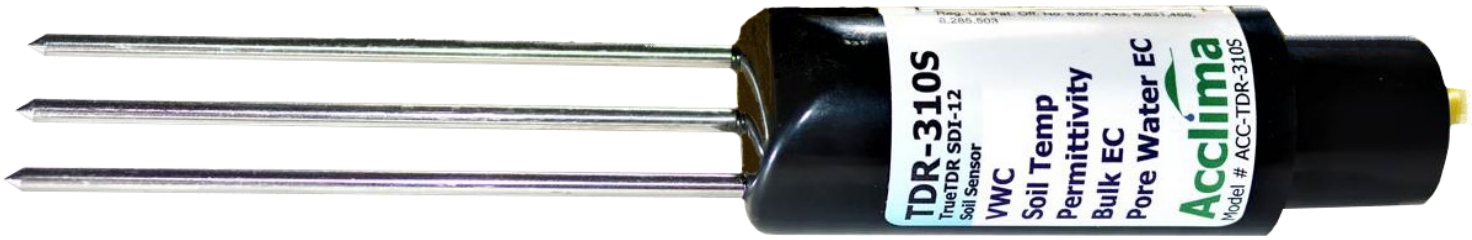
TDR-310S



Description:

Like its older siblings, the TDR-310S is a true waveform digitizing Time Domain Reflectometer that derives soil permittivity and water content from the propagation time of an electromagnetic impulse conveyed along its waveguide. Like many of the expensive competing products (conventional TDR mainframes) the 310S and its siblings contain an ultra-fast rise time step function generator, a waveform digitizer (200 GSPS) and a picosecond-resolution time base (5ps). Unlike these predecessors it eliminates the bandwidth-constraining coax cable, the bulky console, and 90-97% of the cost. Because it is a true time domain device its readings are not derived from current and voltage magnitudes and relationships and hence are not impacted by soil electrical conductivity and compaction. It uses the standard SDI-12 interface and is compatible with all data recorders that are version 1.4 compliant.

Functions:

Volumetric Water Content (0 to 100% with 0.1% resolution)

Permittivity (1 to 80 with 0.1 unit resolution)

Soil Electrical Conductivity a.k.a. Bulk EC (0 to 5000 µS/cm -resolution depends on reading range)

Soil Temperature (-40 to +60 degrees C with 0.1 degree resolution)

Pore Water Electrical Conductivity (0 to 55000 µS/cm)

Features:

10 meter, flexible, waterproof cable

10 cm X 3.5mm stainless steel 3-element waveguide

Rugged, waterproof epoxy housing

Typical 350ps incident wave rise time applied directly to the soil (no bandwidth limiting coax cable).

Input bandwidth to the waveform digitizer is also unrestrained because of the absence of a coax cable.

Operating Parameters:

Read time:	0.7 seconds
Voltage Requirements:	6 to 15 volts DC
Idle Current Consumption:	<35 µA @ 6 to 15 VDC
Read Current Consumption:	100 mA @ 12 VDC

Idle Energy Consumption: 15 J per day at 6 VDC

Read Energy Consumption: 0.7 J per reading at 6 VDC, 0.8 J per reading @ 12 VDC

VWC and Permittivity Performance Specifications: Permittivity to VWC conversion method = Proprietary Dielectric Mixing Model with 0 to 100% range.

* Closely follows Topp Equation to 46% VWC.

Permittivity Reporting Accuracy: ±1% of full scale 1 to 80 relative permittivity units

* From 0 to 4000 µS/cm Bulk (in-soil) Electrical Conductivity

* From –20 C to +50 degrees C, however permittivity of water changes drastically in solid vs liquid states. Therefore the VWC reading will only report liquid water.

Volumetric Water Content Reporting Accuracy: Dependent upon soil type – but typically ±2 percentage points

* Less than 1 percentage point change with Bulk EC changes from 0 to 4000 µS/cm

* Change in VWC with compaction follows only the change in soil volume.

Temperature Performance Specifications: Temperature is measured using a precision thermistor. The thermistor is located within 2 mm of the outer waveguide rod where it enters the epoxy housing.

Temperature Reporting Performance: Typical ±0.2 degrees C, Maximum error ±0.3 degrees C over -12 to +50 C

Electrical Conductivity Performance Specifications: EC is calculated from the long term (200 ns) amplitude of the reflected wave using a geometric parameter called the 'waveguide constant'. This constant is derived in the factory during factory calibration.

EC Reporting Accuracy: ±25 µS/cm 0 to 1000 µS/cm, ±2.5% 1000 µS/cm to 6000 µS/cm

* Pore water EC is calculated from the Hilhorst model using an average pore size to represent all soils. Hence its accuracy is not specified. The reading does provide a 'ballpark' indication of the salinity of the water in the soil as opposed to the soil/water mixture or 'Bulk EC' property.

Dimensions:

DIMENSIONS ARE IN CENTIMETERS