DELTA-T DEVICES

Hand-held Readout Unit for ThetaProbe

TYPE HH1

USER MANUAL

HH1-UM-2

ThetaMeter is a portable, self-contained power supply and readout unit which, when used with a ThetaProbe, type ML1, provides a compact and fully portable volumetric moisture measurement system.

Measurement ranges

ThetaMeter has three pre-calibrated ranges, selectable via the slide switch on the front panel:

Mineral soil moisture

When this range is selected, ThetaMeter converts the output signal from a ThetaProbe into a volumetric moisture fraction reading with units of $m^3 m^{-3}$, and displays this on the LCD. The working range is 0 - 0.46 $m^3 m^{-3}$ and accuracy decreases above this value. '1' is displayed when very large errors would result. A linear conversion characteristic is used, similar to that published in the ThetaProbe, type ML1, User Manual, and suitable for most mineral soils. 0.05V and 1.0V probe output correspond to 0 and 0.46 $m^3 m^{-3}$ respectively.

Organic soil moisture

When this range is selected, ThetaMeter converts the output signal from a ThetaProbe into a volumetric moisture fraction reading with units of $m^3 m^{-3}$, and displays this on the LCD. The working range is 0 - 0.54 $m^3 m^{-3}$ and accuracy decreases above this value. '1' is displayed when very large errors would result. A linear conversion characteristic is used, similar to that published in the ThetaProbe, type ML1, User Manual, and suitable for most organic soils. 0.12V and 1.0V probe output correspond to 0 and 0.54 $m^3 m^{-3}$ respectively.

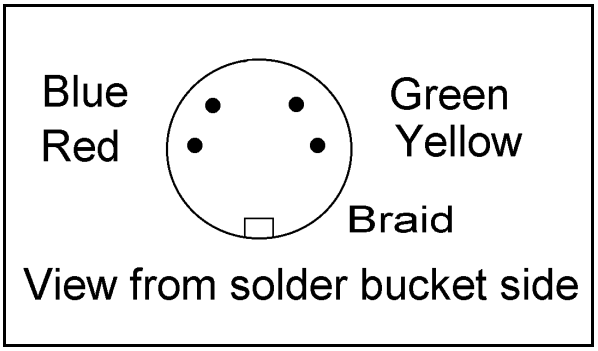
Direct probe output

When this range is selected, the ThetaProbe voltage output is displayed directly. The working range is 0 -1.2VDC. This is greater than the output signal range of ThetaProbe, and so no 'overrange' limit is imposed. This range is useful if working with media other than soil or if performing a soil-specific calibration.

Note that ThetaMeter CANNOT be adjusted for specific soils, but CAN be used to perform a soil-specific calibration. Further details on how to do this can be found in the ThetaProbe, type ML1, User Manual. The conversion chart produced for the specific medium can then be used to convert the probe output voltages displayed during use.

Connections

Connection to ThetaMeter is made via a 4 way DIN connector, mounted in the top of the unit. A mating connector is included for you to attach to your ThetaProbe. Attach the ThetaProbe leads to the connector as shown. Connect the screen braid of the cable to the metalwork of the connector.



Operation

First select the measurement range. Then just press the READ button. Its as simple as that.

Battery type and life

A single 9V battery provides power to both the ThetaProbe and ThetaMeter. An alkaline type is recommended, such as a Duracell MN1604, for long life. Battery power is being consumed only while the READ button is pressed and a useable reading should be achieved within 2-5 seconds. When used like this, the battery life is approximately 1000 readings.

When the battery is exhausted, a battery symbol continually appears on the LCD when the READ button is pressed. When this occurs, the battery should be replaced. It is accessible by sliding open the battery compartment lid on the underside of the ThetaMeter case.

Field use considerations

ThetaMeter is designed to provide instantaneous, portable, moisture measurement. It has similar protection against the environment as you would find in a hand-held calculator. Do not expose it to rain or leave it outside.

Carry the unit with you. The connector interface between ThetaProbe and ThetaMeter enables you to visit probes in permanently installed situations, taking readings while you are there. ThetaProbe is waterproof and can be left in exposed conditions or buried, however the connector supplied to mate it to ThetaMeter CANNOT. Connectors fitted to probes left in exposed situations should be protected against water ingress when not in use. This can be done by covering the connector and a few centimeters of the cable with a small plastic bag and sealing its neck to the cable using an elastic band.

Electromagnetic Compatibility (EMC)

When used with a ThetaProbe which has been installed as described in its User Manual, ThetaMeter conforms to the appropriate standards for compatibility under the European Union EMC Directive 89/336/EEC.

If not used in this manner, some interference may be experienced on nearby radio equipment while the READ button is pressed. Under most conditions, moving the radio equipment further from ThetaProbe (typically 1-2 metres) will stop the interference.

Accuracy

As ThetaMeter is designed for use with ThetaProbe, its accuracy, or system error contribution, is best expressed as an addition to the accuracy of the probe. The probe accuracy is dependent on your chosen method of probe calibration and is fully described in the ThetaProbe, type ML1, User Manual. The maximum addition you could experience when using ThetaMeter is given in the Technical Specification section of this document, but in practice, it will probably be much less.

Technical specification

Type No.	HH1
Display type and function	Integral 3+1 digit LCD indicating: Voltage output from ThetaProbe soil moisture sensor Volumetric soil moisture content , $m^3 .m^{-3}$ Low battery condition
Working range	0 to 0.46 $m^3.m^{-3}$ soil moisture using 'mineral soils' range 0 to 0.54 $m^3.m^{-3}$ soil moisture using 'organic soils' range 0 to 1.2V using voltage range
Overrange indication	'1' displayed on soil moisture ranges when large errors would result
System error contribution	less than +/- 0.006$m^3 .m^{-3}$ over working range
Battery life	Approximately 1000 readings, based on 3 sec. duty cycle
Case size	160 x 85 x 30 mm
Weight	220 gms approx.

Guarantee

Our Conditions of Sale ref: COND/91/11 set out Delta-T's legal obligations on these matters. For your information the following paragraphs summarize Delta-T's position but reference should always be made to our Conditions of Sale which prevail over the following explanation.

Instruments manufactured by Delta-T are guaranteed for one year against defects in manufacture or materials used. The guarantee does not cover damage through misuse or inexpert servicing, or other circumstances beyond our control.

For the U.K. this means that no charges are made for labour, materials or return carriage for guarantee repairs.

For other countries, the guarantee covers free exchange of faulty parts during the guarantee period.

Alternatively, if the equipment is returned to us for guarantee repair, we make no charge for labour or materials but we do charge for carriage and U.K. customs clearance.

We strongly prefer to have such repairs discussed with us first, and if we agree that the equipment does need to be returned, we may at our discretion waive these charges.

Service and spares

Spare parts for our own instruments can be supplied from our works.

We recognize that some users of our instruments may not have easy access to technically specialized backup and, should it prove necessary, instruments may be returned to our works for servicing.

Users in countries which have a Delta-T Agent or Technical Representative should contact them in the first instance.

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Delta-T Devices Ltd.
128 Low Road, Burwell,
Cambridge CB5 0EJ, England.
Tel: 01638 742922, Fax: 01638 743155