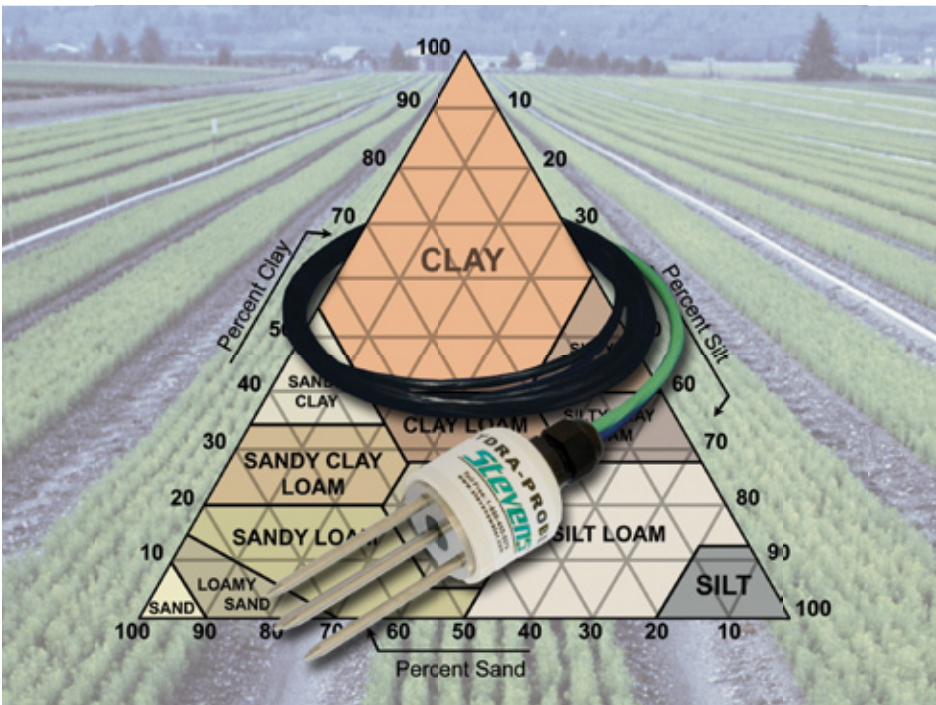


# Hydra Probe II Soil Sensor



## Description

Stevens' Hydra Probe II offers a unique advantage over other soil probes by providing an all-in-one, in-situ system that can measure many different parameters simultaneously. The Hydra Probe instantly calculates soil moisture, electrical conductivity, and temperature as well as supplying the raw voltages and complex dielectric permittivity for research applications. The data adds science to soil management for better understanding of the impact soil conditions have on plants and the climate. The objective of the Hydra Probe is to optimize analysis of soil conditions for research studies and for enhanced quality and yield of turf and crops.

Hydra Probe sensing technology has been deployed for over 10 years by the USDA and is used by NASA for ground truthing of satellite based soil imaging. A compact, rugged design with potted internal components makes the Hydra Probe easier to deploy than competing sensors and ideal for remote and harsh conditions. Durable construction makes it possible for the units to remain in the field for many years, maintenance-free.

The defined sensing volume allows accurate measurements in regions where there are strong soil moisture gradients, such as near the soil surface. Response time to changing soil conditions is immediate, and calibration is as simple as selecting a soil type (sand, loam, silt or clay).

Each Hydra Probe is serial addressable, allowing for multiple sensors to be connected to any RS485 or SDI-12 data logger via a single cable. Sensor data can also be sent directly to a radio modem.

The Hydra Probe is a coaxial impedance dielectric sensor. Both components of the complex dielectric permittivity can be obtained from the reflected behavior of an electromagnetic wave. Because the Hydra Probe characterizes both components of the complex dielectric permittivity, soil moisture and soil electrical conductivity can be measured simultaneously. An onboard processor converts the raw signal response into the dielectric permittivities and thus soil moisture and electrical conductivity. With a standard database or spreadsheet, managers can view real-time soil snapshots or long-term soil trends.

## Benefits

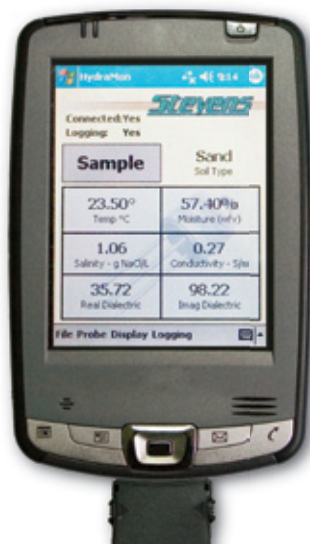
- Instantly measure soil moisture, conductivity, salinity, and temperature
- Optimize soil analysis, watering and fertilization
- Enables measurement of native (undisturbed) soil
- Low risk: ten years of field-proven science
- Measure flow of water, fertilizer from topsoil to sub-root zone
- Performs well in high-salinity soil
- Easier monitoring of remote sites
- Review real-time soil data and trends from the office

## Features

- Instantaneous sensor response
- Serial addressable: multiple units on one cable
- Maintenance-free
- Easily linked to wireless systems
- No calibration for mineral soil
- Custom calibration available for peat, grain, and organic soil
- Compatible with most data logging systems
- Digital or analog output
- Temperature corrected
- Compact, rugged for years of in-soil use

## Applications

- Long/short-term soil monitoring
- Spot checking of soil
- Golf & sports turf management
- Precision agriculture/fertigation
- Geotechnical measurement
- Weather/climate studies
- Agriculture Research
- Soil & ground water remediation
- Watershed management
- Flood control forecasting
- Forecasting forest tinder conditions
- Irrigation Management



## SOIL MEASUREMENT PROFILING

Measure and log current soil conditions using the portable **POGO** Hydra Probe sensor and *Stevens* HydraMon software. The user can simply spot check current soil conditions and save measurements to a file on the POGO. When the POGO is synchronized with the computer, the file can be opened for further data analysis using *MS Excel*.

## HYDRA PROBE PARAMETERS

1. Voltage 1
2. Voltage 2
3. Voltage 3
4. Voltage 4
5. Voltage 5
6. Soil Temperature in Celsius
7. Soil Temperature in Fahrenheit
8. Soil Moisture Percentage
9. Loss Tangent
10. Soil Conductivity (temperature corrected) in Siemens / meter
11. Real dielectric permittivity
12. Real dielectric permittivity (temperature corrected)
13. Imaginary dielectric permittivity
14. Imaginary dielectric permittivity (temperature corrected)
15. Soil conductivity in Siemens / meter
16. Diode Temperature in Celsius
17. Saved for future development
18. ADC Reading 1
19. ADC Reading 2
20. ADC Reading 3
21. ADC Reading 4
22. ADC Reading 5

## TECHNICAL SPECIFICATIONS

Measurements	Range	Accuracy
Dielectric Constant	1 to 80 where 1 = air 80 = distilled water	± 1.5% or 0.2 whichever is typically greater
Soil Moisture for inorganic & mineral soil	From completely dry to fully saturated	± 0.01 WFV for most soils ± 0.03 max for fine textured soils
Conductivity	0.01 to 1.5 S/m	± 2.0% or 0.005 S/m whichever is typically greater
Temperature*	-10° to +55° C	± 0.1° C

\*Extended temperature range sensor (down to -30° C) available. Please call for details.

## ELECTRICAL OPERATION

	SDI-12	RS485
Electrical	9-20 VDC	9-20 VDC
Communication Protocol	SDI-12 Standard v. 1.2	Custom or open spec
Cable Length	60 meters / 197 feet	1219 meters / 4000 feet (max. non-spliced 304.8m / 1000 ft)
Power	<1 mA idle / 30 mA active	<10 mA idle / 30 mA active
Cable	3-wire: power, ground, data	4-wire: power, ground, com+, com-
Baud Rate	1200	9600
Intersensor Variability	± 0.012 WFV ( $\theta$ m <sup>3</sup> m <sup>-3</sup> )	± 0.012 WFV ( $\theta$ m <sup>3</sup> m <sup>-3</sup> )

## ORDERING INFORMATION

Part #	Description
93640-025	Hydra Probe II with 25 ft/7.62 m of cable (specify SDI-12 or RS485)
93640-050	Hydra Probe II with 50 ft/22.86 m of cable (specify SDI-12 or RS485)
93640-100	Hydra Probe II with 100 ft/30.48 m of cable (specify SDI-12 or RS485)
93633-001	POGO Portable Soil Sensor with PDA and HydraMon Software



## ENVIRONMENTAL PARAMETERS

- Operating Temperatures:  
In soils: freezing to +55° C  
Standard temperature probe range: -10° C to +55° C  
Extended temperature probe range: -30° C to +55° C
- Storage Temperatures: -40° C to +55° C
- Water Resistance: tolerates continuous full immersion
- Cable: 22 gauge, UV resistant, direct burial
- Vibration and shock resistant with potted components in PVC housing and 304 grade stainless steel tines

## PHYSICAL PARAMETERS

- Length: 4.9 in (12.4 cm)  
Diameter: 1.6 in (4.2 cm)
- Sensing Volume (Cylindrical region)  
Length: 2.2 in (5.7 cm)  
Diameter: 1.2 in (3.0 cm)
- Weight: 200 g (cable: 0.08 kg/m)

Contact Stevens regarding complete data collection and management systems.

**Stevens**<sup>®</sup>  
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