

# Saturnia Probe



Smart irrigation with soil moisture sensors

Agrotech's sensor technology provides real-time measurements of soil moisture, temperature and electrical conductivity so you can confidently optimize your growing operations.



## Contact info



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# Introduction

Agurotech's Saturnia probe is designed, manufactured, and produced in-house in the Netherlands. Agurotech's origins trace back to fundamental, Nobel Prize-winning science conducted at Nikhef, the Dutch National Institute for Subatomic Physics, where this technology has already been successfully applied by Innoseis, who holds a share in Agurotech, and has become market-leading for oil and gas exploration and satellite sensors.

The Saturnia probe is a fully sealed, cableless probe designed for insertion into the soil to provide accurate and reliable measurements. Utilizing Frequency Domain Reflectometry (FDR), it measures soil moisture, electrical conductivity, and soil temperature at different depths (15cm, 30cm, 45cm, and 60cm) through two distinct probe models.

The Saturnia probe employs cellular connectivity and is primarily used in open field agriculture for irrigation purposes. However, it is also suitable for applications in smart cities, greenhouses, and grasslands used for dairy farming. Designed for quick and easy installation, the Saturnia probe can be integrated with various data acquisition systems.

It comes with either an API that supplies data from real-time measurements or an advanced app that provides precise irrigation recommendations. These recommendations, based on user inputs (e.g. soil- and crop type) and sensor data, are available through a subscription-based model to optimize yield while efficiently using water.

## Sensor technology

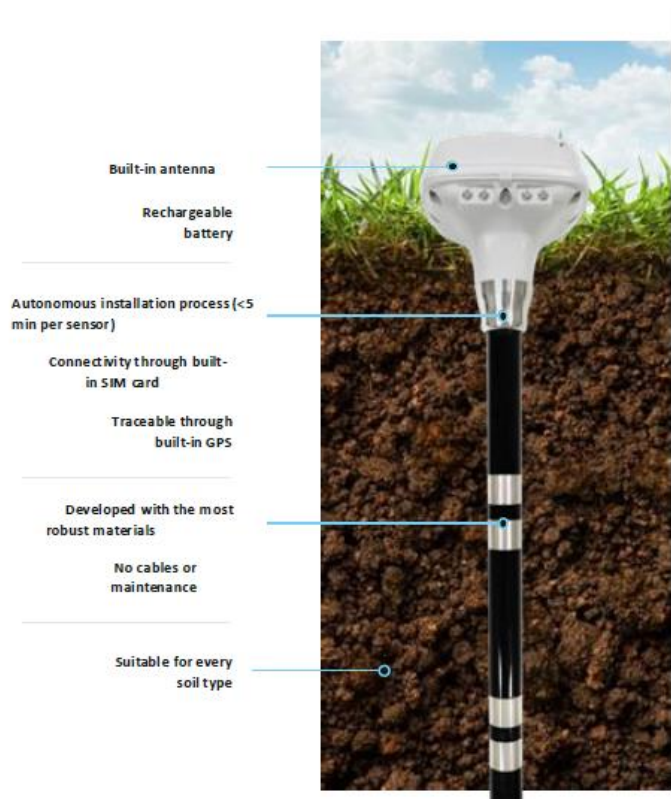
Precise measurements on multiple depths until 90cm

Real time measurements:

- Soil moisture, volumetric water content (VWC)
- Temperature
- Electrical conductivity (EC)

### Sensor models

Depth	15cm	30cm	45cm	60cm	90cm
Saturnia Parva	●	●			
Saturnia Magna	●	●	●	●	
Saturnia Profunda		●		●	●



## Key Features

- **Long Lifespan:** Engineered for over 10 years of reliable performance in harsh outdoor environments.
- **Built-in GPS Tracker:** Provides traceability and precise location tracking.
- **Quick Installation:** Can be installed in soil in under 5 minutes.
- **Low Maintenance:** Requires no regular maintenance, ensuring ease of use.
- **Compact Design:** Sensor protrudes less than 9cm above the soil, allowing for easy maneuverability and minimal disruption to field operations.
- **Sensor Orientation Detection:** Automatically enters sleep mode when positioned horizontally and activates in a vertical position, indicating proper installation and operation.
- **Extended Battery Life:** Offers 3-5 years of operation with options for rechargeable or replaceable batteries.
- **Global Connectivity:** Supports 2G, 3G, 4G LTE (M), and NB-IoT, ensuring comprehensive coverage worldwide.
- **Servicing Dashboard:** Monitors key performance indicators (KPIs) for the sensor fleet, including battery level, location, installation status, correct installation verification, and irrigation advice.
- **Accurate Calibration:** Provides precise measurements across all soil types.

## Physical and Performance Specifications

Probe Model	Short	Long
<b>Number of sensors</b>	6	12
<b>Dimensions:</b> (length, width, height)	471x90x110mm	797x90x110mm
<b>Outer Probe Diameter</b>	24mm	24mm
<b>Materials</b>	Lexan Copolymer, Carbon fibre	
<b>Impact Resistance</b>	Designed to withstand drops from a height of up to 1.5 meters without damage	
<b>Pressure Tolerance</b>	Insensitive to variations in normal atmospheric pressure	
<b>Weather resistance</b>	Weather Resistance IP68, for outdoor use, dust and water immersion resistant	
<b>Weight</b>	950g	1230g
<b>Measurement frequency</b>	1MHz, 100MHz	
<b>Operating Principle</b>	FDR Technology: measurement of the soil's dielectric constant by observing the change in frequency of an electromagnetic signal.	
<b>Radio Access Technology</b>	LTE-M, NB-IoT, 2G	

<b>Moisture resolution</b>	1:1000	1:1000
<b>Moisture range (%)</b>	0-100%	0-100%
<b>Moisture Precision (%)</b>	<1% VWC	<1% VWC
<b>Temperature Accuracy</b>	±0.2°C	±0.2°C
<b>Operating Temperature</b>	-20°C to 60°C	20°C to 60°C
<b>Storage Temperature</b>	-20°C to 50°C -4°F to 122°F	
<b>Calibration Requirements</b>	None	None
<b>Other</b>	GPS tracker included GNSS Interfaces: GPS, GLONASS, BeiDou, Galileo	

• **Saturnia illustrations**

1. Short Probe



2. Top sensor



3. Drill & Drill bit (18mm diameter)



4. Rubber Flap



Figure 1 illustrates a “short” probe that measures Volumetric Water Content (VWC), Electrical Conductivity (EC), and temperature at depths of 15 cm and 30 cm. The rod, or the long part of the sensor, is completely buried in the soil, with only the top enclosure visible above the surface. The top enclosure contains integrated battery with built-in GNSS and cellular antenna. The rod contains the acquisition hardware, which sends a signal through one of the rings for each depth. The same rings are used for EC and VWC measurements.

Figure 2 shows the top section of the probe, which features a waterproof enclosure with a built-in GPS tracker. On top of the rod, there is an LED light that uses different colors to provide installation and troubleshooting instructions for the end user. For more details, refer to Section 7 on Operating Instructions. Each probe has a QR code on top that users can scan with the Agurotech application.

This Instrument is manufactured by our principle company

