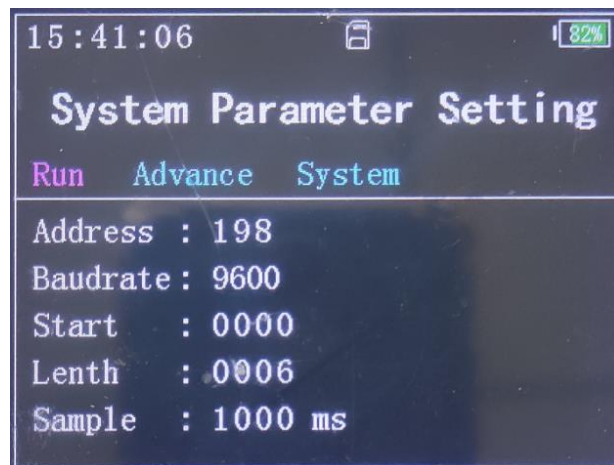
Running menu

Menu Description：

- Address: Sensor address；
- Baudrate: Sensor baud rate；
- Start : Starting collection address；
- Lenth: Number of sensors collected；
- Sample: Sensor sampling period；

2) Advanced menu

Short press the "up" or "down" button to select the menu. After selecting the menu, briefly

press the "OK" button to enter the configuration state, and the corresponding numerical value will be displayed in reverse. In the numerical configuration st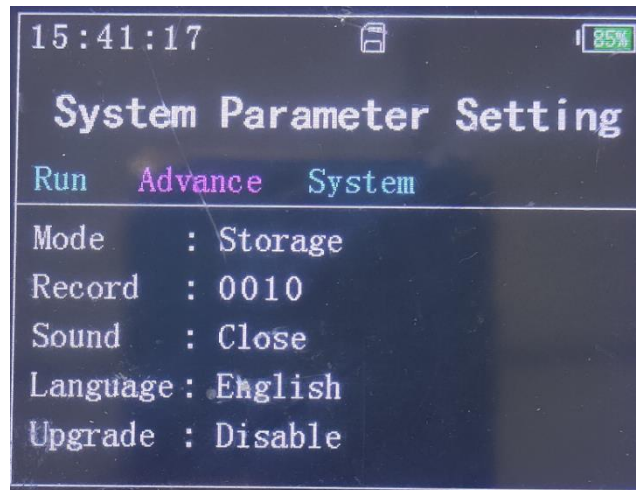ate, short press "up" to increase the value, and short press "down" to decrease the value. Short press the "Left" or "Right" button to select the numerical digit that needs to be modified. In a non numerical state, briefly press the "up" or "down" button to switch function items. After setting, short press "OK" to complete the setting.

Advanced menu

Menu Description：

- Mode: Operating mode；

- Record: Data storage period；

- Sound: System sound；

- Language: Language setting；

- Upgrade: Firmware upgrade；

3) System menu

Short press the "up" or "down" button to select the menu. After selecting the menu, briefly press the "OK" button to enter the configuration state, and the corresponding numerical value will be displayed in reverse. In configuration mode, short press "up" to increase the value, and short press "down" to decrease the value. Short press the "Left" or "Right" button to select the numerical digit that needs to be modified. After setting, short press "OK" to complete the setting.
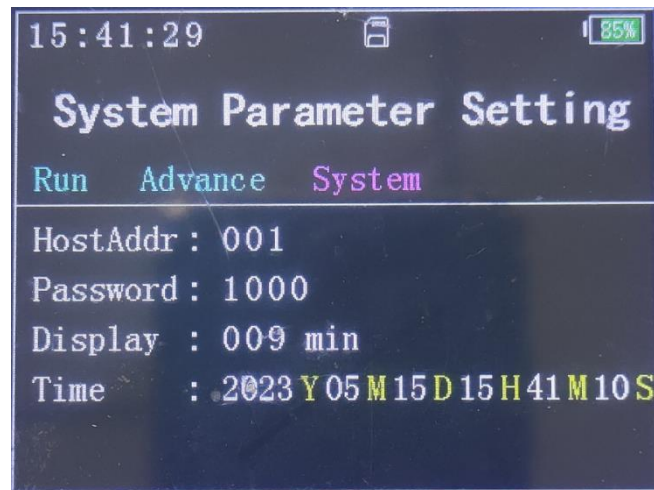
System menu

Menu Description：

- Host Address : Handheld device address；

- Password: Authorization password；

- Display : Screen display time；

- Time : System time；

4.5 Mode setting

Main interface->"SET" Settings menu->"Advance" Advanced menu->"Mode" Mode menu

By pressing the up and down buttons, select the "Mode" configuration mode, press the "OK" button to set it, press the "Up" or "Down" button to select the mode, and then press the "OK" button to confirm.

Storage mode: Insert Type C into the computer, and the computer will recognize the USB flash drive, then find the stored data from the USB flash drive and export it.

Configuration mode: Insert Type C into the computer, and the computer will recognize the serial port. Based on the local address, the default baud rate is 115200. Find the corresponding serial port and perform device debugging, firmware upgrade, and other operations.
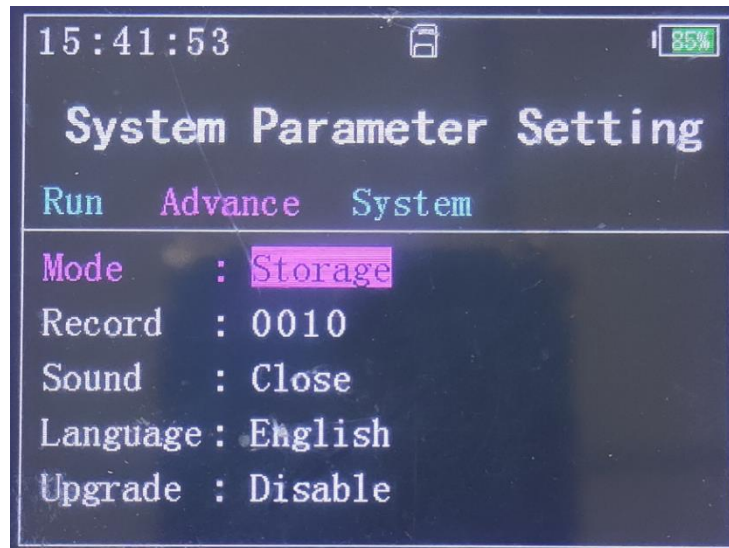
Storage mode
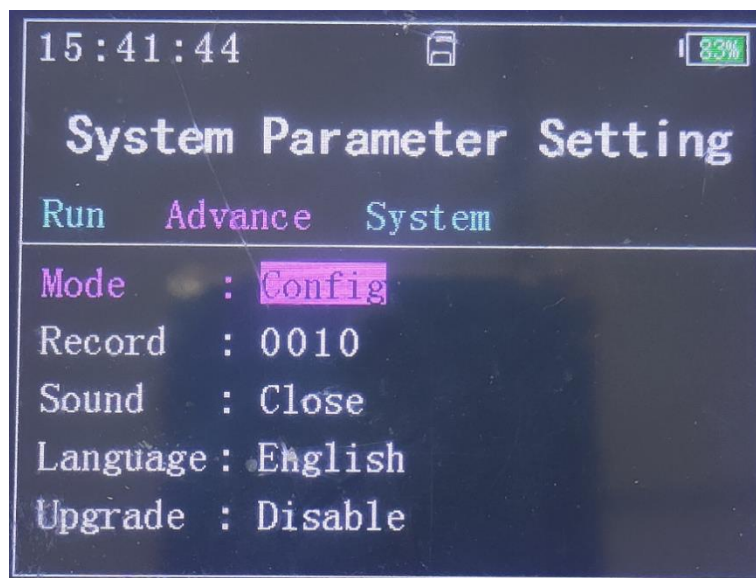
Configuration mode

4.6 Other operations

1) No key operation sets the countdown based on the screen display time, and turns off the screen display when the time is up. Press any button to activate the screen display in the resting state.

2) After setting password protection, enter the password input interface. Enter the correct password and it will automatically enter. If you forget the password, you can press and hold the【Cancel】button for 5 seconds. After hearing the "beep" sound, release your hand to skip the authorization password and enter the configuration menu during this screen display time.

3) Long press and hold the 【Cancel】 button for more than 10 seconds, and the system will automatically restart.

5. USB storage

According to the menu configuration storage cycle, the system automatically stores water quality collection data. If you need to read the collected data, you need to set the device's "Mode Setting" to the "Storage" data storage mode, and then insert it into the computer through USB. At this time, the computer automatically recognizes the USB flash drive and opens to read or copy the data. (After inserting USB, the recognition time may be longer by about 10 seconds)

When reading data, it is best to cut the data from the SD card to the computer. It is not recommended to perform formatting operations, which takes a long time, about 1 minute. Do not perform other operations during the formatting process.
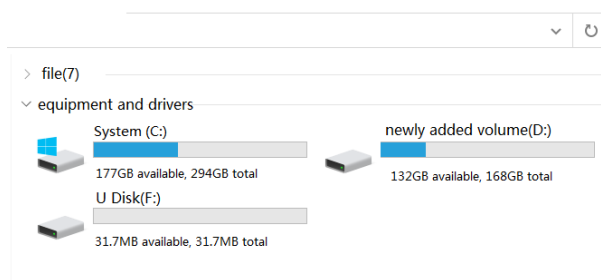
USB drive recognition

The generated storage directory is as follows：
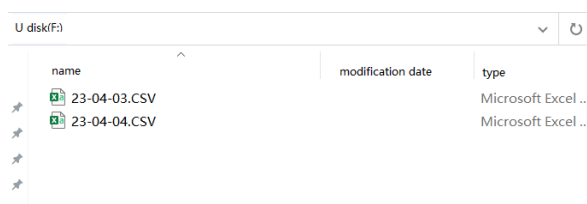
Data storage directory

The generated storage data format is as follows：

	A	B	C	D	E
1	Date	Time	1# CO2(PPM)	2# CO2(PPM)	3# CO2(PPM)
2					
3	2023/5/5	16:23:14	0	0	0
4	2023/5/5	16:23:24	0	0	0
5	2023/5/5	16:23:46	0	0	0
6	2023/5/5	16:23:56	0	0	0
7	2023/5/5	16:24:06	0	0	0
8	2023/5/5	16:24:16	0	0	0
9	2023/5/5	16:24:32	0	0	0
10	2023/5/5	16:24:36	0	0	0
11	2023/5/5	16:24:46	0	0	0
12	2023/5/5	16:24:56	0	0	0
13	2023/5/5	16:25:06	0	0	0
14	2023/5/5	16:25:16	0	0	0
15	2023/5/5	16:25:26	0	0	0
16	2023/5/5	16:25:36	0	0	0
17	2023/5/5	16:25:46	0	0	0
18	2023/5/5	16:25:56	0	0	0
19	2023/5/5	16:26:06	0	0	0
20	2023/5/5	16:26:16	0	0	0
21	2023/5/5	16:26:26	0	0	0
22	2023/5/5	16:26:36	0	0	0
23	2023/5/5	16:26:46	0	0	0

Data storage format

7 in 1 soil parameters monitor sensor
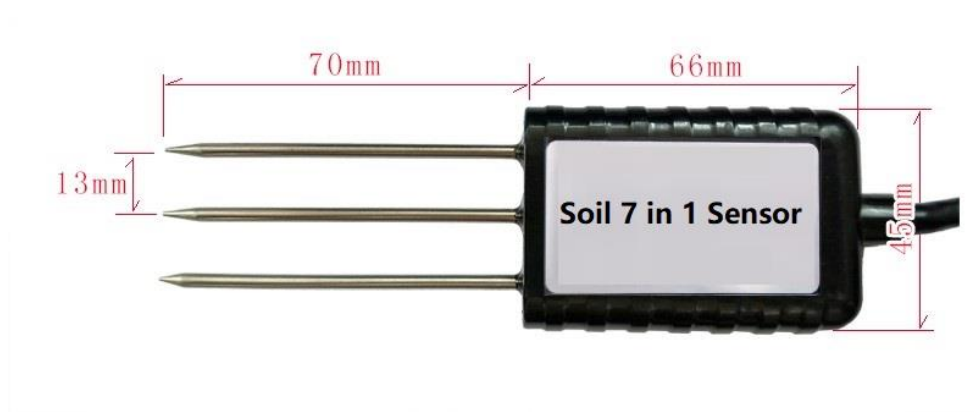
HONDE TECHNOLOGY CO,LTD

1. Product Introduce

The sensor has stable performance and high sensitivity, and can simultaneously monitor soil temperature, humidity, conductivity, salinity, nitrogen, phosphorus, and potassium data. It is an important tool for observing and studying the occurrence, evolution, improvement, and water and salt dynamics of saline soil. By measuring the dielectric constant of the soil, it can directly and stably reflect the true moisture content of various soils. It can measure the volume percentage of soil moisture, which is a soil moisture measurement method that meets the current international standards. By measuring the electrical conductivity of the soil, the salinity reflects the salinity of the soil in time, and by measuring the nitrogen, phosphorus and potassium content of the soil, it reflects the nutrient status of the soil in time, providing a data basis for scientific planting.

2. Product Features

1. The seven parameters of soil water content, electrical conductivity, salinity, temperature and nitrogen, phosphorus and potassium are combined into one.

2. Low threshold, few steps, fast measurement, no reagents, unlimited detection times.

3. It can also be used for the conductivity of water and fertilizer integrated solutions, and other nutrient solutions and substrates.

4. The electrode is made of specially processed alloy material, which can withstand strong external impact and is not easy to damage.

5. Completely sealed, resistant to acid and alkali corrosion, can be buried in soil or directly into water for long-term dynamic testing.

6.High precision, fast response, good interchangeability, probe plug-in design to ensure accurate measurement and reliable performance.

3. Product application

The sensor is suitable for soil moisture monitoring, scientific experiments, water-saving irrigation, greenhouses, flowers and vegetables, grassland pastures, soil rapid testing, plant cultivation, sewage treatment, precision agriculture and other occasions.

4. Product Parameter

1. Technical Parameters

➢   Measurement parameters: soil moisture and temperature and EC and salinity and NPK

➢   Measuring range

● Temperature: -40° C~80° C

● Moisture: 0~100% RH

● EC:0~20000μs/cm

- Salinity:0~10000ppm

- NPK: 1-1999 mg/kg(mg/L)

➢ Measurement accuracy:

- Temperature: ±0.5° C

- Moisture: 0-50%, ±2%; 53%-100%, ±3%

- EC: ±3%

- Salinity: ±3%

- NPK: ±2%FS

➢ Resolution:

- Temperature: 0.1℃

- Moisture: 0.1%RH

- EC: 1 us/cm

- Salinity:1ppm

- NPK: 1 mg/kg(mg/L)

➢ Response time: ＜15s

➢ Conductivity temperature compensation: Built-in temperature compensation sensor, compensation range 0-50 ℃

➢ Output signal: RS485 (standard Modbus-RTU protocol, default address: 01)

➢ Baud rate: 9600/4800/2400bps, default is 9600bps

➢ Supply voltage: 5 ~ 30V DC

➢ Power consumption≤0.15W （@12V,25 ° C）

➢ Working temperature range: -40° C~80° C

➢ Working humidity range: 0-100% (Relative humidity, non-condensing)

➢ Protect level: IP68

2. Physical parameter

➢ Sealing material: ABS engineering plastic, epoxy resin, waterproof grade IP68

➢ Probe Material: Austenitic 316 stainless steel which Anti-rust, anti-electrolysis, salt and alkali resistance, Suitable for all kinds of soil

➢ Low power consumption, high sensitivity, signal stabilization

5. Product Size
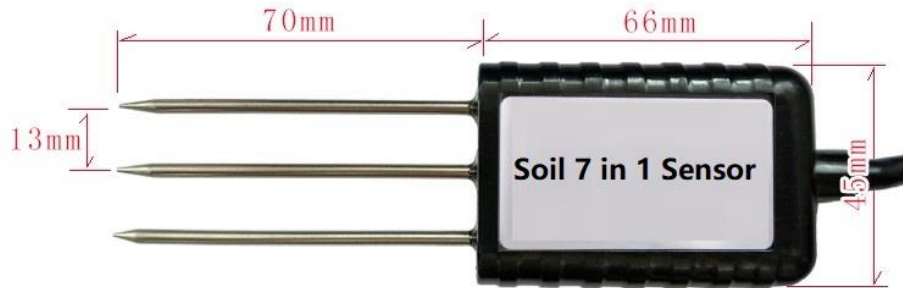
6. Connection method

The wide voltage power input can be 5~30V. When connecting the RS485 signal line, please note that the two lines of A/B cannot be reversed, and the addresses of multiple devices on the bus must not conflict. RS485 connection

| M12 PIN NO.	Wire colour	Interface
1	Brown	Positive power(5-30VDC)
2	Black	GND
3	Yellow	RS485 A
4	White	RS485 B

7. Measurement methods

Since the electrode directly measures the conductivity of the soluble salt ions in the soil, the soil volumetric water content must be higher than about 20% when the soluble ions in the soil can accurately reflect the conductivity of the soil. In the long-term observation, the measured value after irrigation or rainfall is closer to the true level. If you are performing a quick test, you can water the soil to be tested first, and perform the measurement after the water is fully penetrated.

If you are measuring on a hard surface, you should drill a hole first (the hole diameter should be smaller than the probe diameter), then insert it into the soil and compact the soil before measuring; the sensor should be protected from severe vibration and impact, let alone knocked with hard objects. Because the sensor is a black package, the sensor will heat up sharply (up to 50℃) under strong sunlight. In order to prevent excessive temperature from affecting the temperature measurement of the sensor, please pay attention to shading and protection when using it in the field or in the field. .

1. Soil Surface measure method

➢ Select a representative soil environment to clean up surface debris and vegetation

➢ Insert the sensor vertically and completely into the soil

➢ If there is a hard object, the measurement location should be replaced and re-measured

➢ For accurate data, it is recommended to measure multiple times and take the average

➢ To measure deep soil moisture, it is recommended to use our company's dedicated soil drill

2. Buried measure method
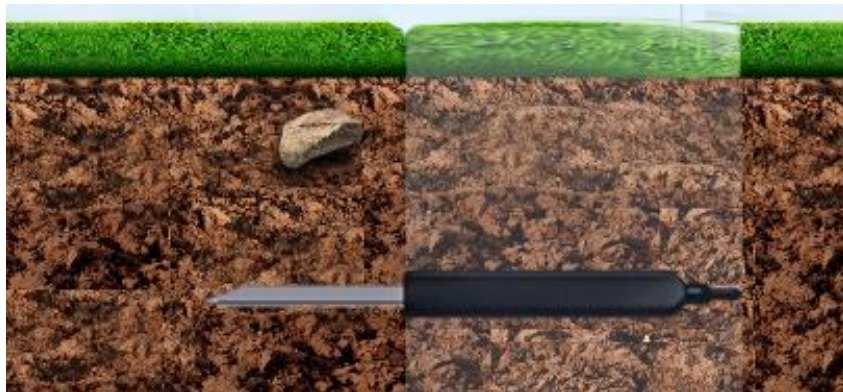
➢ Make a soil profile in the vertical direction, slightly deeper than the installation depth of the bottommost sensor, between 20cm and 50cm in diameter

➢ Insert the sensor horizontally into the soil profile

➢ After the installation is completed, the excavated soil is backfilled in order, layered and compacted, and horizontal installation is guaranteed.

➢ If you have the conditions, you can put the removed soil in a bag and number it to keep the soil moisture unchanged, and backfill it in reverse order.

3. Three-tier installation

4. Six-tier installation

10cm

20cm

40cm

60cm

80cm

100cm

Backfill in order
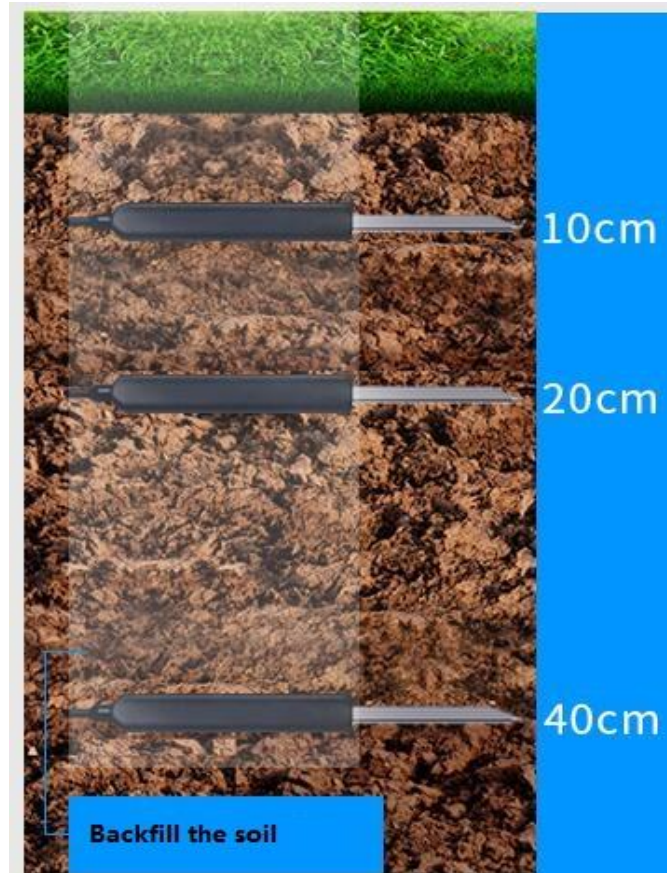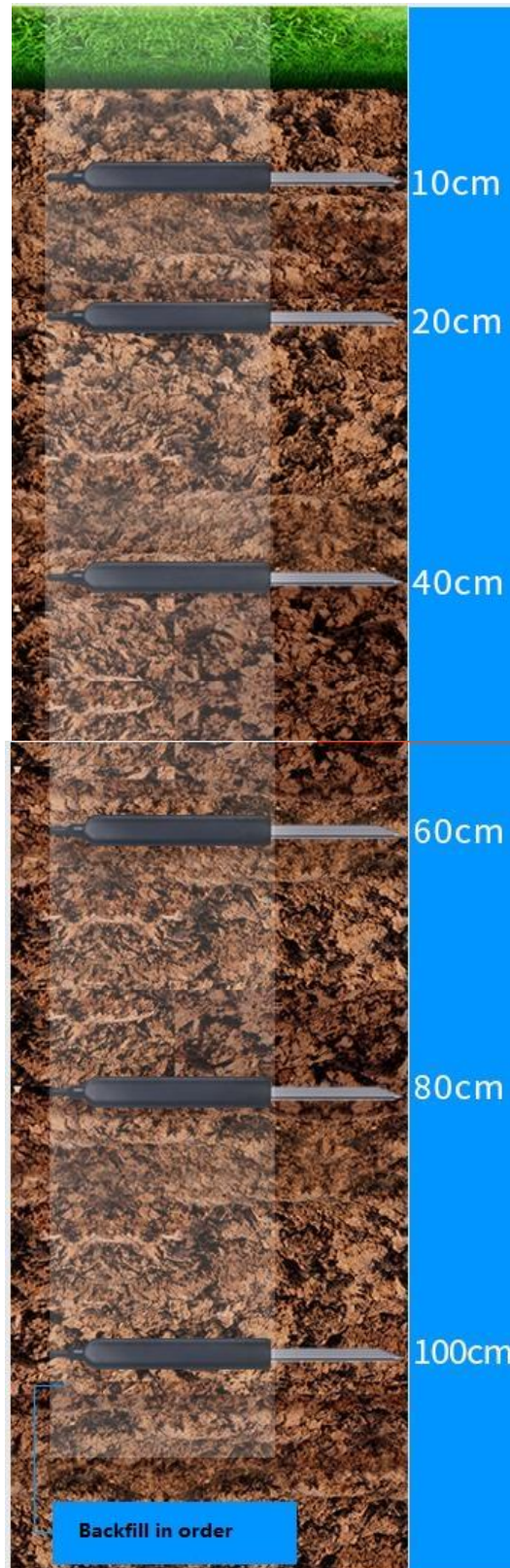
1. Measure Notes

(1). All steel needles must be inserted into the soil during measurement.

(2). Avoid direct sunlight on the sensor, which will cause excessive temperature. Field ambassador use caution against lightning strikes.

(3). Do not bend the steel needle violently, do not pull the sensor lead wire with force, do not beat or violently impact sensor.

(4). The protection grade of the sensor is IP68, which can soak the sensor in water.

(5). Due to the presence of radio frequency electromagnetic radiation in the air, it should not be left in the air for a long time power-on state

8. Data conversion method

1. Standard Modbus-RTU protocol

Baud rate: 2400bit/s, 4800bit/s, 9600 bit/s can be set, the factory default is 9600bit/s

Check digit: none;

Data bit: 8; Stop bit: 1

2. Data frame format definition

Using Modbus-RTU communication protocol, the format is as follows:

Time for initial structure ≥ 4 bytes

Address code = 1 byte

Function code = 1 byte

Data area = N bytes

Error check = 16-bit CRC code

End structure ≥ 4 bytes of time

Address code: the address of the transmitter, which is unique in the communication network

Function code: The command function instruction issued by the host. The transmitter uses function codes 0x03 (read register data) and 0x06 (write register data).

Data area: The data area is the specific communication data, pay attention to the high byte of 16bits data first!

CRC code: two-byte check code.

Host inquiry frame structure

Address code	Function code	Register start address	Register length	Check digit low	Check digit high
1 byte	1 byte	2 bytes	2 bytes	1 byte	1 byte

Slave response frame structure

Address code	Function code	Effective bytes	Data 1 area	Data 2 area	Data N area	Check code
1 byte	1 byte	1 byte	2 bytes	2 bytes	2 bytes	2 bytes

3. Register address

Register	PLC or configuration	Content	Operation	Definition description

address	address			
0000 H	40001 (Decimal)	Soil Moisture	Read only	Real-time value of water content (expand 100 times)
0001 H	40002 (Decimal)	Soil Temperature	Read only	Real-time temperature value (enlarge 100 times)
0002 H	40003 (Decimal)	Soil EC	Read only	Real-time conductivity
0003H	40004 (Decimal)	Nitrogen content	Read only	Real-time value of nitrogen content
0004H	40005 (Decimal)	Phosphorus content	Read only	Real-time value of phosphorus content
0005 H	40006 (Decimal)	Potassium content	Read only	Real-time value of potassium content
0006 H	40007 (Decimal)	Salinity	Read only	Salinity real-time value
0026H	40039(Decimal)	Soil Moisture Coefficient Calibration	Read/Write	Coefficient range -1.000~+2.000
0027H	40040(Decimal)	Soil Moisture offset calibration	Read/Write	Calibration range -20.00%~+20.00%
0028H	40041(Decimal)	Soil EC Coefficient Calibration	Read/Write	Coefficient range -1.000~+2.000
0029H	40042(Decimal)	Soil EC offset calibration	Read/Write	Calibration range -2000us/cm~2000us/cm
0200 H	40513 (Decimal)	Device address	Read and write	1~255
0201 H	40514 (Decimal)	Device baud rate	Read and write	0-1200 1-2400 2-4800 3-9600, default 4-19200 5-38400

4.Communication protocol examples and explanations

1. Modify the address, for example: change the address of the transmitter with address 1 to 2, host →

slave

Original address	Function code	Register address low	Register address high	New address low	New address high	CRC16 low	CRC16 high
0X01	0X06	0X02	0X00	0X00	0X02	0X09	0XB3

If success, the slave will send: 01 06 02 00 00 02 09 B3

Note: If you forget the present sensor address value, you can check the sensor address by the following

instruction:

Host sends: FE 03 02 00 00 01 91 BD

If feedback: FE 03 02 00 01 6D 90

It mean the sensor address is 01.

Note: The FE is the broadcast address (universal address), if you forget the present sensor address,

you can use the broadcast address FE to obtain the sensor address.

(2) Read soil Moisture &Temperature & EC & N & P & K & Salinity at device address 0x01

➤ Inquiry frame

Address code	Function code	Register start address	Register length	Low check bit	Check code high
0X01	0X03	0X00 0X00	0X00 0X07	0X04	0X08

➤ Response frame

Address code	Function code	Number of valid bytes	Data area							Low check bit	High Check bit
			Moisture	Temp	EC	N	P	K	Salinity		
0X01	0X03	0X0E	0x27 0X10	0x05 0XD9	0x01 0XDB	0x00 0X3F	0x00 0X19	0x00 0X9A	0x00 0XED	0XF1	0X62

Calculation instructions:

Moisture: 2710(hexadecimal) = 10000 (Decimal) => Moisture = 100.00%

Temperature: 05D9(hexadecimal)= 1497(Decimal) => Temperature = 14.97℃

EC: 01DB(hexadecimal) = 475(Decimal) => EC = 475us/cm

N:003F((hexadecimal) = 63(Decimal) => N = 63mg/KG

P:0019(hexadecimal) = 25(Decimal) => P = 25mg/KG

K:009A(hexadecimal) = 154(Decimal) => K = 154mg/KG

Salinity:00ED(hexadecimal) = 237(Decimal) => Salinity= 237ppm

Note: When the temperature is lower than 0 degrees, the complement code is used

➤ Example: Write the coefficient to change the EC content of the device address 0x01

Inquiry frame (hexadecimal): change to 0.933 times the original value, as the original coefficient is 1, then need minus

0.067 in the coefficient, then , write -67=FFBD(HEX)

Address	Function code	Start address	EC content coefficient	Check code low	Check code high
0x01	0x06	0x00 0x28	0XFF 0XBD	0x88	0X43

Response frame (hexadecimal): If success, it will feedback: 01 06 00 28 FF BD 88 43

Example: Write the offset data to change the EC value in the device address 01

Inquiry frame, for example add 10 to the present EC value, (converted the hexadecimal data is 00 0A)

Address	Function code	Start address	EC content coefficient	Check code low	Check code high
0x01	0x06	0x00 0x29	0x00 0X0A	0XD8	0X05

Response frame (hexadecimal): If success, it will feedback: 01 06 00 29 00 0A D8 05

9. Common problems and solutions

The device cannot be connected to the PLC or computer possible reason:

1. The computer has multiple COM ports and the selected port is incorrect.

2. The device address is wrong, or there are devices with duplicate addresses.

3. The baud rate, check method, data bit and stop bit are wrong.

4. The 485 bus is disconnected, or the A and B wires are connected reversely.

5. If the number of equipment is too large or the wiring is too long, power should be supplied nearby, and a 485 booster

should be added and a 120Ω terminal resistance should be added at the same time.

6.The USB to 485 driver is not installed or damaged.

7. The equipment is damaged.