

AT

Delta-T Devices

www.delta-t.co.uk

Soil Moisture Measurement



The EQ3 Equitensiometer offers maintenance-free measurement of soil water potential over 0 to -1000 kPa.

- Convenient, accurate and reliable alternative to water-filled tensiometers
- Maintenance free: no refilling, degassing, or topping up
- Built in temperature sensor
- Buriable and frost resistant (IP68)

Overview

The EQ3 Equitensiometer provides reliable matric potential and soil temperature measurement over a wide soil water potential range. The EQ3 is particularly well suited for use in dry soils.

The EQ3 uses class leading ThetaProbe technology to avoid the many problems of water-filled tensiometers. It measures water potential (matric potential) in the range 0 to -1000 kPa and provides an accurate loggable output.

Data logging

The EQ3 can be logged by any Delta-T data logger, including the powerful GP2. It is also compatible with many other manufacturers' data loggers. The EQ3 can be used with an HH2 Moisture Meter, but only the unconverted millivolt output is displayed, and the temperature reading is not available.

Installation

The EQ3 Tensiometer is buriable (IP68) and maintenance-free. It can be inserted into augured holes or positioned in the wall of a trench (which is then carefully back-filled). Optional extension tubes assist placement and removal when burying at depth and a detachable cable systems enables simple changes of cable length.

The EQ3 is rugged, maintenance-free (no refilling, degassing, or topping up required), frost resistant and low powered; this means it can be left installed at remote sites over long periods of time. In such instances it is possible to access sensor data wirelessly via a modem enabled data logger such as the Delta-T GP2.

Working principle

The EQ3's measuring rods are embedded in a porous material (the equilibrium body). This material has a known, stable relationship between water content and matric potential. When the EQ3 Tensiometer is inserted into the soil, the matric potential within the equilibrium body equilibrates to that of the surrounding soils. The water content of the matric material is measured directly by the EQ3, and this can be converted into the matric potential of the surrounding soil using the calibration curve supplied with each Equitensiometer.



Applications

The EQ3 Equitensiometer is ideally suited to static long term monitoring of water potential in soils and substrates. It can even be left installed in frozen soils. Typical applications include environmental, plant, soil, ecology and geo-sciences research, as well as civil engineering and agricultural engineering applications.

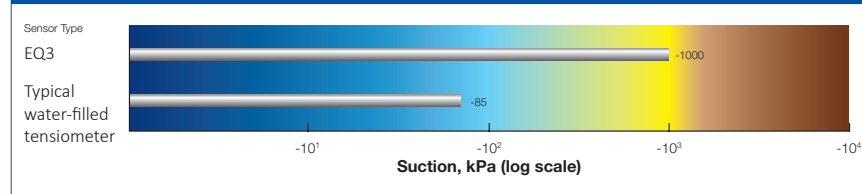
The EQ3's full range is 0 to -1000 kPa but best accuracy is achieved between -100 and -500 kPa. This makes it well suited to plant water stress studies - even in very dry soils.

Please note that despite its many strengths, the EQ3 should not be seen as a rapid response sensor that covers the full range of water potentials at high accuracy. Such a sensor does not yet exist. EQ3 equilibration time is typically several hours.

Ordering Information (full spec on page 15)

EQ3	EQ3 Equitensiometer. See below for cable and accessory options.
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Comparison of matric potential ranges



Cable options and accessories for the ML3 ThetaProbe, SM150T Sensors and EQ3 Equitensiometer



SMSC/lw-05	5 m cable terminating in bare wires for connection to data loggers.
SMSC/d-HH2	90 cm cable, M12 to 25-way D-socket, for connection to an HH2 Meter.

EXT/5W-01 EXT/5W-05 EXT/5W-10 EXT/5W-25	1 m, 5 m, 10 m, and 25 m extension cables, M12 connectors.
ML/EX50	0.5 m extension tube.
ML/EX100	1 m extension tube.
SM-AUG-100	Spiral auger, 45 mm diam. Installs ML3, SM150T or EQ3 at depth, length 1.2 m.

The EXT/5W-xx range of cables can be connected together to create cable runs to the length required. The final EXT/5W-xx cable is connect to an SMSC/lw-05 cable (bare wires suitable for connections to a data logger).

EXT/5W cables are compatible with ML3, SM150T, EQ3 and PR2 SDI-12 soil moisture sensors, and with GP2 cable networks.

All cables are IP68 M12 connector (f) to IP68 M12 connector (m).

Multi-parameter			Soil water potential
WET Sensor 			EQ3 
Volumetric water content	Pore water conductivity (ECp)	Temperature	Soil water potential (matric potential) and soil temperature
$\pm 0.03 \text{ m}^3.\text{m}^{-3}$ (3%)	See graph on page 6	$\pm 1.5^\circ\text{C}$	$\pm 10 \text{ kPa}$ over 0 to -100 kPa 10% of reading over -100 to -1000 kPa $\pm 0.5^\circ\text{C}$, 0 to 40°C for temp sensor $\pm 0.75^\circ\text{C}$, -20 to +60°C for temp sensor
Full accuracy over: 0 to 1.0 m³.m⁻³	See graph on page 6	0 to 50°C	0 to -1000 kPa (-10bar)
0 to 300 mS.m⁻¹			Suitable for all non-saline soils.
Supplied with extended range calibrations which should be used for readings between 300 to 500 mS.m ⁻¹			
-5 to 50°C			0 to 40°C
Serial TTL data providing permittivity, bulk conductivity and temperature, from which water content and pore water conductivity are calculated			0-1.0 V differential, non-linear. (Calibration data and graph supplied with each sensor)
			Resistance 5.8Ω to 28kΩ for temp sensor
6 to 10 V, ~38 mA for 2.5 s			5 to 14 V, ~18 mA for 1 s
IP68			IP68
~500 ml			N/A
Sample volume is weighted towards soil immediately surrounding the rods			
Overall: ~120 x 45 x 13 mm Rods: 68 mm x 3.0 mm dia Outer rods 68 mm x 3.0 mm dia Central rod 65 mm x 5.0 mm dia			181 mm x 40.5 mm diameter
Weight: 0.1 kg			Weight: 0.3 kg (excl. cable)
Sensor calibrations supplied in WET Sensor EEPROM			Individual sensor calibrations supplied
Recalibration advised every 3 years (depending on use)			Recalibration advised every 2 years (depending on use)
Generalised Mineral, Organic, Sand and Clay calibrations are supplied, specialist calibrations are available for horticultural substrates (see page 7)			No soil calibrations required
Measures pore water conductivity, moisture content and temperature directly within soils and substrates. It has crucial applications in precision horticulture and soil science research.			Maintenance-free dielectric tensiometer with soil temperature measurement. Can be left installed even in frozen soils. Best results in dry soils. Readings are lower accuracy than water-filled tensiometers.