Document Title: Description, AN, Calibrating ECH2O Probes		Part # and Rev. 13393-04	
		Release Date: 1-12-07	
Rev.	Description	Revision By	Date
-04	Updated to new sensors and techniques	Chris Chambers	11/22/10

Production Filename: 13393 (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

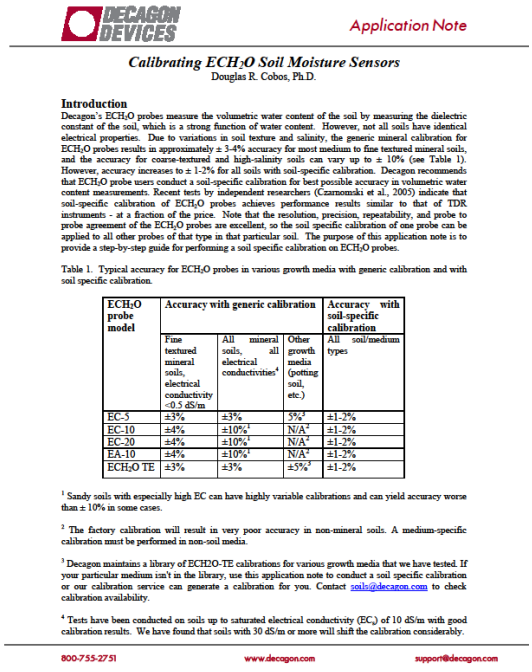
Colors: Color Print on White

Printer: HP Color LaserJet 8550-PS

Finish: None

Adhesive: None

Special Notes: Illustrations are Ref Only ** Not to Scale ** (Shown page 1 of 7)



DECAGON DEVICES Application Note

Calibrating ECH$_2$O Soil Moisture Sensors

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Introduction

Decagon's ECH$_2$O probes measure the volumetric water content of the soil by measuring the dielectric constant of the soil, which is a strong function of water content. However, not all soils have identical electrical properties. Due to variations in soil texture and salinity, the generic mineral calibration for ECH$_2$O probes results in approximately ± 3-4% accuracy for most medium to fine textured mineral soils, and the accuracy for coarse-textured and high-salinity soils can vary up to ± 10% (see Table 1). However, accuracy increases to ± 1-2% for all soils with soil-specific calibration. Decagon recommends that ECH$_2$O probe users conduct a soil-specific calibration for best possible accuracy in volumetric water content measurements. Recent tests by independent researchers (Czarnomski et al., 2005) indicate that soil-specific calibration of ECH$_2$O probes achieves performance results similar to that of TDR instruments - at a fraction of the price. Note that the resolution, precision, repeatability, and probe to probe agreement of the ECH$_2$O probes are excellent, so the soil specific calibration of one probe can be applied to all other probes of that type in that particular soil. The purpose of this application note is to provide a step-by-step guide for performing a soil specific calibration on ECH$_2$O probes.

Table 1. Typical accuracy for ECH$_2$O probes in various growth media with generic calibration and with soil specific calibration.

ECH$_2$O probe model	Accuracy with generic calibration			Accuracy with soil-specific calibration
	Fine textured mineral soils, electrical conductivity <0.5 dS/m	All mineral soils, all electrical conductivities[4]	Other growth media (potting soil, etc.)	All soil/medium types
EC-5	±3%	±3%	5%[2]	±1-2%
EC-10	±4%	±10%[1]	N/A[2]	±1-2%
EC-20	±4%	±10%[1]	N/A[2]	±1-2%
EA-10	±4%	±10%[1]	N/A[2]	±1-2%
ECH$_2$O TE	±3%	±3%	±5%[3]	±1-2%

[1] Sandy soils with especially high EC can have highly variable calibrations and can yield accuracy worse than ± 10% in some cases.

[2] The factory calibration will result in very poor accuracy in non-mineral soils. A medium-specific calibration must be performed in non-soil media.

[3] Decagon maintains a library of ECH2O-TE calibrations for various growth media that we have tested. If your particular medium isn't in the library, use this application note to conduct a soil specific calibration or our calibration service can generate a calibration for you. Contact soils@decagon.com to check calibration availability.

[4] Tests have been conducted on soils up to saturated electrical conductivity (EC_e) of 10 dS/m with good calibration results. We have found that soils with 30 dS/m or more will shift the calibration considerably.

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