Document Title: Description, AN, THERM, TR.com The KD2-Pro Thermal Properties Analyzer vs ASTM and IEEE Standards		Part # and Rev. 13945-01	
		Release Date:	
Rev.	Description	Revision By	Date

Production Filename: 13945 (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

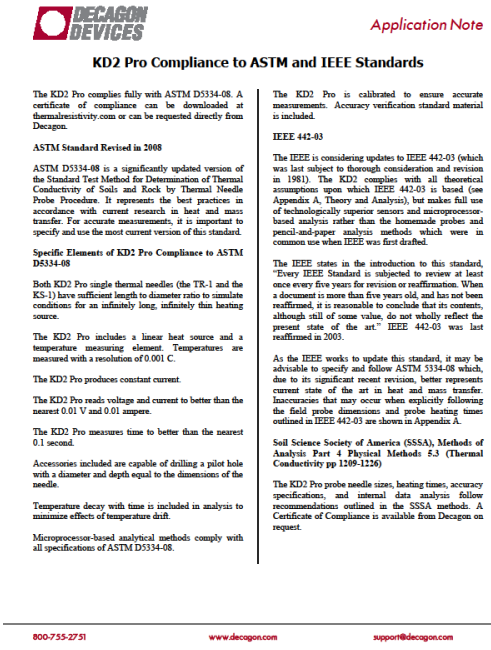
Colors: Color Print on White

Printer: HP Color LaserJet 8550-PS

Finish: None

Adhesive: None

Special Notes: Illustrations are Ref Only ** Not to Scale ** (Shown page 1 of 4)



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Application Note

KD2 Pro Compliance to ASTM and IEEE Standards

The KD2 Pro complies fully with ASTM D5334-08. A certificate of compliance can be downloaded at thermalresistivity.com or can be requested directly from Decagon.

ASTM Standard Revised in 2008

ASTM D5334-08 is a significantly updated version of the Standard Test Method for Determination of Thermal Conductivity of Soils and Rock by Thermal Needle Probe Procedure. It represents the best practices in accordance with current research in heat and mass transfer. For accurate measurements, it is important to specify and use the most current version of this standard.

Specific Elements of KD2 Pro Compliance to ASTM D5334-08

Both KD2 Pro single thermal needles (the TR-1 and the KS-1) have sufficient length to diameter ratio to simulate conditions for an infinitely long, infinitely thin heating source.

The KD2 Pro includes a linear heat source and a temperature measuring element. Temperatures are measured with a resolution of 0.001 C.

The KD2 Pro produces constant current.

The KD2 Pro reads voltage and current to better than the nearest 0.01 V and 0.01 ampere.

The KD2 Pro measures time to better than the nearest 0.1 second.

Accessories included are capable of drilling a pilot hole with a diameter and depth equal to the dimensions of the needle.

Temperature decay with time is included in analysis to minimize effects of temperature drift.

Microprocessor-based analytical methods comply with all specifications of ASTM D5334-08.

The KD2 Pro is calibrated to ensure accurate measurements. Accuracy verification standard material is included.

IEEE 442-03

The IEEE is considering updates to IEEE 442-03 (which was last subject to thorough consideration and revision in 1981). The KD2 complies with all theoretical assumptions upon which IEEE 442-03 is based (see Appendix A, Theory and Analysis), but makes full use of technologically superior sensors and microprocessor-based analysis rather than the homemade probes and pencil-and-paper analysis methods which were in common use when IEEE was first drafted.

The IEEE states in the introduction to this standard, "Every IEEE Standard is subjected to review at least once every five years for revision or reaffirmation. When a document is more than five years old, and has not been reaffirmed, it is reasonable to conclude that its contents, although still of some value, do not wholly reflect the present state of the art." IEEE 442-03 was last reaffirmed in 2003.

As the IEEE works to update this standard, it may be advisable to specify and follow ASTM 5334-08 which, due to its significant recent revision, better represents current state of the art in heat and mass transfer. Inaccuracies that may occur when explicitly following the field probe dimensions and probe heating times outlined in IEEE 442-03 are shown in Appendix A.

Soil Science Society of America (SSSA), Methods of Analysis Part 4 Physical Methods 5.3 (Thermal Conductivity pp 1209-1226)

The KD2 Pro probe needle sizes, heating times, accuracy specifications, and internal data analysis follow recommendations outlined in the SSSA methods. A Certificate of Compliance is available from Decagon on request.