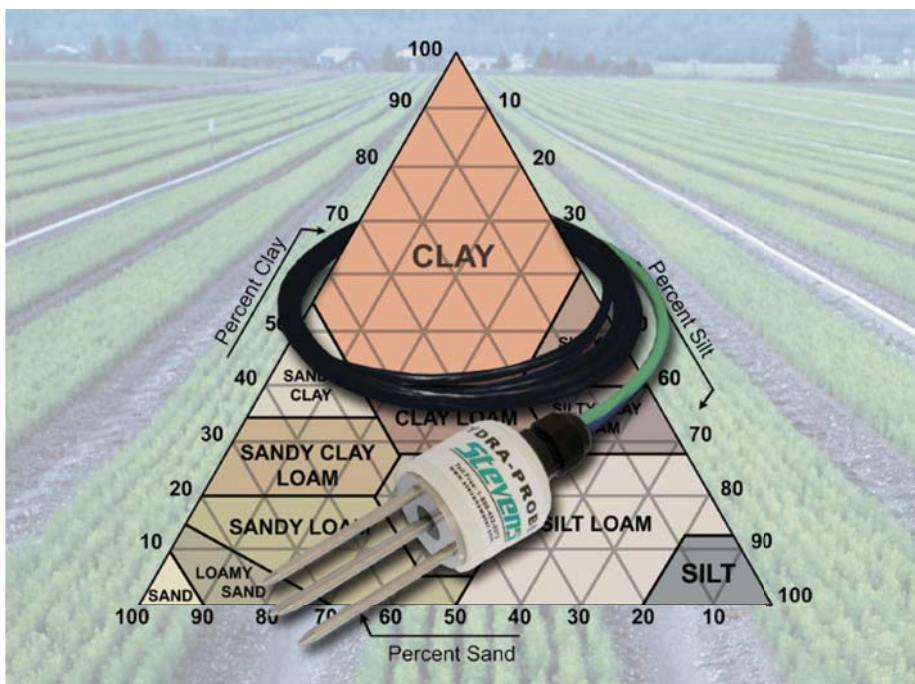


Hydra Probe II Soil Sensor



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.

This 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 20 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. The Hydra Probe's soil moisture calibration has been vigorously peer-reviewed making it one of the most accurate soil sensors available.

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 on-board 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: twenty years of field-proven science
- Measure flow of water 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 required for mineral soil
- Custom calibration available for peat, organic soil, or other mediums
- 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

Stevens[®]
Water Monitoring Systems, Inc.

HYDRA PROBE 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	± 0.3° C

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

**Accuracy may vary with some soil textures.

HYDRA PROBE 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 ($\theta \text{ m}^3 \text{ m}^{-3}$)	± 0.012 WFV ($\theta \text{ m}^3 \text{ m}^{-3}$)

HYDRA PROBE 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
93633-002	Wi-Fi POGO Wireless Soil Sensor (see below for details)

PORTABLE SOIL MEASUREMENT PROFILING



Measure and log current soil conditions using the portable **POGO Wi-Fi** sensor and the *Stevens HydraMon* mobile app available from the Apple App store. Quickly spot check current soil conditions and save measurements the iPhone, iPad, or iTouch. Email the data anywhere and post-process with *MS Excel* or other program.

HYDRA PROBE PARAMETERS

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



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)



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