

Smart Water Application Technologies/SWAT Calibration Report

Testing Agency: Center for Irrigation Technology <http://cati.csufresno.edu/cit/>

Testing Period: January 2009 to January 2010

Product Type: Soil Moisture Sensor

Product Make and Model: Baseline S-100 biSensor

Product Description: Sensor measures moisture content in Time Domain Transmissometry

SWAT Protocol*: Turf and Landscape Irrigation Equipment - SOIL MOISTURE SENSORS

Phase 1: Indoor Lab Screening Tests - 7th Draft Testing Protocol

The concept of soil moisture sensors has an extensive history of scientific study and documentation. The objective of Phase 1 lab tests is to determine sensor calibration curves over a range of conditions that affect soil moisture, including soil type, temperature and salinity. Phase 1 testing determines sensor response over manufacturer specified test ranges to continue into Phase 2. At that time the soil sensor will be integrated with an irrigation controller to measure irrigation adequacy and efficiency in a virtual landscape using the current performance criteria of 0.40 inches of rainfall and 2.50 inches of ETo.

Phase 1 Soil Moisture Sensor testing does not test the efficacy of a sensor over the entire range of soil moisture conditions possible and do not measure the integration of a soil sensor with a controller to manage irrigation.

Sensor performance curves were developed to determine the relationship between sensor readings and soil moisture content for a soil filled container. Relationships are determined for a range of soil textures, ambient temperatures and water conductivity values.

*All SWAT protocols may be viewed at www.irrigation.org

Phase 1 SWAT Calibration Summary: Baseline S-100 biSensor

Measures are between field capacity (i.e. practical soil water holding capacity) and a selected drying range specified by the manufacturer over which the sensor was tested.

Equation (Linear)

Test of Soil Moisture Sensor

Response Function Developed¹

Response in Fine-Textured Soil

Linear
(y = 0.1757x + 0.3308)

Response in Medium-Textured Soil

Linear
(y = 0.5412x + 0.1487)

Response in Coarse-Textured Soil

Linear
(y = 0.7640x + 0.1133)

Response in Soil at 15 °C (59 °F)

Linear
(y = 0.4690x + 0.1949)

Response in Soil at 35 °C (95 °F)

Linear
(y = 0.4686x + 0.1773)

Response in Soil Susceptible to Freezing

Linear
(y = 0.5382x + 0.1788)

Response in Fine-Textured Soil to Irrigation with 2.5 dS/m salinity water

Linear
(y = 0.1961x + 0.3462)

Response in Fine-Textured Soil to Irrigation with 5.0 dS/m salinity water

Linear
(y = 0.1534x + 0.3632)

Response in Medium-Textured Soil to Irrigation with 2.5 dS/m salinity water

Linear
(y = 0.5198x + 0.1947)

Response in Coarse-Textured Soil to Irrigation with 2.5 dS/m salinity water

Linear
(y = 0.8438x + 0.1540)

Response in Medium-Textured Soil for six wet/dry cycles

Linear
(y = 0.4690x + 0.1806)

¹Regression equations of the data gathered vs. moisture content as measured by gravimetric sampling, or the measured weight of water in the soil samples. The dynamics of variable manufacture selected calibration endpoints preclude the applicability of correlation coefficients for inter-test or inter-sensor comparisons. A Nonlinear designation means a regression equation other than a straight line was used to best describe the relationship.

Product Detail Supplied by Manufacturer

Baseline S-100 biSensor

www.baselinesystems.com

Operation

Features

Additional Hardware

Digital
Absolute-
reading
Time Domain
Transmissometry

- Provides stable readings across a wide range of soil temperature and EC conditions
- Ability to act as a moisture transducer in a closed loop irrigation system.
- No post-install adjustments needed.
- Can measure soil and irrigation system properties for automatic setup.
- No electrically conductive components having earth contact.

- Natively communicates via highly reliable digital protocol to Baseline controllers and monitors over two-wire or over conventional field valve and common wires in parallel with standard 24vac solenoids.
- WaterTec S100: add-on module compatible with any standard 24vac irrigation timer. S100 interrupts conventional timers, auto-calibrates, and includes built-in diagnostics and history reporting.



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