

KD2 PRO Thermal Properties Analyser



The KD2 Pro is a fully portable field and lab thermal properties analyser. It uses the transient line heat source method to measure thermal conductivity, resistivity, diffusivity, and specific heat. Sophisticated data analysis is based on 30+ years of research experience on heat and mass transfer in soils and other porous materials.

Excellent Accuracy

The compact KD2 Pro controller is much more than a simple readout for time and temperature. A proprietary algorithm fits time and temperature data with exponential integral functions using a nonlinear least squares method. This fully mathematical solution delivers thermal conductivity/resistivity to within $\pm 10\%$.

Corrects for Temperature Drift

Temperature changes of a thousandth of a degree per second--the sun warming the soil, for example, or someone walking into the lab-- destroy the accuracy of thermal properties calculations. Unlike other thermal needle systems, the KD2 Pro corrects for linear temperature drift that can cause large errors.



Solutions for soil, plant & environmental monitoring

www.ictinternational.com.au

Ph: +61 2 6772 6770 sales@ictinternational.com.au

KD2 PRO Thermal Properties Analyser

SENSOR	KS-1	TR-1	SH-1
MEASUREMENT	Read time- 60 Seconds	Read time- 5 Minutes	Read time -2 Minutes-
ACCURACY	Accuracy: (Conductivity): $\pm 5\%$ from 0.2 - 2 W/(m· K) ± 0.01 W/(m· K) from 0.02 - 0.2 W/(m· K)	Accuracy: (Conductivity): $\pm 10\%$ from 0.2 - 4 W/(m· K) ± 0.02 W/(m· K) from 0.1 - 0.2 W/(m· K)	Accuracy: (Conductivity) $\pm 10\%$ from 0.2 - 2 W/(m· K) ± 0.01 W/(m· K) from 0.02 - 0.2 W/(m· K) (Diffusivity) $\pm 10\%$ at conductivities above 0.1 W/(m· K) (Volumetric Specific Heat) $\pm 10\%$ at conductivities above 0.1 W/(m· K)
RANGES	K: 0.02 to 2 W/(m·K) R: 50 to 5000 °C·cm/W	K: 0.1 to 4 W/(m·K) R: 25 to 1000°C cm/W	K: 0.02 to 2.00 W/(m· K) R: 50 to 5000 °C·cm/W 0.1 to 1 mm ² /s (diffusivity) 0.5 to 4 mJ/(m ³ K) (volumetric specific heat
CABLE	0.8 m	0.8 m	0.8 m
ENVIRONMENT	-50 to 150°C	-50 to 150°C	-50 to 150°C
DIMENSIONS	6 cm needle length 1.27 mm diameter needle	10 cm needle length 2.4 mm diameter needle	30 mm needle length 1.27 mm diameter 2 needles

SAMPLE MATERIAL	KS-1	TR-1	SH-1
LOW VISCOSITY LIQUIDS (E.G. WATER)	Best ¹	No	No
HIGH VISCOSITY LIQUIDS (E.G. GLYCEROL, OIL)	Best	Ok	No
INSULATION AND INSULATING MATERIALS	Best ⁵	Ok	Ok
MOIST SOIL	No	Best	Ok
DRY SOIL, POWDERS, GRANULAR MATERIALS	No	Best ²	Ok
CONCRETE	No	Best ³	Ok ⁴
ROCK	No	Best ³	Ok ⁴
OTHER SOLIDS	No	Best ³	Ok
VOLUMETRIC SPECIFIC HEAT	No	No	Best
THERMAL DIFFUSIVITY	No	No	Best

1 In low viscosity liquids, the read time should be set to the minimum allowed 1 minute to avoid free convection.

2 In dry granular materials where contact resistance can be significant, extending the read time to the maximum allowed 10 minutes will produce the most accurate results.

3 In solid materials where a pilot hole has been drilled and contact resistance can be significant, using thermal grease and extending the read time to the maximum allowed 10 minutes will produce the most accurate results.

4 The SH-1 sensor will take accurate measurements in rock and cured concrete, but it is very difficult to drill a small diameter, parallel holes in these materials to accommodate the SH-1 needles.

5 The KS-1 needle with 10 min read time gives good results with insulation. Heater temperatures with the other two probes are quite high for insulation measurements.



Solutions for soil, plant & environmental monitoring

www.ictinternational.com.au

INTERNATIONAL

Ph: +61 2 6772 6770 sales@ictinternational.com.au

KD2 Pro Specifications

ACCURACY	±5 to ±10% Thermal Conductivity/Resistivity ±10% Specific Heat ±10% Thermal Diffusivity
MEASUREMENT SPEED	1, 2, 5, & 10 min. read times depending on measurement type (see user's manual for more information).
DATA STORAGE	4,095 readings, flash memory
COMPLIANCE TO STANDARDS	ASTM Standard D5334-08 and IEEE Standard 442-1981
OPERATING ENVIRONMENT	-50 to 150°C for sensors
BATTERY SOURCE	4 AA
AUTO-READ MODE	Users can collect unattended data at user-defined intervals in the auto-read mode
TYPE	Ultra low-power 16-bit microcontroller w/ 24-bit A/D converter
DISPLAY	Liquid Crystal Display (LCD) 7.5 cm x 4 cm
CASE DIMENSIONS	15.5 x 9.5 x 3.5 cm
INCLUDED ACCESSORIES	KS-1 Thermal Conductivity/Resistivity sensor (for liquids) TR-1 Thermal Conductivity/Resistivity sensor (for solids) SH-1 Dual-Needle Thermal Diffusivity and Specific Heat sensor (for solids) User's manual Pelican carrying case Readout stand Performance verification standards Thermal grease Drill bit for drilling pilot holes in materials Concrete pilot pin KD2 Pro download utility RS232 cable
CALIBRATION	Each KD2 Pro comes factory calibrated and includes performance verification standards K: 0.02 to 4 Wm ⁻¹ C ⁻¹ D: 0.1 to 1.0 mm ² s ⁻¹ R: 0.25 to 50mC W ⁻¹ C: 0.5 to 4 MJ m ⁻³ C ⁻¹
RANGE OF MEASUREMENTS	* Accuracy and measurement range vary with sensor type. See Comparisons tab.



Solutions for soil, plant & environmental monitoring

www.ictinternational.com.au

INTERNATIONAL

Ph: +61 2 6772 6770 sales@ictinternational.com.au