

## SenseCAP Wireless Soil Temperature, VWC & EC Sensor - LoRaWAN EU868 - MT20

SKU 101990796

SenseCAP Wireless VWC, Temperature and EC Sensor measures soil volumetric water content (VWC), temperature and the electric conductivity of Soil. The device consists of a 3-in-1 sensor, a LoRaWAN module, a custom battery and an IP66 enclosure, optimized for outdoor use that requires reliable data collection over years.



## PRODUCT DETAILS



### About SenseCAP

**SenseCAP** is focusing on wireless environmental sensing applications: smart agriculture, precision farming, and smart city, to name a few. It consists of hardware products (sensors, data-loggers & gateways, etc.), software services (SenseCAP portal, mobile App, open dashboard), an API for device & data management.



### Note

Please email [sensecap\[at\]seeed\[dot\]cc](mailto:sensecap@seeed.cc) to request any technical support for this product.

## Features

- High Performance: high accuracy, reliability, and stability
- Enables Data Transmission with LoRaWAN
- Compact Design: 3-in-1, soil moisture, temperature, and EC sensor
- Industrial-grade Robustness: IP66 rated, suitable for long-term applications.
- Strong Anti-interference: made of flame-retardant epoxy resin.
- High Durability: anti-corrosion, with excellent performance for long-term use
- IP66 Certified
- User-friendly: easy to use, install and integrate
- Support LoRaWAN protocol Class A
- High reliability and stability
- Ultra-wide-distance transmission: 10km in the line-of-sight scenes, 2 km in urban scenes
- Battery life  $\geq$  6 years

## Description

The Sensor measures the volumetric water content(VWC), the Soil temperature, and the electrical conductivity (EC). The VWC is used to determine the amount of water stored in the soil. Electrical conductivity can be used to determine the level of salts in soil (salinity). These parameters are very important indicators of soil fertility and health, which ultimately affect the plants that grow in them. High soil salinity will make it difficult for plants to consume water even with a high moisture level in the soil. This will ultimately "burn" the plants. Meanwhile, too much moisture in the soil is not only bad for the plants but also wastes water and adds extra burdens on our planet.

Plants grow best in their preferred environment, at the optimal ranges of soil moisture, temperature, and EC level. It is important for growers to get access to the data of these parameters, to get insights on what actions need to be taken to ensure plant health and higher yield.

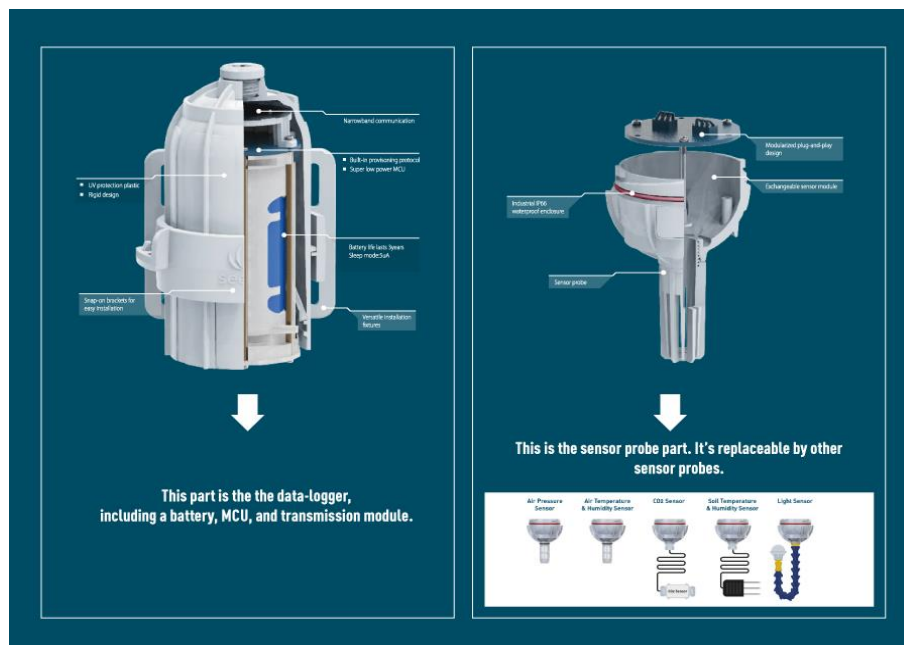
This Soil Moisture & Temperature & EC LoRaWAN Sensor is designed with industry standards, featuring high precision and high sensitivity and durability. It has a LoRaWAN module to transmit collected data over long distances without cables. Incorporating three sensors (soil moisture sensor, soil temperature sensor, and soil

electrical conductivity) into one, with auto temperature compensation, this sensor ensures the accuracy of measurements regardless of the environmental changes.

By measuring the dielectric constant of the soil, it can measure the soil VWC (volumetric water content) regardless of various soil types. The measurement conforms to current international standards for soil moisture measurement.

The stainless-steel probe can be permanently inserted in the soil with quick testing for long-term use. This soil sensor is IP66 rated, very robust and durable, suitable to be applied at long-term monitoring of soil moisture, temperature, and electrical conductivity at scientific experiments, water-saving irrigation, gardening, greenhouses, outdoor farming, horticulture, golf turf management, forestry, precision agriculture, and other professional environmental monitoring scenarios. It can also be applied in the water, nutrient solution, and other kinds of substrates where the EC level is needed.

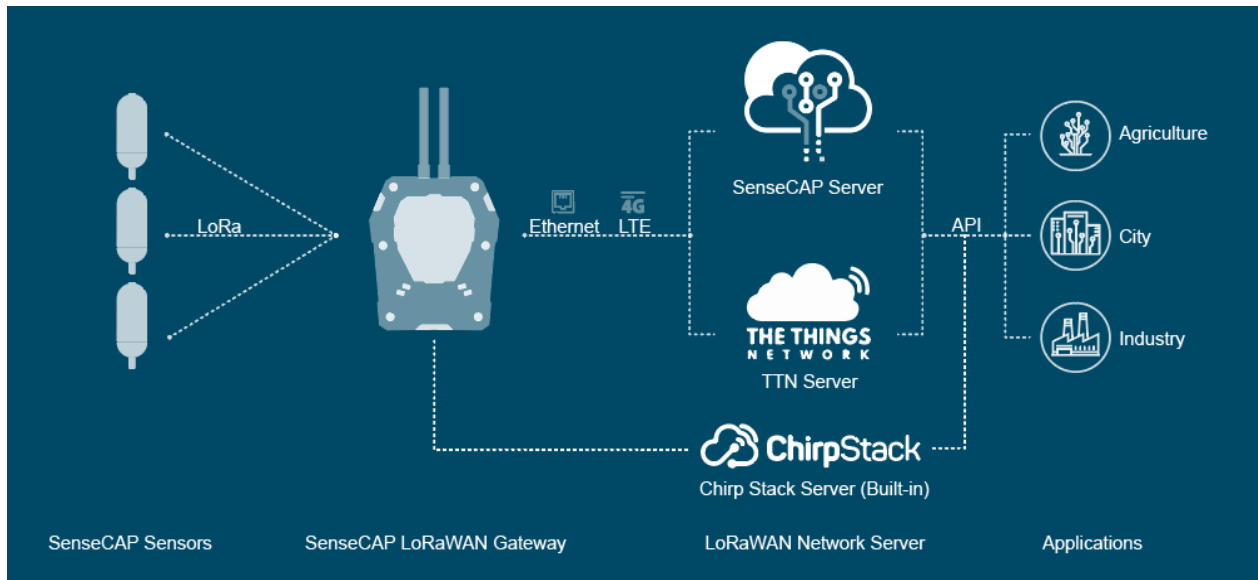
This device incorporates a built-in LoRa transmitter based on SX1276 for long-range transmission, the 3-in-1 sensor, and a custom battery. It is specifically designed and optimized for use cases powering end devices by batteries for years. To minimize the power consumption, the device wakes up, transmits the collected soil moisture and temperature data to the gateway, and then goes back to sleep.



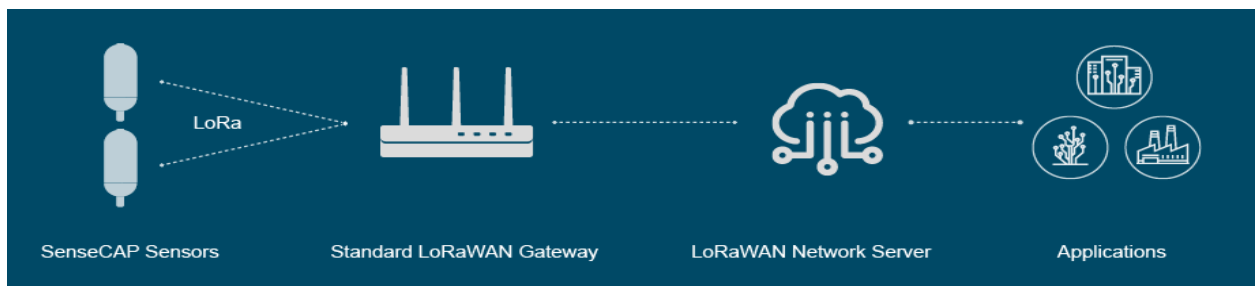
Under the best of circumstances, the battery is expected to last for more than 6 years, depending on environmental factors and the data transmission intervals. Please kindly note that the default interval is once per hour. If you'd like to change the data upload interval, please refer to [this document](#)

To fit in adverse conditions, the LoRaWAN Module is designed with industry standards and equipped with an IP66 waterproof enclosure, protecting the device from UV radiation, rain, and sunlight exposure.

The SenseCAP Sensor adopts a modular design, integrating the data logger with the sensor probe, which can be replaced by other SenseCAP sensor probes.



### SenseCAP Sensor + Other LoRaWAN Gateway Architecture



## Applications

The sensor can be used for different environmental monitoring scenarios some examples are:

- water-saving irrigation
- gardening
- greenhouses
- outdoor farming
- horticulture
- golf turf management,
- forestry,
- precision agriculture

Besides being used in the soil, the sensor can also be used in water and nutrient solutions.



## Specifications

Soil Temperature	
Range	-40 °C to +80 °C
Accuracy	±0.5 °C
Resolution	0.1 °C
VWC	

Range	From completely dry to fully saturated (from 0% to 100% of saturation)
Accuracy	±3% ( 0 to 51 %); ±5% ( 50 to 100 %)
Resolution	0.1 %(0 to 50%); 0.3%(51 to 100%)

#### **Soil Salinity**

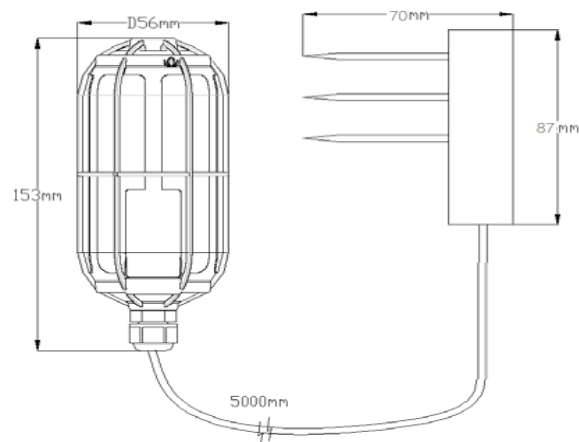
Range	0 to 23000uS/cm
Accuracy	±5% from 0~7000uS/cm ±15% from 7000~23000uS/cm
Resolution	10uS/cm(0~7000uS/cm) 50uS/cm(7000~23000uS/cm)

#### **General Parameters**

Product Model	LoRa-S-EU868-Soil Temp&VWC&EC-01
Microcontroller	Ultra-low-power MCU
Support Protocol	Based on LoRaWAN v1.0.2 protocol
LoRa Channel Plan	EU868
LoRa Power Output	16 dBm (EIRP)
Sensitivity	-137.5dBm(SF12, BW125KHz)
Current Consumption	5 μA (sleep mode) 120 mA max(active mode)
Communication Distance	2 to 10 km (depending on different antennas and environments)

Measuring Area	A cylinder area (with the probe as the center, diameter: 7cm, height: 7cm)
IP Rating	IP66
UV Resistance	anti-aging (from rain/sun exposure): UL746C F1
Enclosure Material	PC
Operating Temperature	-40 °C to +60 °C
Operating Humidity	0 to 100%RH (non-condensing)
Device Weight	385g
Certification	RoHS
Battery (Contained in equipment)	
Battery Life	≥ 3 years (upload data once per hour)
Battery Voltage	3.6V
Battery Capacity	19Ah (non-rechargeable)

## Technical Details



The device is designed with a fixed LoRa channel, which can not be modified by users. The supported channels are as follows. Please refer to [this document](#) for how to connect this device with a LoRaWAN gateway.

**Please kindly note the device uses 2nd Sub-Band by default (channels 8 to 15 and 65).**

LoRa Channel Plan	
Uplink (MHz)	Frequency(MHz): 868.1, 868.3, 868.5, 867.1, 867.3, 867.5, 867.7, 867.9 (SF7BW125 to SF12BW125)
Downlink (MHz)	Multiplexing the frequency points of the 8 uplink channels. 869.525MHz - SF9BW125 (RX2 downlink only)

## Part List



① Sensor



② Bracket



③ M4 Self-drilling Screw



④ M3 Self-drilling Screw

1	Sensor	1x
2	Bracket	1x
3	M4 Self-drilling Screw	4x
4	M3 Self-drilling Screw	2x



## FAQ

**Q: What exactly is soil moisture measured?**

A: Measured is soil volumetric water content, soil volumetric water content %= soil volumetric water content \* bulk density

**Q: How is soil volume water content measured?**

A: By measuring the dielectric constant, and then through a certain calculation formula to convert into soil volume water content.

**Q: Why does the measured volume water content of soil not reach 100% in water?**

First of all, the saturated water content of the soil is about 60%, and the measurement of higher water content is not of practical significance.

Second, we need to pay attention to the test environment and method when testing.

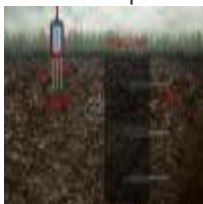
A: 7\*7\*7cm square column range measured by the sensor probe. If water is used for the test, a container of at least 20\*20\*20cm is required, and the probe is placed in the middle (with water to immerse the probe).

The resulting value will be between 80% and 100%.

**Q: How to install a soil sensor probe?**

Dig a vertical hole, insert the sensor steel needle into the hole to be measured, and then compacted the pit to ensure that the steel needle is in close contact with the soil.

A:



**Q: Is the conductivity affected by the soil moisture?**

**A:** The EC value can be continuously monitored in the field, mainly by measuring Bulk EC value, which is related to soil water content. If there is no water or little water content, the ions in the soil cannot dissolve in the water, and conductivity will be low.

## ECCN/HTS

HSCODE 9025800090

USHSCODE 9031808070

UPC

## LEARN AND DOCUMENTS

*Documentations*

**LoRaWAN Gateway and Sensor Catalog**

