Document Title: Description, AN, Calibration Equations for EC-5/TE/5TE		Part # and Rev. 13392-03	
		Release Date: 1-12-07	
Rev.	Description	Revision By	Date
-03	Updated equation 3 & 4	DDH	12/10

Production Filename: 13392 (In Product Library)

Path to Working Files: DecaDoc\Application Notes\Master

Dimensions: 8.5 inch wide, 11 inch tall

Material: Paper, 92 Bright White or better, 75g/m² or heavier

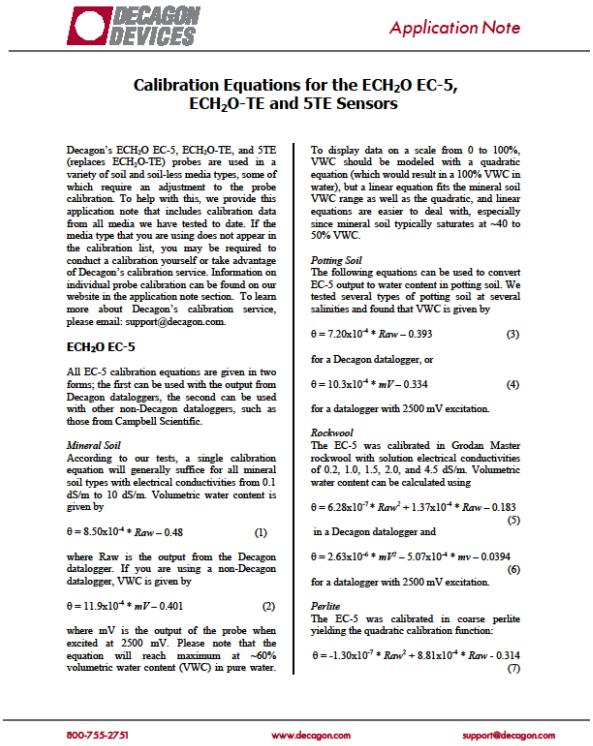
Colors: Color Print on White

Printer: HP Color LaserJet 5550

Finish: None

Adhesive: None

Special Notes: Illustrations are Ref Only ** Not to Scale ** (Shown page 1 of 3)



DECAGON DEVICES Application Note

Calibration Equations for the ECH$_2$O EC-5, ECH$_2$O-TE and 5TE Sensors

Decagon's ECH$_2$O EC-5, ECH$_2$O-TE, and 5TE (replaces ECH$_2$O-TE) probes are used in a variety of soil and soil-less media types, some of which require an adjustment to the probe calibration. To help with this, we provide this application note that includes calibration data from all media we have tested to date. If the media type that you are using does not appear in the calibration list, you may be required to conduct a calibration yourself or take advantage of Decagon's calibration service. Information on individual probe calibration can be found on our website in the application note section. To learn more about Decagon's calibration service, please email: support@decagon.com.

ECH$_2$O EC-5

All EC-5 calibration equations are given in two forms; the first can be used with the output from Decagon dataloggers, the second can be used with other non-Decagon dataloggers, such as those from Campbell Scientific.

Mineral Soil
According to our tests, a single calibration equation will generally suffice for all mineral soil types with electrical conductivities from 0.1 dS/m to 10 dS/m. Volumetric water content is given by

$$\theta = 8.50x10^{-4} * Raw - 0.48 \quad (1)$$

where Raw is the output from the Decagon datalogger. If you are using a non-Decagon datalogger, VWC is given by

$$\theta = 11.9x10^{-4} * mV - 0.401 \quad (2)$$

where mV is the output of the probe when excited at 2500 mV. Please note that the equation will reach maximum at ~60% volumetric water content (VWC) in pure water. To display data on a scale from 0 to 100%, VWC should be modeled with a quadratic equation (which would result in a 100% VWC in water), but a linear equation fits the mineral soil VWC range as well as the quadratic, and linear equations are easier to deal with, especially since mineral soil typically saturates at ~40 to 50% VWC.

Potting Soil
The following equations can be used to convert EC-5 output to water content in potting soil. We tested several types of potting soil at several salinities and found that VWC is given by

$$\theta = 7.20x10^{-4} * Raw - 0.393 \quad (3)$$

for a Decagon datalogger, or

$$\theta = 10.3x10^{-4} * mV - 0.334 \quad (4)$$

for a datalogger with 2500 mV excitation.

Rockwool
The EC-5 was calibrated in Grodan Master rockwool with solution electrical conductivities of 0.2, 1.0, 1.5, 2.0, and 4.5 dS/m. Volumetric water content can be calculated using

$$\theta = 6.28x10^{-7} * Raw^2 + 1.37x10^{-4} * Raw - 0.183 \quad (5)$$

in a Decagon datalogger and

$$\theta = 2.63x10^{-6} * mV^2 - 5.07x10^{-4} * mv - 0.0394 \quad (6)$$

for a datalogger with 2500 mV excitation.

Perlite
The EC-5 was calibrated in coarse perlite yielding the quadratic calibration function:

$$\theta = -1.30x10^{-7} * Raw^2 + 8.81x10^{-4} * Raw - 0.314 \quad (7)$$

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