



Mysentech Soil Trio

Datasheet

V4.2

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1. Introduction

Thank you for choosing Mysentech soil sensors. This manual guides you through using the Mysentech Soil Trio (MST) Sensor for Soil Moisture, Temperature, and Electrical Conductivity (EC).

The MST Sensor features high sensitivity, accurate measurements, stable performance, low power use, weather resistance, and ease of use. It's suitable for agriculture, forestry, horticulture, and other planting sectors.

Before shipping, each sensor undergoes precise calibration for temperature and moisture accuracy, ensuring it's ready for immediate use. The sensor uses RS485 communication for better interference resistance.

Functional Features

- Utilizes a custom RF resonant circuit for stable signals and strong penetration.
- Incorporates embedded models and calculations for moisture and conductivity, tailored for various soils with high precision.
- Offers a Wide measurement range, excellent linearity, and wide applicability.
- Features built-in memory, eliminating the need for maintenance or on-site calibration.
- Supports energy-saving mode to fulfill ultra-low-power measurement needs.
- Supports IAP online firmware upgrade function.
- Supports algorithm parameter tuning.

Technical Specifications

Operating temperature range: -40°C to +85°C

Soil moisture content measurement

- Typical accuracy: $\pm 3\%$
- Resolution: 0.1%
- Range: 0 to 100%

Temperature measurement

- Typical Accuracy:
 - $\pm 0.5^{\circ}\text{C}$ (from 0°C to $+50^{\circ}\text{C}$)
 - $\pm 1.5^{\circ}\text{C}$ (from -40°C to $+85^{\circ}\text{C}$)
- Resolution: 0.004°C (16-bit ADC)

Conductivity measurement

- Typical accuracy: $\pm 3\%$ FS
- Resolution: 0.01mS/cm
- Range: 0 to 20mS/cm

Acquisition time: < 0.2 seconds

Peak power consumption: 16.12mA@5V

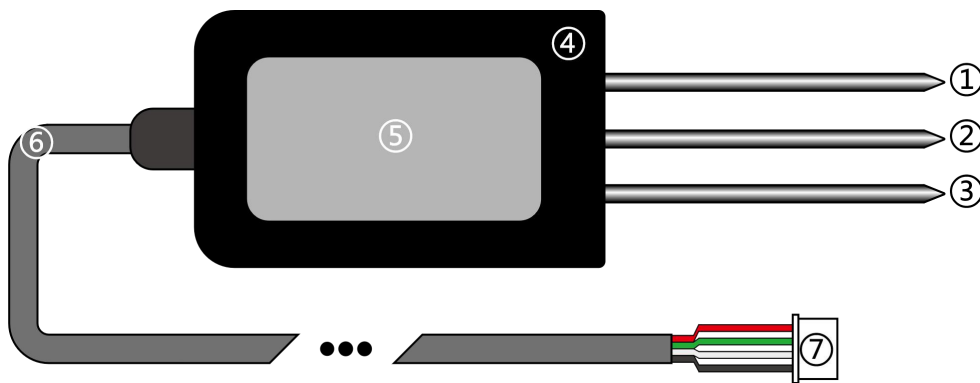
Supply voltage: 3.6V to 24V

Interface: RS485(MODBUS protocol)

IP rating: IP67

Sensor size: 72mm × 45mm × 15mm (probe not included)

Product Formation



- ① Conductivity electrode (EC)
- ② Ground electrode (GND)
- ③ Moisture content electrode (FDR)
- ④ Product enclosure
- ⑤ Product label
- ⑥ Cable
- ⑦ Connector

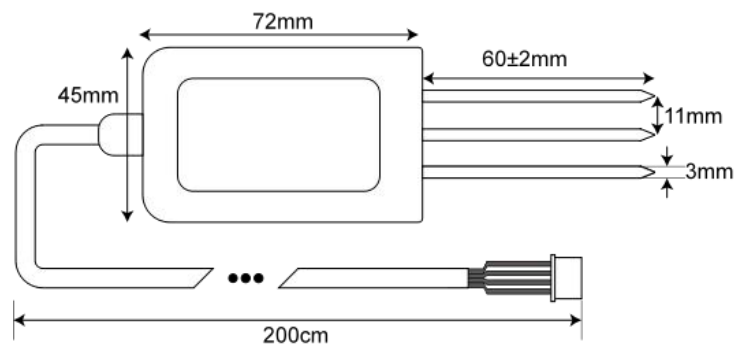
2. Selection Guide and Interface Description

The product information table is as follows:

Product Name	Product Model	Note
Mysentech Soil Trio	MST Sensor	Soil moisture, conductivity, and temperature measurement, with terminals
Mysentech Soil Trio	MST Sensor-NP	Soil moisture, conductivity, and temperature measurement; no terminals; 3 cm of stripped wire; 5 mm of tinned wire
Mysentech Soil Trio (NEC)	MST Sensor (NEC)	Soil moisture and temperature measurement, with terminals

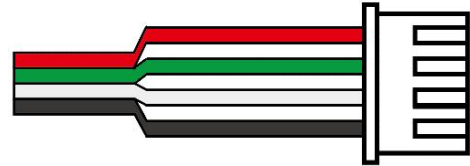
Note: The sensor comes standard with a 2-meter, 4-wire unshielded cable. If you require a different cable length, please place a custom order.

Taking a sensor with terminals as an example, the sensor dimensions and a photo of the actual product are shown below:



The definition of sensor connector and wire sequence are as follows:

category	Wire color	Description
Power supply	red	power positive
	black	power negative
Data	yellow or green	485-A
	white	485-B



3. Communication Protocols

3.1 Basic Communication Parameters

Code	8-bit binary
Data bit	8-bit
Parity bit	-
Stop bit	1 bit
Error checking	CRC-16/MODBUS (redundant cyclic code)
Baud rate	Default 9600bps (user configurable)

3.2 Data Frame Format Definition

The Modbus-RTU communication protocol is used in the following format:

Address field=1 byte

Function field=1 byte

Data field=N bytes

CRC field=16 bit CRC code (low byte first)

Address field: The address of the sensor, which is unique in the communication network (factory default 0x01).

Function field: Instruction function indication issued by the host, function field 0x03 reads register data, and function field 0x06 writes to a single register.

Data field: The data area is specific communication data, please note that the high byte of 16 bits data comes first.

CRC field: Two byte checksum, with low bytes before and high bytes after.

Host inquiry frame structure

Address Field	Function Field	Register Starting Address	Register Length	Check Code Low bit	Check Code High Bit
1 byte	1 byte	2 bytes	2 bytes	1 byte	1 byte

Slave reply frame structure

Address Field	Function Field	Effective Bytes	First Data Area	Second Data Area	Nth Data Area	Check Field
1 byte	1 byte	1 byte	2 bytes	2 bytes	2 bytes	2 bytes

3.3 Register Definition

Register Starting Address	Data Length (the unit is 2 bytes)	Content	Description	Operation
0000 H	1	baud rate configuration	0-1200 1-2400 2-4800 3-9600, default 4-19200 5-38400	read and write
0002 H	1	485 node address	unsigned integer, 1~252	read and write
0003 H~0009 H	7		reserve	
000A H	1	oscillation count value	unsigned integer, 0~65535	read only
000B H	1	temperature	signed number (increased by 10	read only

			times), -70.0 ~ 150.0°C	
000CH	1	soil moisture content	unsigned percentage, resolution 0.1% (increased by 10 times)	read only
000DH	1	soil conductivity value	unsigned number, resolution of 0.01mS/cm	read only
001AH	1	oscillation meter values in the air	unsigned integer, 0~65535	read and write
001BH	1	water oscillation meter value	unsigned integer, 0~65535	read and write
001CH	1	oscillator meter numerical calibration slope A	unsigned integer (0-2 range) A/32768	read and write
001DH	1	oscillator meter calibration intercept B	signed integer -32768~32767	read and write
0020H	1	soil moisture content SF1	unsigned number (increased by 1000 times), 0-1	read and write
0021H	1	soil moisture content 1	unsigned percentage, resolution 0.1% (increased by 10 times)	read and write

0022H	1	soil moisture content SF2	unsigned number (increased by 1000 times), 0-1	read and write
0023H	1	soil moisture content 2	unsigned percentage, resolution 0.1% (increased by 10 times)	read and write
0024H	1	soil moisture content SF3	unsigned number (increased by 1000 times), 0-1	read and write
0025H	1	soil moisture content 3	unsigned percentage, resolution 0.1% (increased by 10 times)	read and write
0026H	1	soil moisture content SF4	unsigned number (increased by 1000 times), 0-1	read and write
0027H	1	soil moisture content 4	unsigned percentage, resolution 0.1% (increased by 10 times)	read and write
0028H	1	soil moisture content SF5	unsigned number (increased by 1000 times), 0-1	read and write
0029H	1	soil moisture content 5	unsigned percentage, resolution 0.1% (increased by 10 times)	read and write
002AH	1	soil moisture content SF6	unsigned number (increased by	read and write

			1000 times), 0-1	
002BH	1	soil moisture content 6	unsigned percentage, resolution 0.1% (increased by 10 times)	read and write
002EH	1	hardware Version	the main version number is 8 bytes high; The lower 8 bytes are the minor version number. Example: 9.1 is stored as 0x91.	read only
002FH	1	firmware Version	the main version number is 8 bytes high; The lower 8 bytes are the minor version number. Example: 9.2 is stored as 0x92.	read only

3.4 Communication Protocol Example

3.4.1 Reading soil temperature, soil moisture, and soil conductivity values at sensor address 0x01

Inquiry frame

Example: 01 03 00 0B 00 03 74 09

Queries 4-words (8 bytes) data from Node 1, with a starting address of 0x000A

Address Field	Function Field	Starting Address	Data length (the unit is 2 bytes)	Check Code Low Bit	Check Code High Bit
0x01	0x03	0x00 0x0B	0x00 0x03	0x74	0x09

Reply frame

Example: reading a temperature of -10.1 °C , soil moisture of 15.5%, and soil conductivity value of 1mS/cm

Address Field	Function Field	Effective Bytes	Temperature Value	Soil Moisture	Soil Conductivity Value	Check Code Low Bit	Check Code High Bit
0x01	0x03	0x06	0xFF 0x9B	0x00 0x9B	0x00 0x64	0x20	0xA2

Note:

1. Temperature: When the temperature is below 0°C, upload in the form of a complement code.

0xFF9B (hexadecimal)= -101 => Temperature = -10.1°C

2. Soil moisture: unsigned number

0x009B (hexadecimal)=155=> soil moisture = 15.5%

3. Soil conductivity value: unsigned number

0x0064 (hexadecimal)=100=> Soil conductivity value = 1mS/cm

3.4.2 Modifying the sensor address

Change the sensor address from 01 to 02

Note: When modifying the address, only one sensor can be connected to the bus.

Set Frame

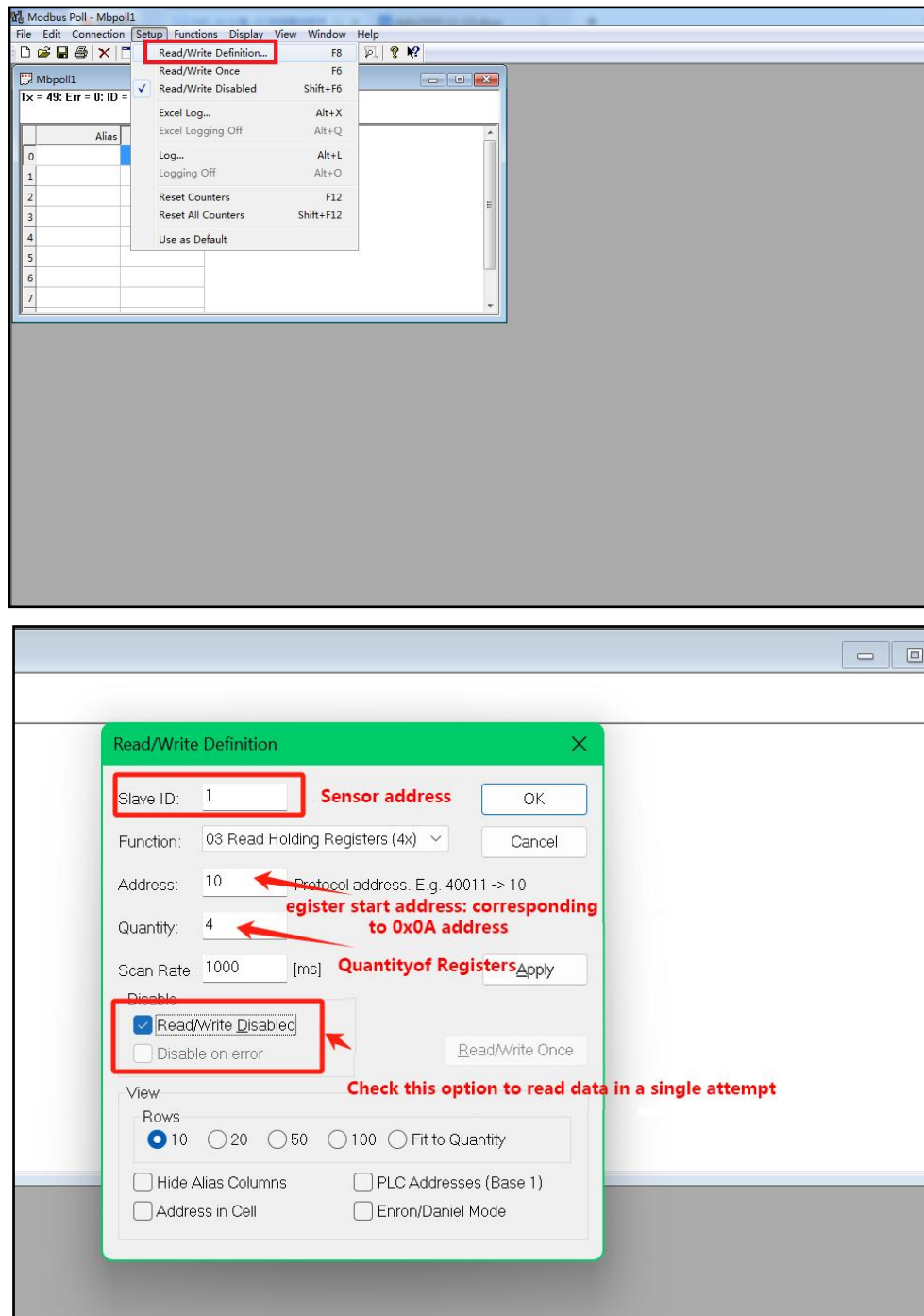
Address Field	Function Field	Starting Address	New Sensor Address	Check Code Low Bit	Check Code High Bit
0xFE	0x06	0x00 0x02	0x00 0x02	0xBD	0xC4

Reply frame

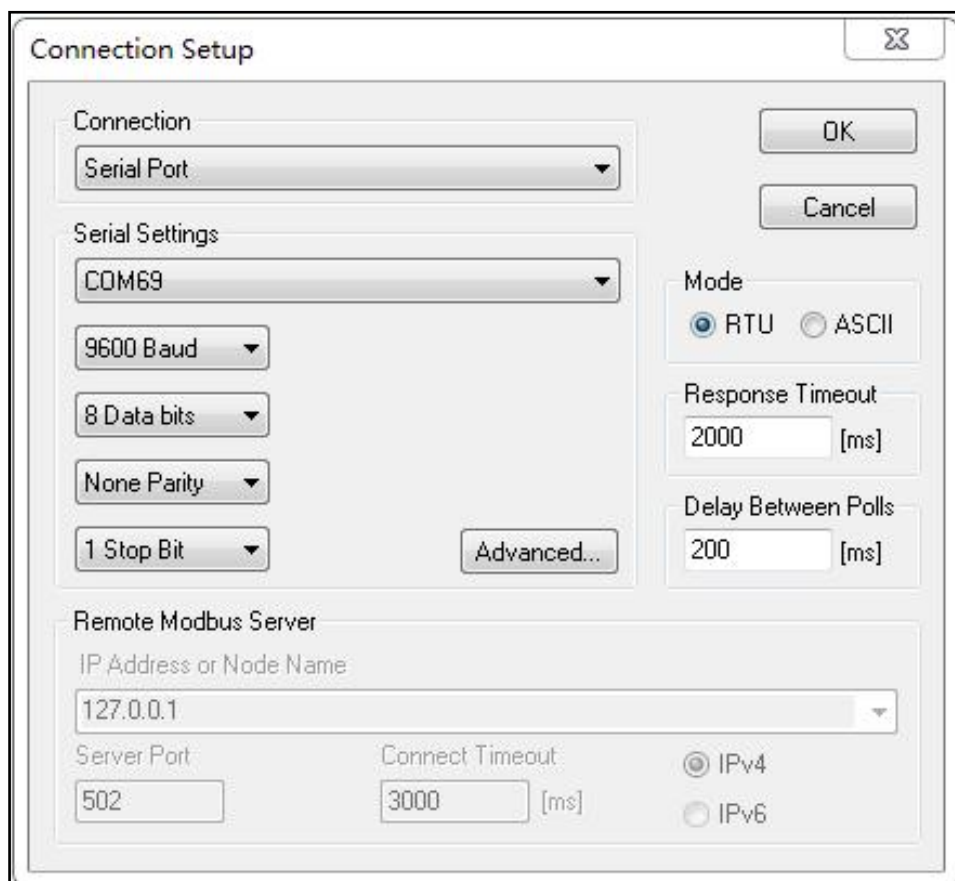
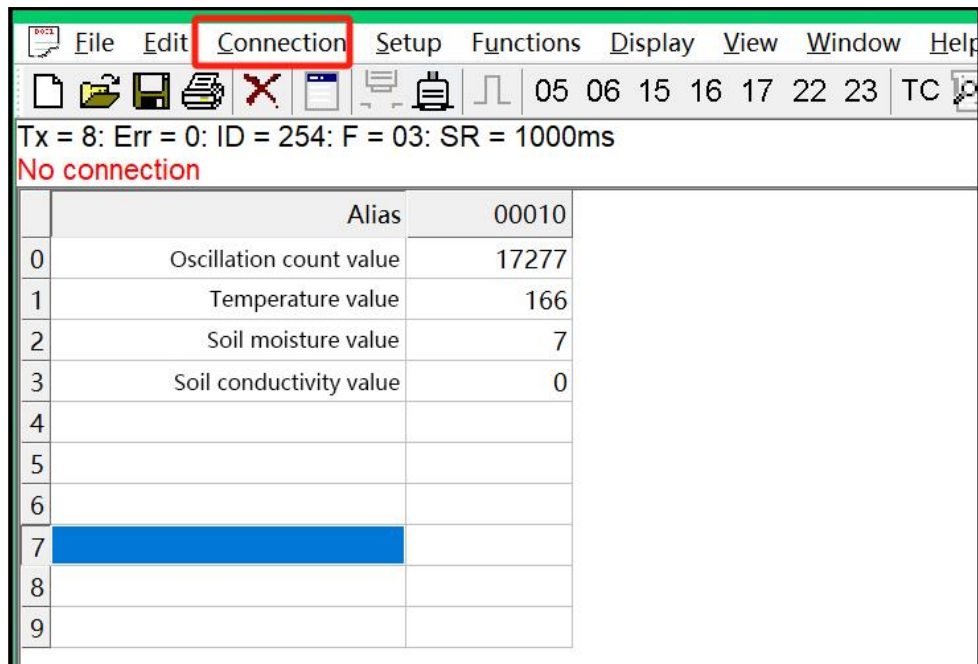
Address Field	Function Field	Start Address	New Sensor Address	Check Code Low Bit	CheckCode High Bit
0xFE	0x06	0x00 0x02	0x00 0x02	0xBD	0xC4

4. Modbus Poll Instructions for Use

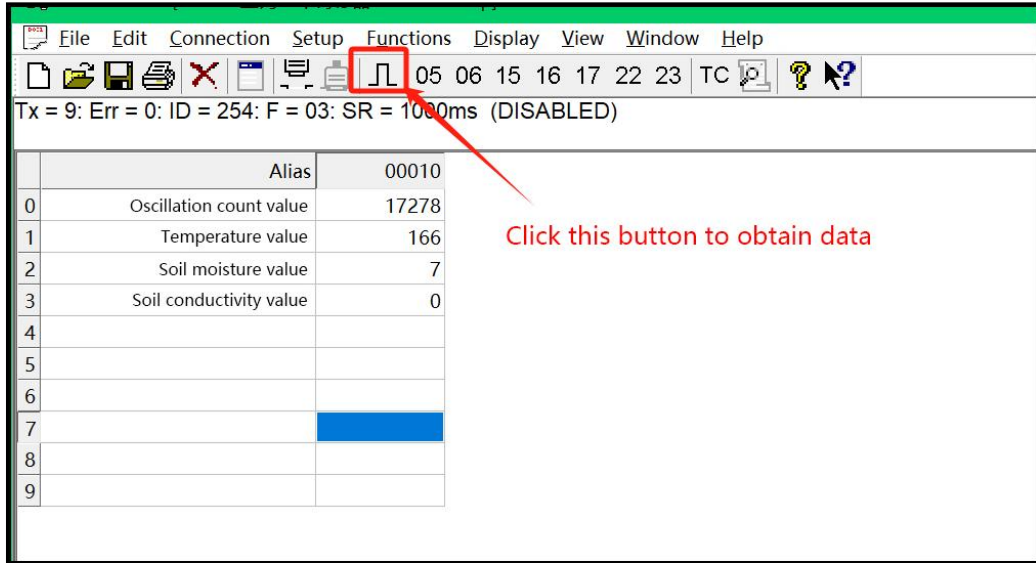
4.1 Initializing Configuration Sensor Parameters



4.2 Connecting the 485 Serial Port



4.3 Acquiring Sensor Data



The screenshot shows the MYSentech software interface. The menu bar includes File, Edit, Connection, Setup, Functions, Display, View, Window, and Help. The toolbar contains various icons, with a red box highlighting a button that looks like a square wave. Below the toolbar, the status bar displays: Tx = 9: Err = 0: ID = 254: F = 03: SR = 1000ms (DISABLED). The main area contains a table with the following data:

	Alias	00010
0	Oscillation count value	17278
1	Temperature value	166
2	Soil moisture value	7
3	Soil conductivity value	0
4		
5		
6		
7		
8		
9		

A red arrow points from the text "Click this button to obtain data" to the highlighted button in the toolbar.

Attachment: Sensor terminals

The part number of the sensor ' s connector (horizontal patch) is HDGC2001WR-S-4P, with a specification of 4PIN and a spacing of 2mm (as shown in the following figure); The connector is compatible with wire specifications of 0.2 square millimeters. If other connector are needed, customization is required.

