USER GUIDE FOR WIRELESS SOIL MOISTURE SENSOR WS433-SMT

WS433-SMT-MN-EN-01	AUG-2020

This document is applied for the following products

SKU	WS433-SMT	**HW Ver.**	2.5	**FW Ver.**	5.0
Item Code	WS433-SMT-01	Wireless Soil moisture and Temperature sensor 433Mhz, pre-calibarted, AA 1.5VDC battery, IP67/IP68, sensor cable 2m			

1. Functions Change Log

HW Ver.	FW Ver.	Release Date	Functions Change
2.5	5.0	DEC-2019	• Change RF data rate by button

2. Introduction

WS433-SMT is a Sub-Ghz wireless soil moisture, soil temperature and soil EC. The sensor can be used for up to 5 years with just 1 AA battery. Utilize advanced technology, Frequency Domain Reflectometry to deliver high accuracy and stable measurement of Soil Moisture, not affected by Fertilizer contents and Temperature like the simple Capacitance Moisture Sensor on the marker. The sensor will connect wirelessly to the Wireless Coordinator WS433-R then export the data to RS485 / modbusRTU and from there easily connect to any monitoring and control system. LOS distance from sensor to receiver is 500m and can be extended by Extender. Sensors can be used for applications such as intelligent irrigation systems, greenhouses, pastures for cows, soil testing ...



WS433-SMT-H1.PNG

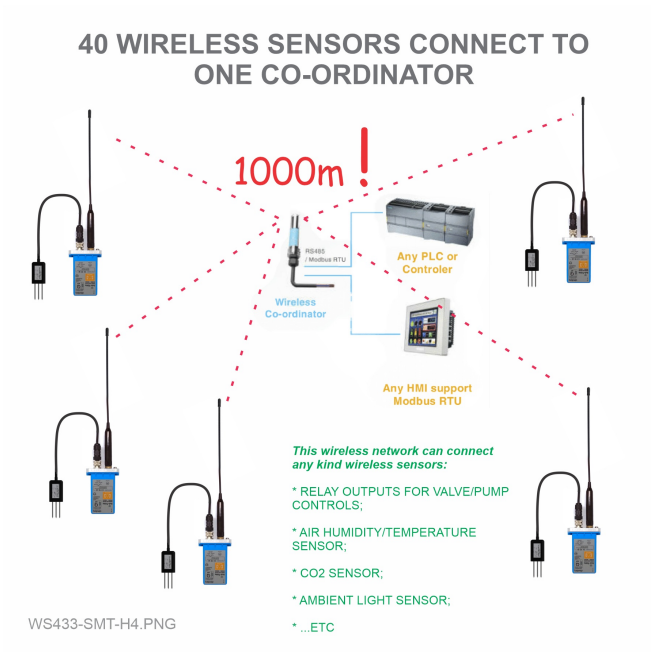
3. Specification

SENSORS SPECIFICATION :	
Sensors	Advanced technology - Frequency Domain Reflectometry, Pre-calibrated at factory
Moisture range / accuracy / resolution	0 .. 100 %, acc +/- 3.0% , res 0.01%
Temperature range / accuracy / resolution	-30 .. + 70 oC, acc +/- 0.3 oC, res 0.1 oC
EC range / accuracy / resolution	0 .. 20 mS/cm, acc +/- 2.0% span, res 0.1 mS/cm
Measurement Volume	Dia. 70mm x Height 70mm
Wetted materials	316L SS & thermoplastic
Sensor Dimensions	71x45x16mm with probes 70mm and signal cable 2m
WIRELESS SPECIFICATION :	
Data speed	Up to 50kbps
Antenna	External Antenna
Battery	02 x AA 1.5, working time up to 10 years (depends on configuration)
Frequency Band	ISM 433Mhz, Sub-GHz technology from Texas Instrument, USA
International Compliance	ETSI EN 300 220, EN 303 204 (Europe) FCC CFR47 Part15 (US), ARIB STD-T108 (Japan)
Vietnam Type Approval Certification	QCVN 73:2013/BTTTT, QCVN 96:2015/BTTT (EMC Compliance)
Security Standard	AES-128
Operating temperature	-40oC..+60oC (with AA L91 Energizer battery)
Housing	Poly-carbonate, IP68
Installation method	Plugs directly into the ground with a 500mm long plastic rod
Dimensions / Net weight	125x30x30mm (Wireless part only), < 60g
Box dimension / Gross weight	190x50x50mm, 100g

4. Applications









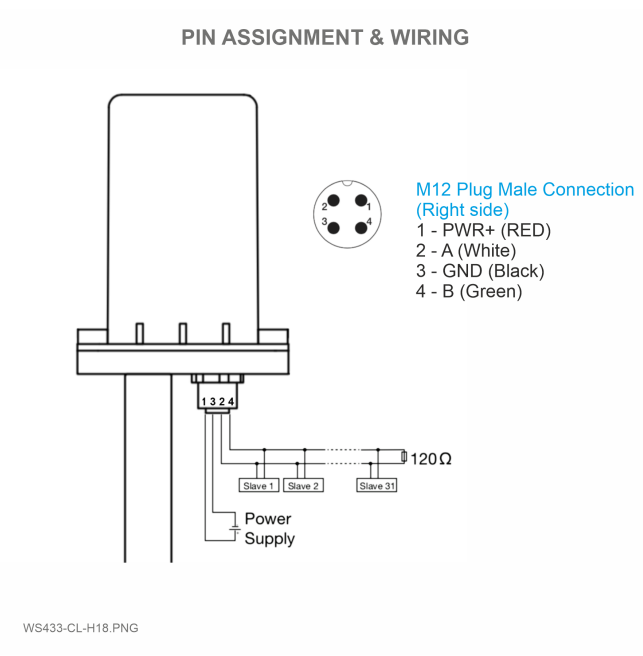
5. Operation Principle

5.1 Add sensors node to Co-ordinator WS433-CL

5.1.1 Add Sensor Node ID automatically



WS433-CL-H10.PNG



WS433-CL-H18.PNG

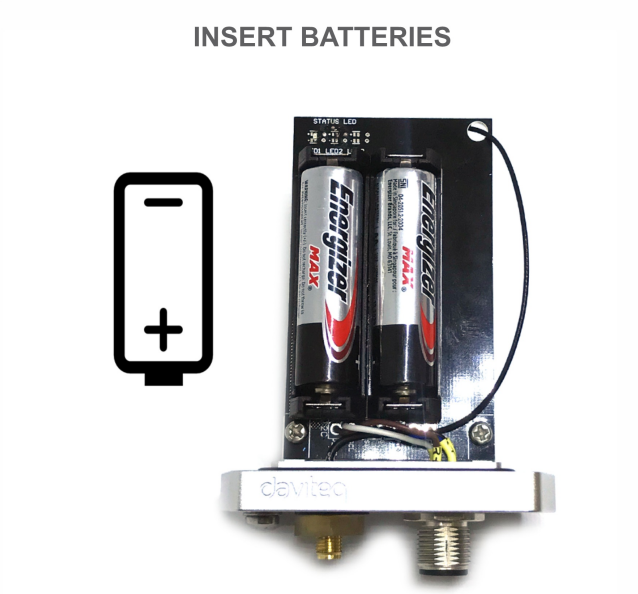
Step 1: After supplying power the Co-ordinator via M12 connector, the Node ID must be registered within the first **5 minutes**, up to 40 WS.

Step 2: Mount the antenna on the sensor. **Note:** Use your hand to tighten the antenna on the sensor, not using tools.

Open the wireless sensor cover with hex key, then insert batteries.







Step 3: After insert batteries, bring the wireless sensor closer to the Co-ordinator's antenna. If:

- Buzzer plays **1 peep** sound, LED blink 1 time, that means registering Node ID on Co-ordinator **successfully.**
- Buzzer plays **2 peep** sounds, LED blink 2 times, that this Node ID is **already registered.**

If you do not hear the "Peep" sound, please disconnect the power the co-ordinator, wait a few minute and try again.

Node id added in this way will be written to the **smallest node_id_n** address which is = **0.**

Set **Rssi_threshold** (see **RF MODE CONFIG** (in the **Modbus Memmap of WS433-CL**), default **-25**): The case if Co-ordinator is on high position and need to add node sensor. We set the sensor as close as possible and set the **Rssi_threshold** to **-80**, **-90** or **-100** to increase the sensitivity to allow WS433-CL-04 can add sensors at a longer distance. After that, perform 2 steps of adding sensors and then reset Rssi_threshold = -25.

Enb_auto_add_sensors configuration (see **RF MODE CONFIG** (in the **Modbus Memmap of WS433-CL**)): In case you do not want to turn off the power WS433-CL, you can set **Enb_auto_add_sensors = 1**, this way we have 5 minutes to add nodes (add up to 40 nodes) . After 5 minutes **Enb_auto_add_sensors** will automatically **= 0.**

Memmap resgisters

You can download Modbus Memmap of WS433-CL9 with the following link:

https://filerun.daviteq.com/wl/?id=BKEaUzdArkoc0Hc7nfpRShdPVToVrqQZ

Please find the tab with Memmap matching the sensor you are using.

5.1.2 Add sensor node into WS433-CL-04 (1) through intermediate WS433-CL-04 (2) and Modbus

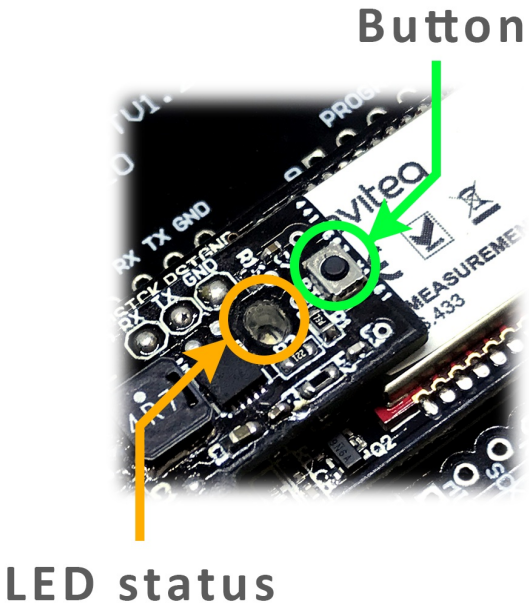
In case the sensor need to be added to WS433-CL-04 (1) has been installed in a high position, the sensor cannot be brought close to WS433-CL-04 (1). For more details:

http://www.daviteq.com/en/manuals/books/long-range-wireless-co-ordinator-ws433-cl/page/user-guide-for-long-range-wireless-co-ordinator-ws433-cl

5.2 Button Function

Open the cover of sensor then use the push button to set the data transfer speed for the first 30 seconds when the battery is first installed, after 30 seconds the push button function does not work.

- Press and hold the button for 2 seconds => LED blinks once => Release the button to set Data rate RF 50kbps.
- Press and hold the button for 5 seconds => LED blinks twice => Release the button to set Data rate RF 625bps.
- Press and hold the button for 10 seconds => LED blinks 3 times => Release the button to reset RF parameters (frequency, RF output power, data rate), if held for more than 30 seconds then the button function does not work.



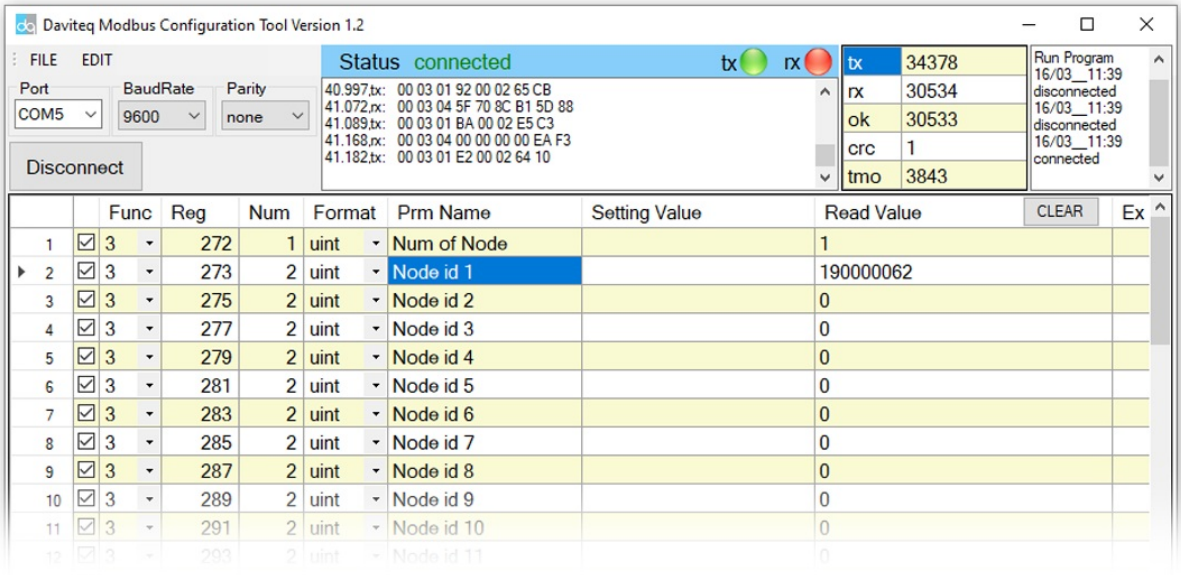
Reset default WS433:

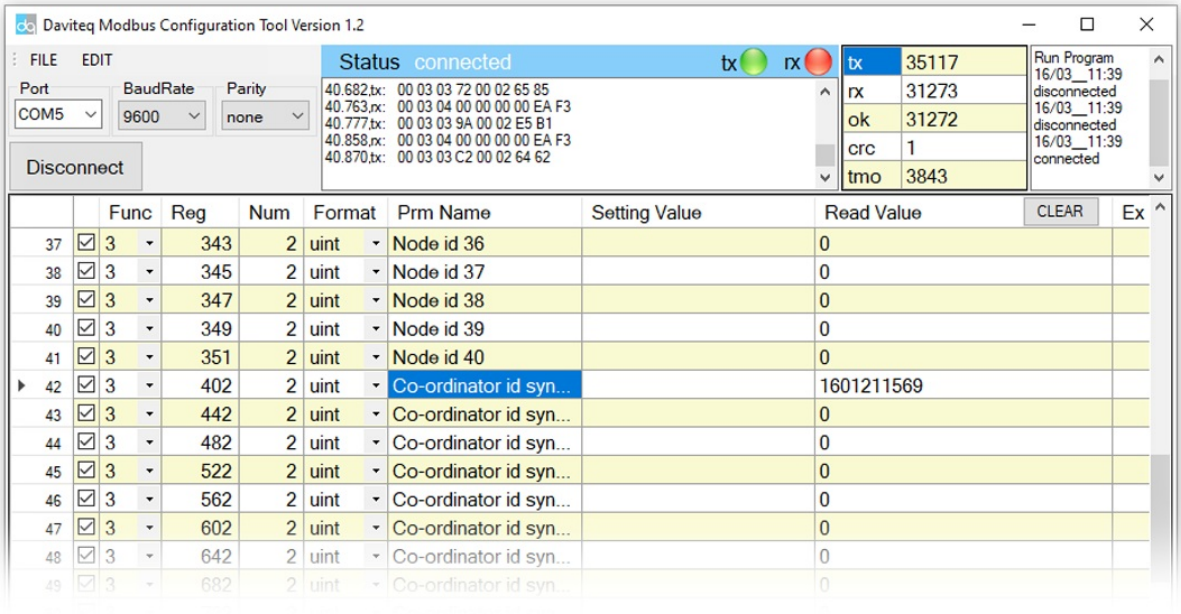
- **Frequency:** 433.92 MHz
- **RF transmit power:** 15 dBm
- **RF data rate:** 50 kbps

5.3 Configuration

5.3.1 Check after configuring the co-ordinator

- **Num of Node** will indicate the number of nodes managed by WS433-CL.
- Every time a node is **added**, the Num of Node will **increase** by 1.
- Every time a node is **deleted**, the Num of Node is **reduced** by 1.
- Writing Num of Node = 0 will **delete all** 40 node ids to 0.
- If you want to delete a node id, then write it = 0 with the **Write** function is **16** and the **Read** function is **3**.
- See the section "**Adding Wireless sensor** (in the **Modbus Memmap of WS433-CL**)"





First, you need to prepare



Computer



RS485
Configuration Cable



Power Adapter 12-24VDC

WS433-CL-H9.PNG

Step 1: Connect Antenna, RS485 - configuration cable and power supply co-ordinator

INSTALL ANTENNA



WS433-CL-H10.PNG

CONNECT CO-ORDINATOR TO RS485 - CONFIGURATION CABLE via M12 CONNECTOR



WS433-CL-H12.PNG

SUPPLY POWER 12-24VDC



WS433-CL-H11.PNG

CONNECT RS485 - CONFIGURATION
TO COMPUTER via USB



WS433-CL-H13.PNG

Step 2: Open Modbus tool on PC

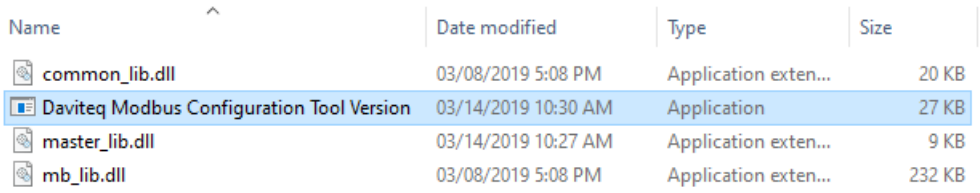
- You can download Daviteq Modbus Configuration Tool with the following link:

https://filerun.daviteq.com/wl/?id=qK0PGNbY1g1fuxTqbFW9SXtEvCw7bpc6

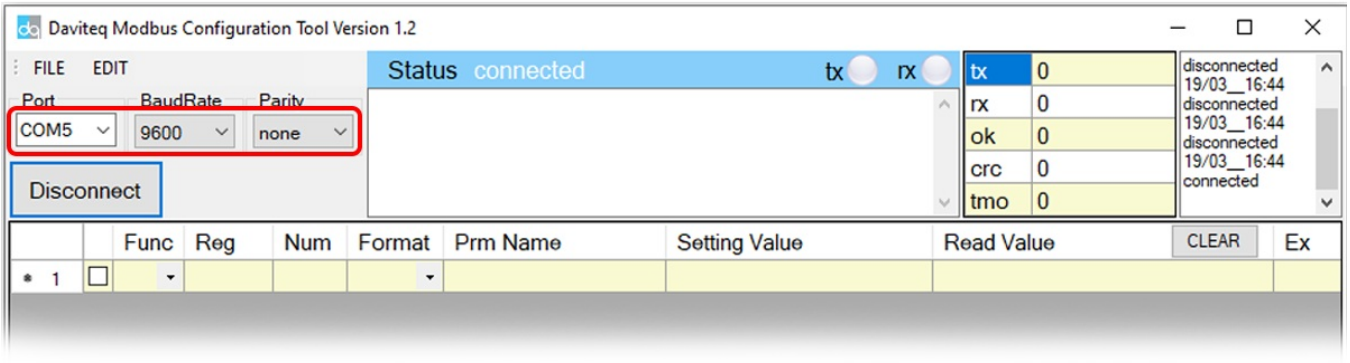
Template File: https://filerun.daviteq.com/wl/?id=hgrjOg3wwvyrvAZ54p8iZiFpDyXTcnec

How to use the Modbus configuration software

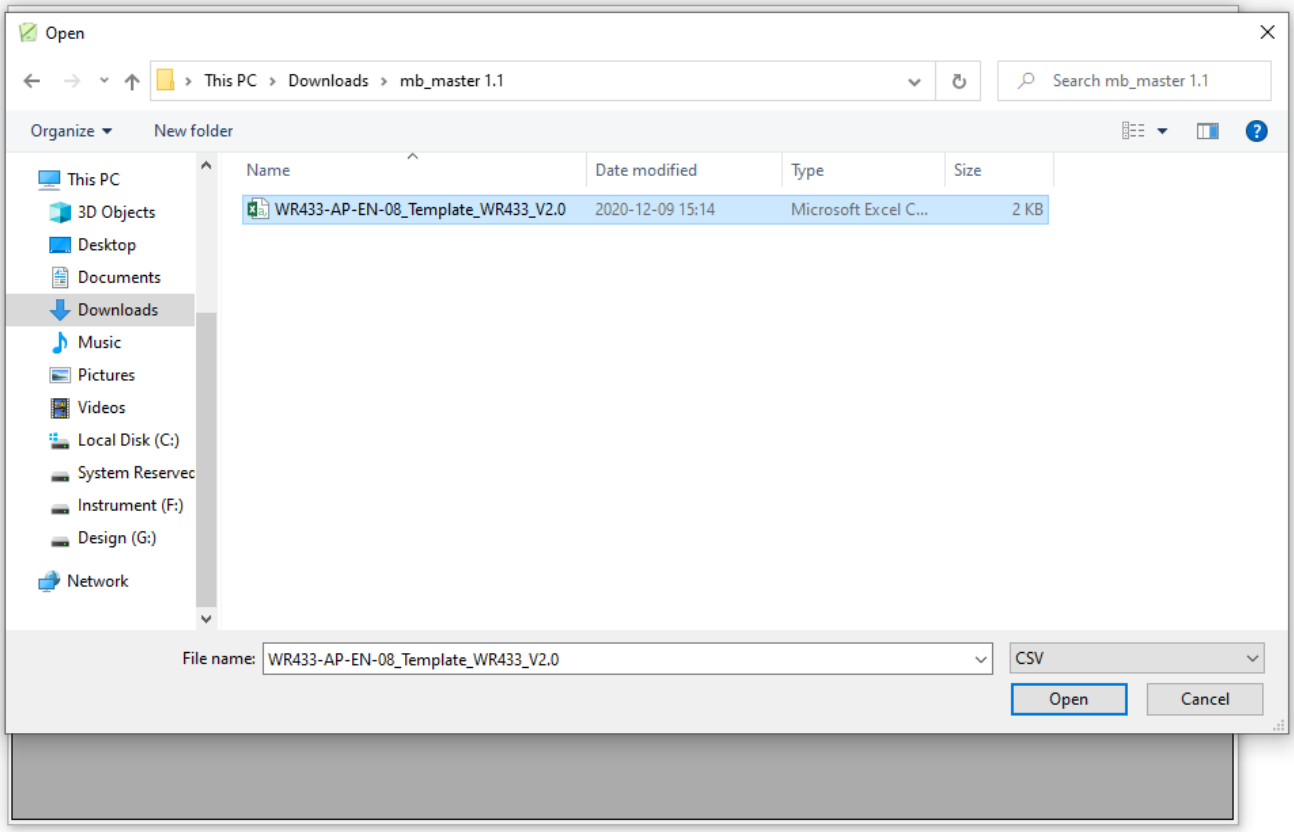
- Unzip file and run file application "**Daviteq Modbus Configuration Tool Version**"



- Choose **COM Port** (the Port which is USB cable plugged in)
- Set the **BaudRate: 9600**, **Parity: none**



- Click " **Connect** " untill the Status displays "**disconnected**" to "**connected**". It means the WS433-CL-04 is being connected with computer;
- Next, we need to import the configuration file for WS433-CL-04 by importing the csv file: Go to MENU**FILE / Import New / =>** select the **template file**.



Step 2: Check information of sensor after adding S/N of each sensor

5.3.2 IO Wiring

WS433-SMT sensor connects to the sensor probe via M12 Connector.







Plug the sensor into the ground so that the metal poles of the sensor are deep in the ground.



6. Installation

6.1 Installation location

The bracket will be fixed on the wall or material with a flat surface with double-sided 3M tape (included in the accessory bag in a carton box) or 2 x M4 screws (supplied by the customer);

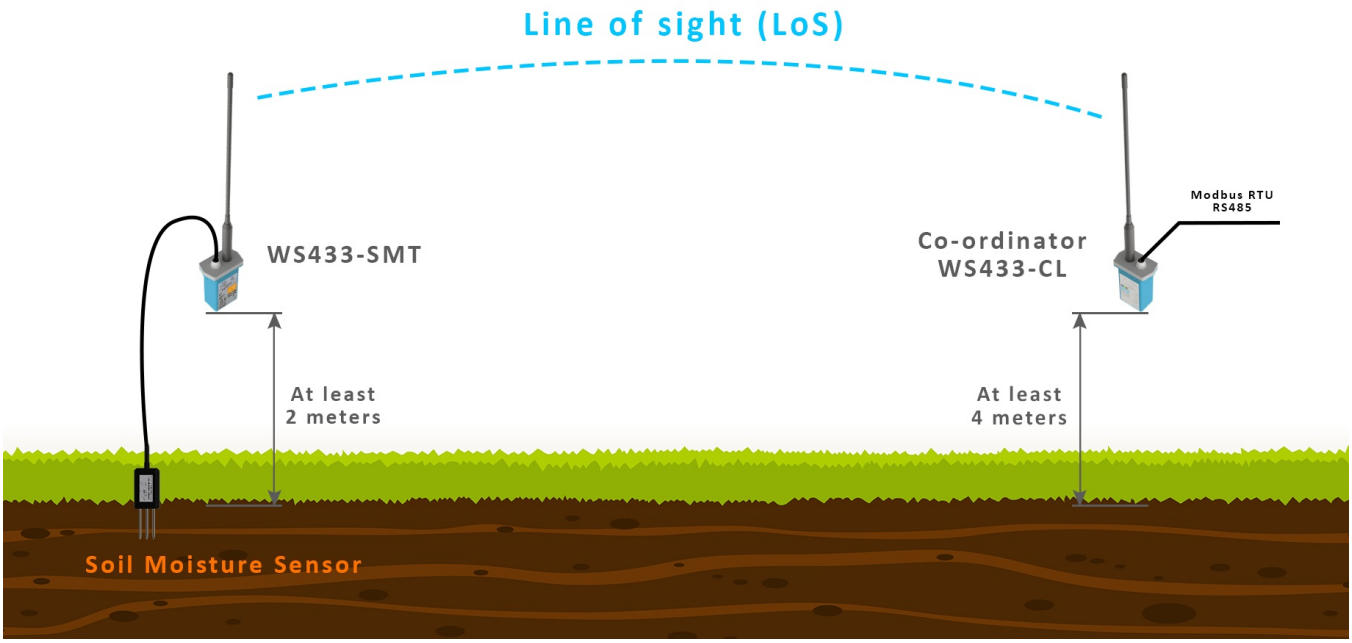
When using 3M double sided tape, please install the sensor at a height of 2 meters or less.

> **ATTENTION:**
>
> ⚠ **DO NOT** install the Wireless sensor or its antenna inside a completed metallic box or housing, because the RF signal can not pass through the metallic wall. The housing is made from Non-metallic materials like plastic, glass, wood, leather, concrete, cement...is acceptable.

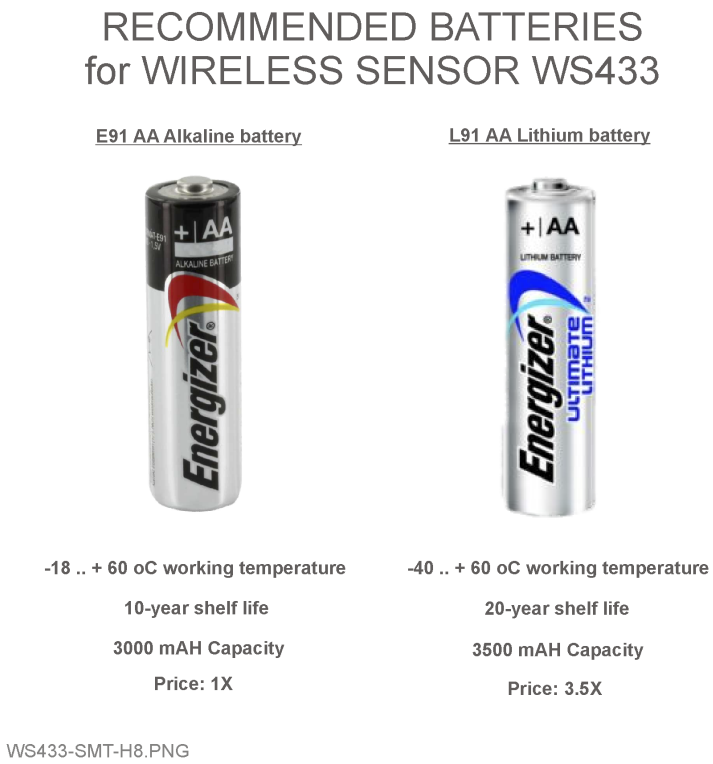
> **NOTE:**

⚠ Co-ordinator WS433-CL must be placed at least**4 meters** from the ground.

The WS433-SMT sensor must be located at least**2 meters** above the ground.



6.2 Battery installation



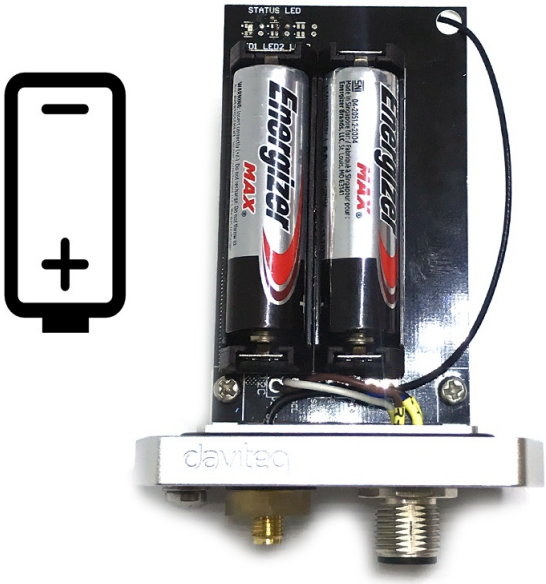
Steps for battery installation:

Step 1: Using L hex key to unscrew M4 screws at the side of housing and carefully pull out the top plastic housing in the vertical direction





Step 2: Insert 02 x AA 1.5VDC battery, please take note the poles of battery



Step 3: Insert the top plastic housing and locking by L hex key

(**NOTE:** When reinstalling the cover, pay attention to put the PCB edge into the middle slot of the box inside as shown below)



7. Troubleshooting

No.	Phenomena	Reason	Solutions
1	The status LED of wireless sensor doesn't light up	• No power supply. • Configuration function of the LED is not correct.	• Check that the battery is empty or not installed correctly. • Reconfigure the led light function exactly as instructed.
2	Wireless sensor not connected to co-ordinator	• No power supply. • The configuration function of the RF data rate is incorrect.	• Check that the battery is empty or not installed correctly. • Reconfigure the RF data rate with the button according to the instructions.

8. Support contacts

Manufacturer

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