



Mysentech Soil Trio Sensor – mini

Datasheet

V1.0

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Table of Contents

1. Introduction	1
2. Interface Description	2
3. Communication Protocols(UART interface)	3
3.1 Basic Communication Parameters	3
3.2 Data Frame Format Definition	3
3.3 Register Definition	4
3.4 Communication Protocol Example	8
3.4.1 Reading soil temperature, soil moisture, and soil conductivity values	8
3.4.2 Modifying sensor address	9

1. Introduction

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

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

Each module's soil moisture accuracy and conductivity calibration needs to be adjusted according to the user's specific design of the soil moisture, conductivity, and temperature sensor system.

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: 0.5°C (from 0°C to +50°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: 50 to 100ms (can be customized according to acquisition requirements)

Power consumption: standby power consumption is 7.2uA and average power consumption is 84uA at 1 time/minute

Supply voltage: 2V~5.5V

Interface: UART(MODBUS protocol)

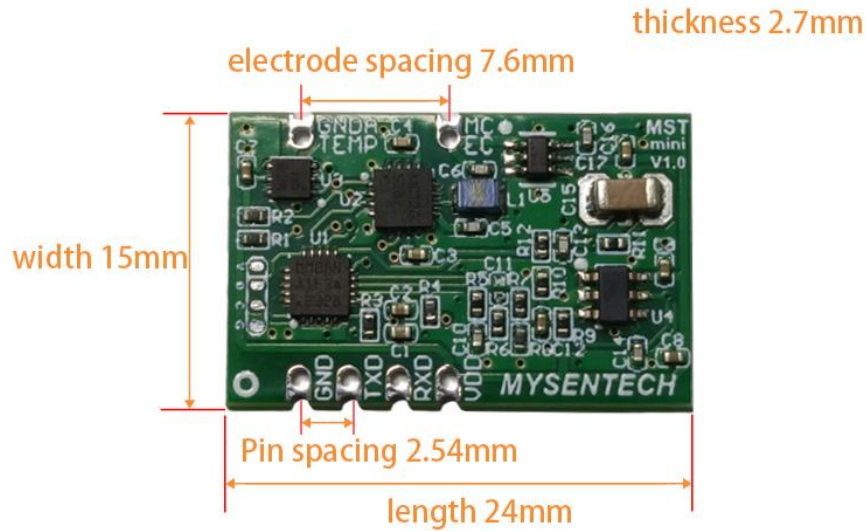
Size: 15mm×24mm×2.7mm

Supports IAP online firmware upgrade function

Supports algorithmic parameter tuning

2. Interface Description

The MST-mini module is illustrated in the following figure.



The UART interface description table is shown in the following table.

Interface Name	Notation	Description
electrode interface	MC	soil moisture/electrical conductivity measurement electrode interface
	GNDA/TEMP	ground electrode interface/temperature probe
UART interface	RXD	connected to the host's TX
	TXD	connected to the host's RX
power interface	GND	power supply ground
	VDD	power supply positive

3. Communication Protocols (UART interface)

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	Function	Effective	First Data	Second	Nth Data	Check
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Field	Field	Bytes	Area	Data Area	Area	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
0001H	1	reserve	reserve	
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 times), -70.0 ~ 150.0°C	read only
000C H	1	soil moisture content	unsigned percentage, resolution 0.1% (increased by 10 times)	read only
000D H	1	soil	unsigned number,	read

		conductivity value	resolution of 0.01mS/cm	only
0013 H	1	instantaneous conductivity sampling value	sampling raw value	read only
0014 H	1	instantaneous conductivity sampling value A	original value of internal sampling for conductivity liquid A	read and write
0015 H	1	calibration conductivity reference value A	unsigned number (increased by 100 times) resolution 0.01mS/cm	read and write
0016 H	1	instantaneous conductivity sampling value B	original value of internal sampling for conductivity liquid B	read and write
0017 H	1	calibration conductivity reference value B	unsigned number (increased by 100 times) resolution 0.01mS/cm	read and write
0018 H	1	compensation slope for aqueous conductivity	increased by 100 times	read and write
0019 H	1	compensation intercept for aqueous conductivity	increased by 100 times	read and write
001A H	1	oscillation meter values in the air	unsigned integer, 0~65535	read and write

001B H	1	water oscillation meter value	unsigned integer, 0~65535	read and write
001C H	1	oscillator meter numerical calibration slope A	unsigned integer (0-2 range) A/32768	read and write
001D H	1	oscillator meter calibration intercept B	signed integer -32768~32767	read and write
0020 H	1	soil moisture content SF1	unsigned number (increased by 1000 times), 0-1	read and write
0021 H	1	soil moisture content 1	unsigned percentage, resolution 0.1% (increased by 10 times)	read and write
0022 H	1	soil moisture content SF2	unsigned number (increased by 1000 times), 0-1	read and write
0023 H	1	soil moisture content 2	unsigned percentage, resolution 0.1% (increased by 10 times)	read and write
0024 H	1	soil moisture content SF3	unsigned number (increased by 1000 times), 0-1	read and write
0025 H	1	soil moisture content 3	unsigned percentage, resolution 0.1% (increased by 10 times)	read and write

0026 H	1	soil moisture content SF4	unsigned number (increased by 1000 times), 0-1	read and write
0027 H	1	soil moisture content 4	unsigned percentage, resolution 0.1% (increased by 10 times)	read and write
0028 H	1	soil moisture content SF5	unsigned number (increased by 1000 times), 0-1	read and write
0029 H	1	soil moisture content 5	unsigned percentage, resolution 0.1% (increased by 10 times)	read and write
002A H	1	soil moisture content SF6	unsigned number (increased by 1000 times), 0-1	read and write
002B H	1	soil moisture content 6	unsigned percentage, resolution 0.1% (increased by 10 times)	read and write
002E H	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
002F H	1	firmware Version	the main version number is 8 bytes high; The lower 8	read only

			bytes are the minor version number. Example: 9.2 is stored as 0x92.	
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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 6-words (12 bytes) data from Node 1, with a starting address of 0x000B

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 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	Check Code High Bit
0xFE	0x06	0x00 0x02	0x00 0x02	0xBD	0xC4