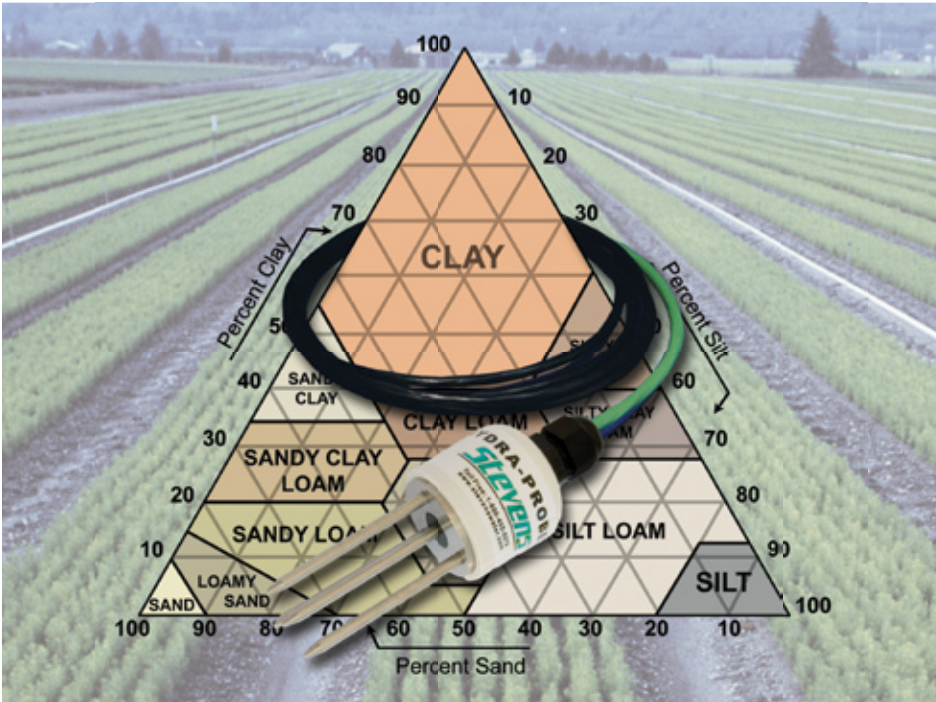


Hydra Probe II Soil Sensor DATA SHEET



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, conductivity, salinity, and temperature as well as supplying the raw voltages and complex 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 uses an electromagnetic signal propagated from the center tine of the probe to measure multiple parameters. The electrical properties of soil can be determined from recorded voltages, which correspond to the reflected behavior of an electromagnetic wave. On-board software converts the raw voltage to standard units of measurement for each parameter. 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
- 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



SOIL MEASUREMENT PROFILING

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

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. Soil Water Conductivity (Temp. corrected) in Siemens / meter |
| 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. Soil Salinity in Grams NaCl / Liter | 21. ADC Reading 4 |
| 10. Soil Conductivity (temperature corrected) in Siemens / meter | 22. ADC Reading 5 |
| 11. Real dielectric permittivity | |
| 12. Real dielectric permittivity (temperature corrected) | |

TECHNICAL SPECIFICATIONS

Measurements	Range	Accuracy
Dielectric Constant	1 to 78 where 1 = air 78 = distilled water	± 1.5% or 0.2 whichever is typically greater
Soil Moisture for inorganic & mineral soil	From completely dry to fully saturated	± 0.03 water fraction by volume in typical soil
Conductivity	0.01 to 1.5 S/m	± 2.0% or 0.005 S/m whichever is typically greater
Temperature	-10° to +65° C	± 0.1° C

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 (θ m ³ m ⁻³)	± 0.012 WFV (θ m ³ m ⁻³)

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)
93635	HydraMon PDA software



ENVIRONMENTAL PARAMETERS

- Operating Temperatures:
In soils: freezing to +65 C
Temperature range: -10 C to +65 C
- Storage Temperatures: -40 C to +70 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.

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