



SOIL MOISTURE METERS

You will return to the contents of P1 SOIL by clicking the pictogram

P1.64

Basic soil moisture meters

Soil moisture content is one of the factors determining optimal plant growth and crop production. The soil moisture content also plays an important part in environmental research for acidification and pollution.

14.26 Thetaprobe soil moisture measuring system

The Thetaprobe soil moisture sensor measures the soil moisture volume percentage by applying the Frequency Domain technique.

The Thetaprobe measures the soil moisture volume percentage by measuring the changes in the dielectric constant. The changes are converted into a millivolt signal proportional to the soil moisture content.

The sensor consists of a sturdy, watertight synthetic housing which contains the electronics. The housing is fitted with 4 stainless steel measuring probes at one end that can simply be pushed into the soil (or other material).

accuracy of 5% with standard calibration and only 2% with soil specific calibration. The sensor has an output signal of 0-1 Vdc.

The sensor is supplied standard with a 5-metre cable and plug for connection to the soil moisture meter or with wire for connection to a datalogger.

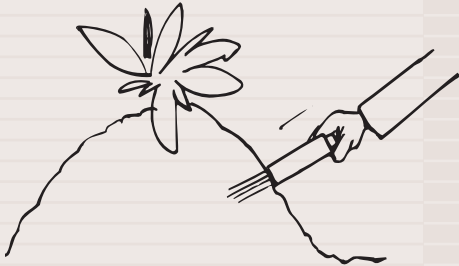
The measurement values are shown on the display of the soil moisture meter and can be stored in the memory (including time and sensor location). These data can be read on a PC.

The meter comes with built-in conversion characteristics for mineral and organic soils. The software allows a further 5 soil specific calibrations to be introduced.

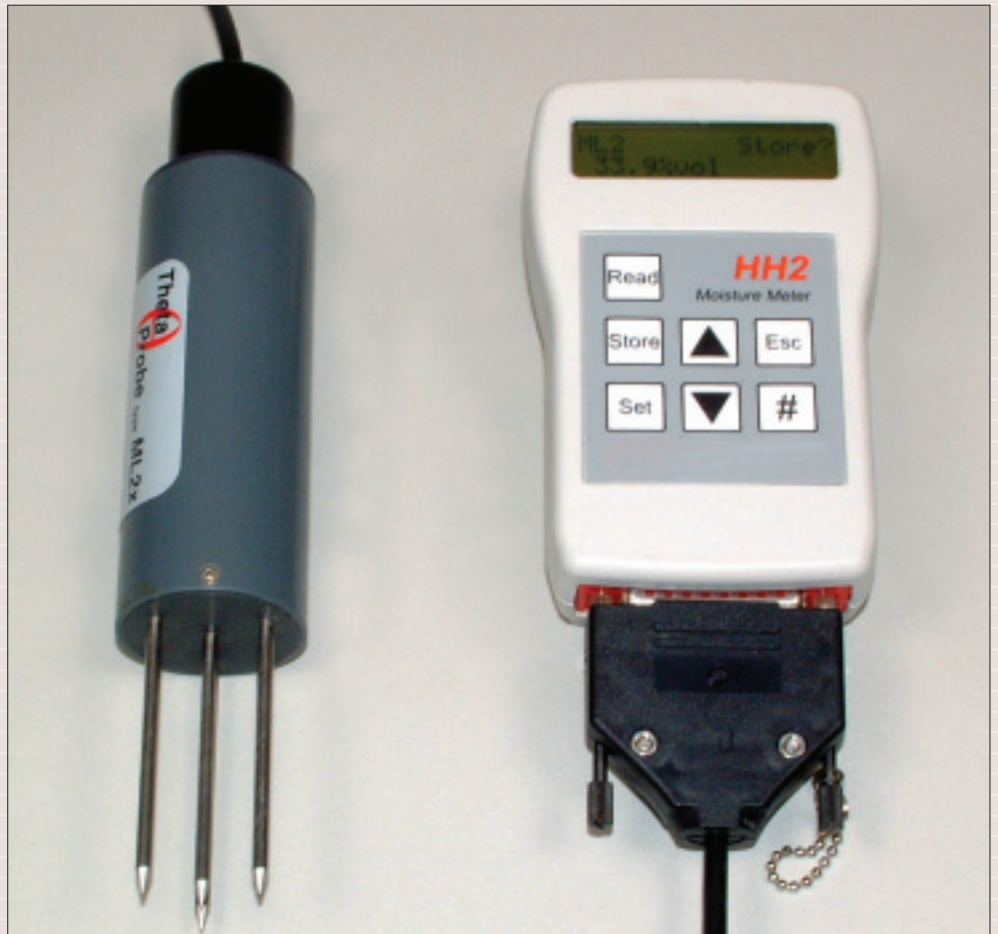
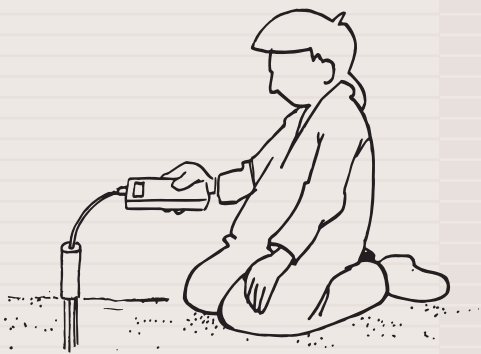
If the moisture content is measured of other materials the meter will give an output signal in millivolts.

If a series of soil moisture measurements is required the soil moisture sensors can be connected easily to a datalogger (art. no.: 14.26.04).

The soil moisture sensor Thetaprobe is pressed into the soil for a surface measurement.



Using the soil moisture meter the sensor is read-out. Data are stored in the meter's memory.



BENEFITS

14.26 Thetaprobe system

- Versatile instrument, measures and stores data
- Push probe, read and store
- Can be extended with profile probe
- Can be extended with conductivity sensor
- Two standard calibrations, three user curves
- A fair accuracy for a fair price
- Own soil data allow direct irrigation advice

Soil moisture meter with soil moisture sensor Thetaprobe

SOIL MOISTURE METERS

Advantages

- Easy to use.
- Accurate measurements.
- Direct readings of the volumetric soil moisture content in the field by using the soil moisture meter.
- Data stored in handheld meter and able to be read on a PC.
- Can be connected to a datalogger.
- Cheaper than TDR or neutron probe systems.
- Applicable in areas with soils with high salt concentrations.
- Fast response time.
- Maintenance free.
- The compact sensors can be placed under any angle.

The Thetaprobe is also available in the form of a profile probe for use in thin-walled tubes that are installed in the soil. The profile probe is fitted with several measuring elements (4 elements with a measuring range of 40 cm, 6 elements with a measuring range of 100 cm) so that the soil moisture content can be measured at different depths within a vertical soil profile.



Datalogger with Thetaprobe



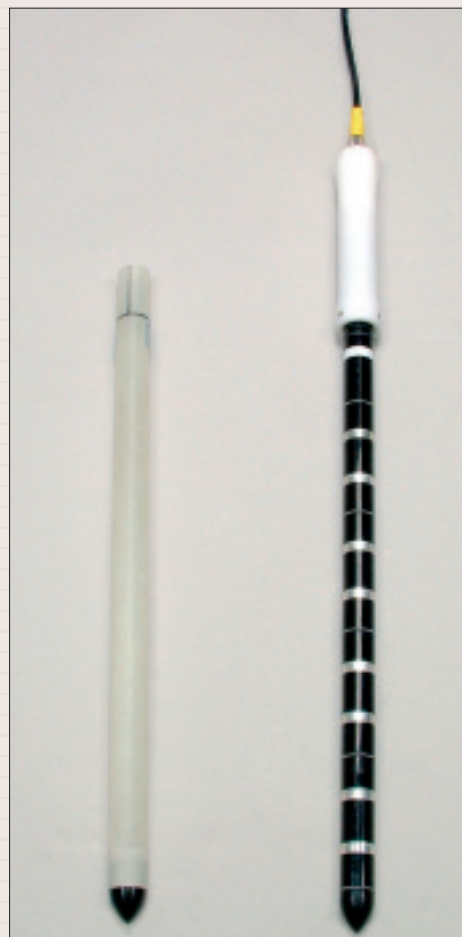
Auger kit for profile probe

The probe measures with an accuracy of $\pm 3\%$ in a thin-walled tube and has a measuring volume of ± 1.5 litres at each profile depth. The profile probe can be used as a portable system by using the soil moisture meter or as a fixed system by using a profile probe in combination with a datalogger. The thin-walled tubes can be placed in the soil with the use of a special auger kit.

Datalogger for Thetaprobe soil moisture sensors

This datalogger with 6 analogue channels is a dedicated datalogger optimised for use with soil moisture sensors. It can be used with combinations of Thetaprobes and also accepts rain gauge and soil temperature probe inputs. Up to 16000 readings can be stored in the memory.

- Ideal for Thetaprobes
- Complete solution with IP67 weather-proof case and battery power
- Pocket PC interface for data collection and configuration

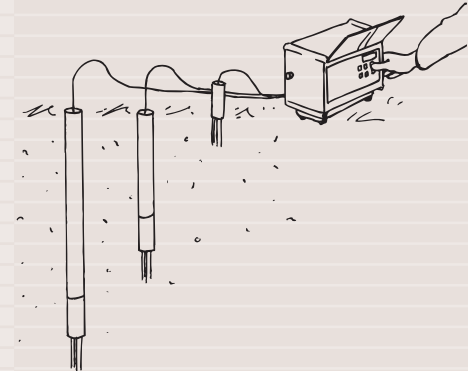


Profile probe and thin-walled tube



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Various sensors are connected to a datalogger.



The profile probe is installed in a thin walled tube and read-out with the soil moisture meter.



BENEFITS

14.26 Thetaprobe system

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- Push probe, read and store
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The soil moisture sensor is placed in a plant pot and read-out with the hand meter.



BENEFITS

14.24 Soil moisture sensor SM200

- Scientific accuracy
- Excellent temperature stability
- Can be used in saline soils
- Minimal soil disturbance
- Easy to use

The soil moisture content is read-out on the soil moisture meter.



BENEFITS

14.22 Gypsum block system

- Cheapest soil moisture indicator
- Fair for schools or indicative measurements
- Very large measuring range

SOIL MOISTURE METERS

14.24 Soil moisture measuring system with SM200 sensor

When it comes to accurate, affordable soil moisture measurement, the new soil moisture sensor SM200 is in a class of its own. Achieving +/- 3% accuracy (with soil specific calibration), this soil moisture sensor can handle both research and irrigation applications. Measuring range of the sensor is 0-50 %vol.

In the past, choosing a low cost soil moisture sensor meant sacrificing stability and accuracy. With the soil moisture sensor SM200 you can have excellent temperature stability, low salinity sensitivity and accurate volumetric water content data. This soil moisture sensor offers an excellent alternative when costs have to be kept down.

The soil moisture meter supplied with the Thetaprobe system can also be used for measurements with the SM200 sensor. The sensor can also be connected to a datalogger for continuous monitoring applications

14.22 Soil moisture measuring system with gypsum blocks

The soil moisture meter can be used in combination with soil moisture blocks (relatively cheap gypsum blocks). The soil moisture content is determined by measuring the resistance between two electrodes inside the gypsum blocks. The condition for reliable measurements is the optimal contact between sensor and soil.

The gypsum blocks are permanently buried in the soil at the desired depth. Once buried there the blocks have a life of 3 to 5 years (depending on the type of soil).

The meter is practical and is constructed in sturdy synthetic material. It has a measuring range of 0 - 100% for 3-100 kPa. The meter is applied in particular in places where a tensiometer cannot be used (dry soils). It is a system that provides an indication as to when irrigation is required. To achieve a series of soil moisture measurements the sensors can be connected to a datalogger.



Soil moisture sensor SM200



Soil moisture meter with gypsum blocks

SOIL MOISTURE METERS

14.27 Soil moisture measuring system Watermark

Soil moisture sensors that measure the moisture tension in the soil are read out with the soil moisture meter Watermark. The measuring principle is similar to that of the gypsum block system. The special sensors however do not dissolve in the soil and have a more consistent distribution of pores so that more accurate measurements are possible. The soil moisture sensors, which have a measuring range of 0-200 kPa (0 - 200 cbar), can be used individually or in combination with a PVC tube (in various lengths) for measuring the moisture tension. The condition for reliable measurements is the optimal contact between sensor and soil. Using the special auger the holes are pre-drilled so that the soil moisture sensors can be placed at various depths. The sensors are buried permanently and have an average life of 3-5 years.

By using a soil temperature meter the temperature measured can be set in the soil moisture meter allowing for temperature correction. The electrical resi-

stance is converted by the soil moisture meter into moisture tension in kPa. The soil moisture sensors can be used as a replacement for tensiometers in most agricultural and landscape irrigation environments.

If a series of soil moisture measurements is required the soil moisture sensors can be connected easily to a datalogger.

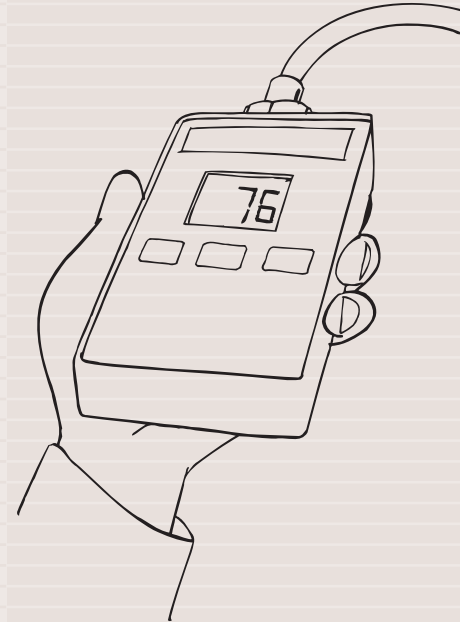
14.27.SA Watermark monitor. Set for automatic soil moisture data logging

The Watermark Monitor is a battery operated data logger capable of automatically taking and storing readings from the Watermark sensors at a configurable interval. Readings can be viewed in the field, or collected data can be downloaded by a PC or hand held device and displayed graphically for analysis. Up to 7 sensors can be recorded, including optional temperature sensors and pressure ON / OFF switches for recording irrigation events. Reading intervals are configurable from once a minute to once every 24 hours. Complete set with 7 sensors, one temperature sensor and software.



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The soil moisture meter Watermark shows the measuring result in kPa.



Soil moisture meter Watermark



Soil moisture sensor Watermark



Watermark monitor

BENEFITS

14.27 Watermark system

- Cheap but serious measuring instrument
- Results directly expressed in soil suction
- Range allows measuring trees and dry crops
- Therefore ideal for irrigation advice
- No field maintenance of probes
- Stable long lasting salinity insensitive probes
- Easy read-out with simple cheap instrument
- Temperature can be corrected

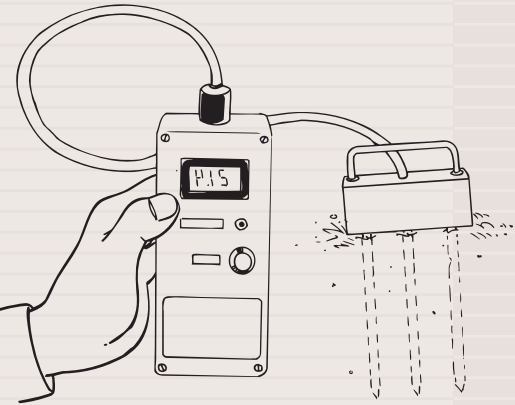


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Reading the meter during a soil moisture determination on the surface.



SOIL MOISTURE METERS

TDR soil moisture meters

The moisture content determines different characteristics of various materials (energy balance, condition, composition). The moisture present in the soil particles determines the transport and storage of solid and dissolved nutrients and pollutants.

Various techniques allow the determination of the moisture content:

- ❑ Drying and weighing of samples: very time consuming work and cost intensive and above all destructive.
- ❑ The neutron method: expensive equipment, severe restrictions imposed by radiation law.
- ❑ Conductivity method: results less reliable due to dependence on type of material and salinity.

A very accurate method that can be easily applied to determine the moisture content is the Time Domain Reflectometry (TDR). The TDR-method allows for accurate measuring results that are immediately available (non-destructive). The principle of the TDR-technique is based on measuring the propagation time of an electromagnetic pulse along measuring pins in the

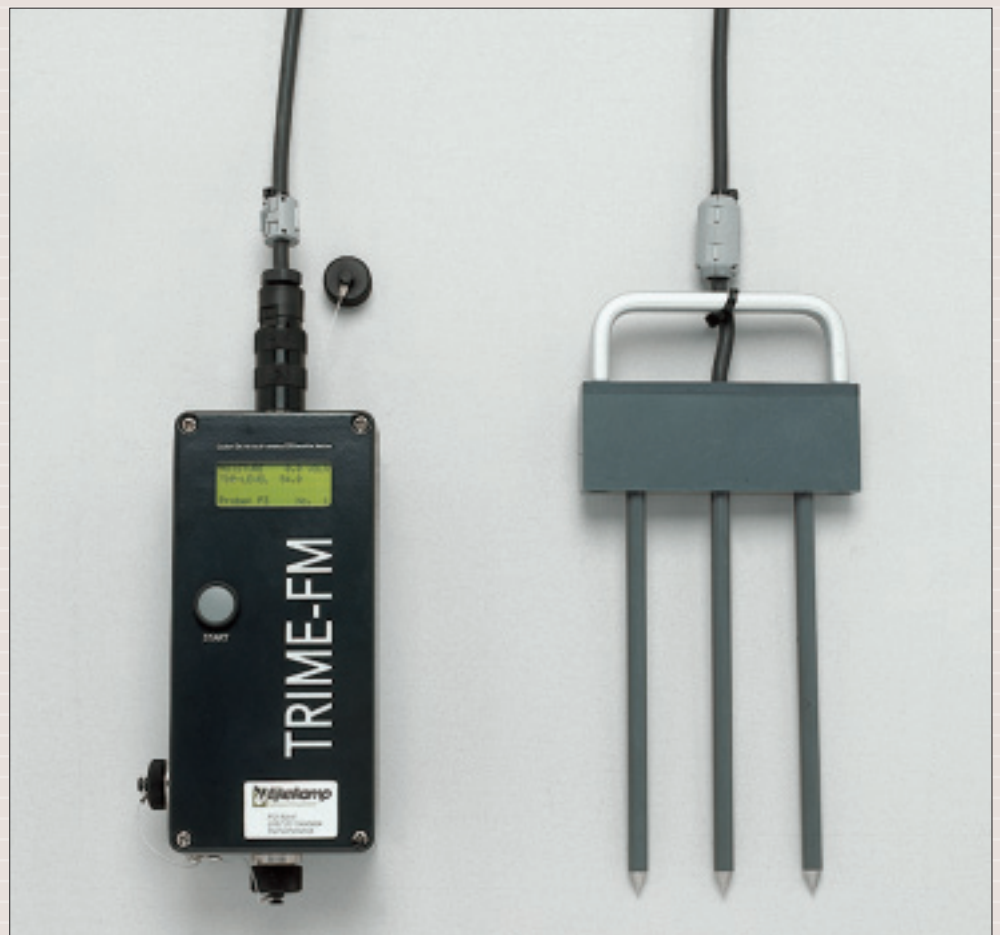
sample. The propagation time depends on the humidity content of the medium to be measured.

14.62 Trime FM-3 soil moisture measuring system

The Trime-system is a specially designed TDR-technique for measuring the moisture content in various materials.

The Trime FM-3 system consists of a read-out unit, various three-pin probes and a unique tube probe. The probes have a measuring range of 0 - 95 volume percentage moisture.

The compact, portable read-out unit is fitted in a robust IP65 housing with an LCD read-out screen. The display shows the measuring result, the TDR-level, the battery capacity and the status. The meter has a very low power consumption; using rechargeable batteries approximately 300 measurements can be executed. The meter has been fitted with an analog output 0 - 1 V and a standard R232/V24 interface and therefore can be linked to a PC for programming, calibrating or reading and processing the measured values.



Trime FM-3 soil moisture meter with three-pin probe

SOIL MOISTURE METERS

All probes have PVC coated rods to obtain best measuring results even in saline materials (bulk soil electrical conductivity up to 2 dS/m).

For very high salinities special high-conductivity-probes (C-version) are available.

The three-pin probes P3S and P3, length measuring pens respectively 110 and 160 mm, are intended for surface measurements.

For measurements in bore holes the P3Z three-pin probe is used. This probe is pushed into the bottom of the bore hole using an adapter.

The tube probe with a measuring range of 0 - 60 volume percent moisture is used for measurements in thin-walled tubes with a length of up to 2 meter.

After installation of the thin-walled tube with cutting shoe in the soil, the tube is sealed watertight using a rubber stopper. The probe is connected to the FM-3 meter and lowered into the tube. Measurements can be executed at any desired depth in the tube. It is possible to execute measurements on several locations and different depths with only one tube probe.

The method using the tube probe can be applied instead of the expensive neutron method.

This method also is non-destructive, but suffers the disadvantages of high costs, severe restrictions imposed by radiation law and problems with the radiation released.

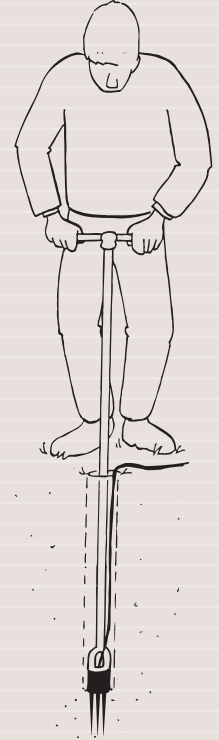
Using the special calibrating set the various probes can be calibrated with the meter. It is also possible to execute a special calibration for deviating materials or types of soil.

The different probes can, using modules, optionally be used in a network.

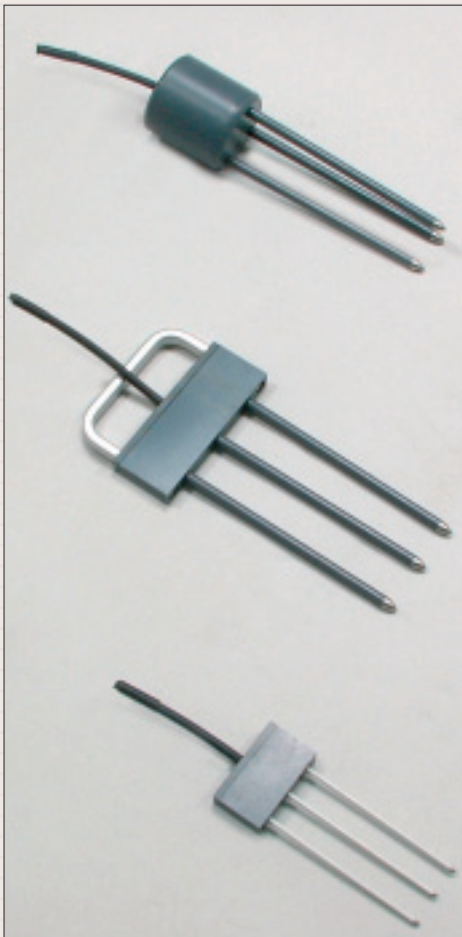
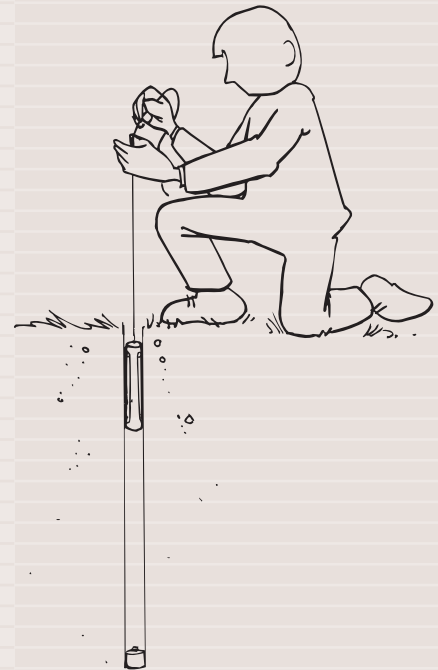


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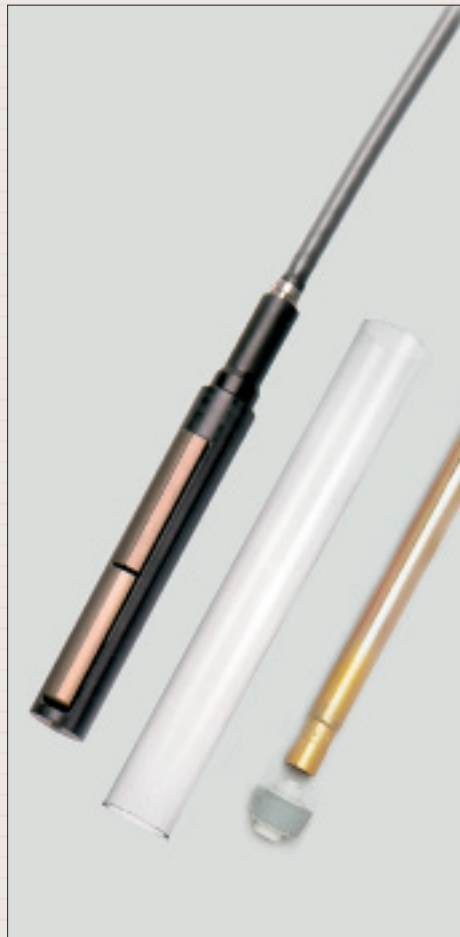
After drilling a hole the probe is pushed into the soil.



The tube probe is lowered into the thin-walled tube.



Three-pin probes

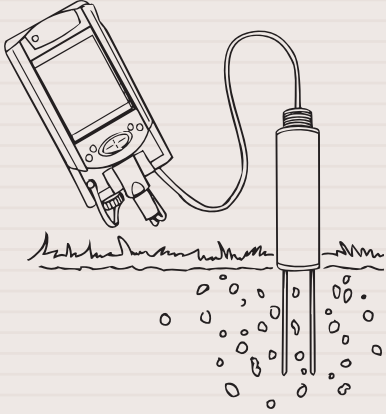


Tube probe, thin-walled tube, stopper



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Data are read-out using the Trime Data Pilot.



SOIL MOISTURE METERS

14.62.50 Trime Data Pilot system

For users wanting to exploit modern PC technology to the full, we can supply the optimum means for measurement data management on location, right at the point of measurement, using a Palm PC with Windows-CE.

The Trime FM meter with its RS 232/V24 interface provide the means for direct extraction of recorded moisture readings with the Trime Data Pilot and storing them in a file incorporating site specific data.

Verbal notes, too, can be recorded directly on location.

It is also possible to connect intelligent probes with its own RS 232/V24 interface directly to the Trime Data Pilot.

Using Windows-CE, the recorded data of course can be analysed on any PC with MS-Excel.

The USB is the standard interface for the transfer of data.

A protective case ensures that the Trime Data Pilot works reliable even in damp and wet surroundings.

BENEFITS

14.62.50 Trime Data Pilot system

- Attractive graphic user-interface
- Creation of up to 999 measurements locations files
- Date can be imported to Exel
- Connectable to Trime FM and stand-alone probes



Trime Data Pilot system connected to intelligent (stand alone) probe

SOIL MOISTURE METERS

14.63 Trase soil moisture measuring system

The Trase system is a complete (modular) measuring instrument for measuring and storing moisture data applying the TDR-technique. The open system allows for different cards to be built-in and makes the instrument suitable to meet future requirements.

The instrument can be supplied in two different designs, with or without built-in multiplexer control card. The meter features a measuring range of 0 - 100% volume percent moisture and is supplied inclusive wave guides, connector, battery and charging equipment.

The meter is housed in a strong, aluminium, waterproof housing and is tip-key controlled. On the large, high-resolution screen it is possible to not only show the measuring values, but also the graphic image of the wave-shape during the measurements. The wave-shape yields all kinds of information regarding the qualities of the material in which the measuring takes place. The instrument operates with various screens (setup, autolog, help, etc.) in order to offer user-friendly control.

The meter has a memory capacity for 200 graphs or 6300 measurements. The recharge-able battery is suitable for approx. 750 manual measurements or 1500 automatic measurements. The instrument is fitted with an RS232-gate for connection to a PC, printer or modem, a connection for recharging the battery or connection to an external power source, a multiplexer connection and a BNC-plug. For different applications different wave guides are available. The standard multiplexer-protection box offers weather-resistant housing, allowing several multiplexer cards to be built-in for the connection of several probes (a maximum of 76 channels; larger boxes are optional available). The multiplexer-cards are self-configuring which makes them easy to fit in the system.

Also available is a **MiniTrase** kit (14.63.SA), which retains all of the superior capabilities of the Trase system, but also features significantly reduced weight, size and cost.

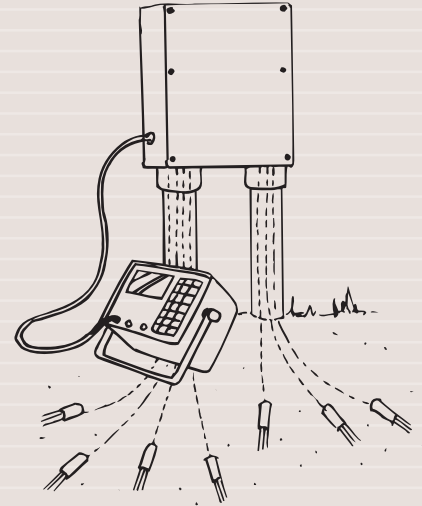


Trase soil moisture measuring system



P1.64

Reading-out several probes connected in the multiplexer-box.



The MiniTrase can be easily transported in a backpack.



BENEFITS

14.63 Trase system

- Shown wave allows full interpretation of value
- Soil type can be derived from wave shape
- Many connection possibilities



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PARTS LIST

Art.no.	Description	Qty. in set	Art.no.	Description	Qty. in set
Soil moisture meters (P1.64)				Thetaprobe soil moisture sensor, soil moisture meter and operating instructions Sensor (SM 200) with cable for connection to hand meter or to data logger.	
	Depending on the aim and application of the soil moisture measurement a choice can be made out of the following systems:		14.24.06	Soil moisture sensor SM200. Measuring range 0-50% vol., accuracy +/- 3% with soil specific calibration. With 2 measuring pins, length 60 mm. Output signal 0-1 Vdc. Excl. cable.	
	- Measuring system with gypsum blocks. Indicative (0% to 100%, cheap, slow reaction. Measuring range 3 - 100 kPa		14.24.10.14	Connecting cable between soil moisture sensor SM200 and soil moisture meter (14.26.02). Cable length 1.5 m.	
	- Measuring system SM 200 Professional applied research market (3% accuracy)		14.24.10.16	Connecting cable between soil moisture sensor SM200 and data logger. Cable length 5 m (without connector).	
	- Measuring system Thetaprobe Professional, scientific market accurate (5% or 2% with soil specific calibration)			Accessories for SM 200 sensor	
	- Measuring system with granular matrix sensors. Professional market, large measuring range (1-200 kPa) (reading soil suction in kPa).		14.24.11.02	Extension tube for soil moisture sensor SM200, length 100 cm.	
14.22	Soil moisture measuring system with gypsum blocks.		14.24.12.10	Extension cable for soil moisture sensor SM200, cable length 10 m.	
	Hand read-out unit:			Soil auger to install the SM 200 sensor at greater depths	
14.22	Soil moisture meter to read out gypsum soil moisture blocks, measuring range 0-100%, readability 1%, accuracy 2%, digital read-out, complete with battery in carrying case		01.02.02.07.B	Edelman auger, bottom part, comb.type, bay., Ø 7 cm	
	Sensor (gypsum blocks):		01.10.01.B	Handle, normal, 60 cm, bay. (incl. coupling sleeve)	
14.22.05	Soil moisture block, gypsum, cable length 3.5 m, set of 5 pieces		01.10.07.B	Extension rod, 100 cm (incl. coupling sleeve) bay.	
	Soil auger for installation of gypsum blocks in the soil. The sand is used to obtain optimal contact between gypsum blocks and surrounding soil.			Datalogger (max. 6 probes)	
01.02.02.07.B	Edelman auger, bottom part, comb.type, bay., Ø 7 cm		14.26.04	Datalogger (Delta-T DL6) suitable for soil moisture sensors (Thetaprobe, profile probe and SM200 sensor). 6 Analogue channels plus temperature and counter inputs. Complete with data transmission cable and software.	
01.10.01.B	Handle, normal, 60 cm, bay. (incl. coupling sleeve)		14.26	Soil moisture measuring system with Thetaprobe sensor.	
01.10.07.B	Extension rod, 100 cm (incl. coupling sleeve) bay.			Hand read-out unit:	
08.01.09	Container synthetic sand, particle size about 73 micron, contents 12.5 kg		14.26.02	Soil moisture meter to read out the Thetaprobe, the W.E.T. sensor, the profile probe and the SM200 soil moisture sensor. With 25-way D socket. Incl. operating instructions, PC software and RS 232 cable.	
14.24	Soil moisture measuring system with SM 200 sensor.		14.26.06.90	Synthetic protection case for Thetaprobe soil moisture sensor, soil moisture meter and operating instructions	
	Hand read-out unit			Sensors. Thetaprobes with connector (for connection to hand read-out unit) or with wire end (for connection to	
14.26.02	Soil moisture meter to read out the Thetaprobe, the W.E.T. sensor, the profile probe and the SM200 soil moisture sensor. With 25-way D socket. Incl. operating instructions, PC software and RS 232 cable.				
14.26.06.90	Synthetic protection case for				



Art.no.	Description	Qty. in set	Art.no.	Description	Qty. in set
	dataloggers).			with soil specific calibration. Output 0-1.0 Vdc. Max. measuring depth 100 cm. Excl. cable.	
14.26.06.01	Soil moisture sensor Theta- probe with 25-way D connector. Measuring range 5-55% vol. Accuracy: +/- 5% with standard calibration, +/- 2% with soil specific calibration. With 4 pins, length 60 mm, Ø 3.2 mm. Output signal 0-1 Vdc. Cable length 5 m		14.26.82.14	Connecting cable between profile probe and hand meter. IP 68 M12 connector to 25-way D connector. Cable length 1.5 m	
14.26.06.02	Soil moisture sensor Theta-probe without connector. Measuring range 5-55% vol. Accuracy: +/- 5% with standard calibration, +/- 2% with soil specific calibration. With 4 pins, length 60 mm, Ø 3.2 mm. Output signal 0-1 Vdc. Cable length 5 m		14.26.82.16	Connecting cable between profile probe and data logger. IP 68 M12 connector to bare wire (without connector). Cable length 5 m.	
14.26.06.03	Soil moisture sensor Theta-probe with dividable cable (for use with extension tube). Measuring range 5-55% vol. Accuracy +/-5% with standard calibr., +/-2% with soil spec. calibr. With 4 pins, length 60 mm, Ø 3.2 mm. Output signal 0-1 Vdc. Cable length 5 m.		14.26.85.01	Thin-wall fibre-glass access tube for profile probe. Length 554 mm, Ø 28 mm, incl. cap. Suitable for 4 rings probe	
	Accessories for Thetaprobe		14.26.85.02	Thin-wall fibre-glass access tube for profile probe. Length 1154 mm, Ø 28 mm, incl. cap. Suitable for 6 rings probe	
14.26.05.01	Spare measuring pin for soil moisture sensor (Thetaprobe). Set of 12 pieces		14.26.90	Auger kit for the installation of the thin-wall fibre-glass access tubes for the Thetaprobe profile probe. Drilling depth 125 cm.	
14.26.05.03	Thetaprobe hand-operated adjusting block for installation in hard soils. Complete with 6 metal pins.		**14.01.01	Single gouge auger with detachable handle, Ø 24 mm total length 130 cm, operational length 50 cm	1
14.26.11.01	Extension tube for soil moisture sensor Thetaprobe, length 50 cm		**14.26.90.01	Spiral auger, single, length 125 cm, Ø 25 mm. With special auger point with Ø 22 mm. With detachable grip	1
14.26.11.02	Extension tube for soil moisture sensor Thetaprobe, length 100 cm		**04.05.01.16	Bent spatula, breadth 16 mm	1
	Soil auger to install the Thetaprobe at greater depths:		**01.10.15	Push-/pull handle, Ø 25.4 mm	1
01.02.02.07.B	Edelman auger, bottom part, comb.type, bay, Ø 7 cm		**14.26.90.03	Brush with rod, Ø 30 mm, length 120 cm	1
01.10.01.B	Handle, normal, 60 cm, bay. (incl. coupling sleeve)		**14.26.90.05	Beating head for access tube for Thetaprobe profile probe	1
01.10.07.B	Extension rod, 100 cm (incl. coupling sleeve) bay.		**14.26.90.07	Hammer with synthetic heads, Ø 50 mm	1
	The Thetaprobe is also supplied as a profile probe to be used in thin-walled fibreglass acces tubes that are installed in the soil.		**01.14	Carrying bag for field equipment, with two shoulder straps (backpack model), (inside) Ø 17x150 cm,	1
14.26.82.04	Soil moisture profile probe with 4 sensor rings. Full measuring range 0-100 vol. % soil moisture. Accuracy (within 0-40 vol.%) 6% with standard calibration and 4% with soil specific calibration. Output 0-1.0 Vdc. Max. measuring depth 40 cm. Excl. cable.			Datalogger (max. 6 probes)	
14.26.82.06	Soil moisture profile probe with 6 sensor rings. Full measuring range 0-100 vol. % soil moisture. Accuracy (with-in 0-40 vol. %) 6% with standard calibration and 4%		14.26.04	Datalogger (Delta-T DL6) suitable for soil moisture sensors (Thetaprobe, profile probe and SM200 sensor). 6 Analogue channels plus temperature and counter inputs. Complete with data transmission cable and software.	
			14.27	Soil moisture measuring system with Watermark sensor	
				Hand read-out unit:	
			14.27.01	Soil moisture meter to read out Watermark soil moisture sensor. With temperature correction. Digital read-out in kPa.	
				Sensor (Watermark) with cable or pvc tube for installation	



PARTS LIST

Art.no.	Description	Qty. in set	Art.no.	Description	Qty. in set
	on greater depths			chargeable batteries, battery charger and case. Supplied with analog output 0-1 V and standard RS232/V24 interface, with cables (excl. probes)	
14.27.05	Soil moisture sensor, granular matrix (Watermark), to measure soil moisture tension. Measuring range 0-200 kPa (=0-200 cbar). Length sensor 80 mm, Ø 22.4 mm. Cable length 1.5 m		14.60.16	CD-rom with WinMonitor software for Trime FM-2 and FM-3 soil moisture meters. To process and display measurements with an IBM compatible PC. Suitable for Windows 95/98/NT/ME/2000 and XP.	
14.27.07	Soil moisture sensor, granular matrix (Watermark), to measure soil moisture tension. Measuring range 0-200 kPa(= 0-200 cbar). Length sensor 80 mm, Ø 22.4 mm. With PVC tube, length 75 cm. Cable length 1.5 m.			Probes and accessories for surface measurements	
14.27.09	Soil moisture sensor, granular matrix (Watermark), to measure soil moisture tension. Measuring range 0-200 kPa (= 0-200 cbar). Length sensor 80 mm, Ø 22.4 mm. With PVC tube, length 120 cm. Cable length 1.5 m		14.62.21	Three-pin hand probe P3S for Trime FM-3 meter or ES-3 module, cable length 1.5 m. With waterproof plug IP 67, length of pins 110 mm, Ø of pins 3.5 mm, distance between pins 20 mm	
	Soil auger to install the sensor in the soil		14.62.22	Three-pin hand probe P3 for Trime FM-3 meter or ES-3 module, cable length 1.5 m. With waterproof plug IP 67, length of pins 160 mm, Ø of pins 8 mm, distance between pins 35 mm	
14.27.17	Spiral auger, single, length 125 cm, Ø 25 mm. With special auger point with Ø 22 mm to install soil moisture sensors (Watermark)		14.62.21.01	Spare measuring pin for P3S probe 14.62.21	
	Soil temperature sensor for compensation measurements		14.62.22.01	Spare measuring pin for P3 and P3Z probe 14.62.22 and 14.62.23	
14.27.15	Common soil temperature meter for soil moisture measurement system (Watermark). Temperature can be adjusted on soil moisture meter		14.62.22.02	Adjusting block (pvc) incl. metal pins to pre-drill for the three-pin hand probe	
	Datalogger with accessories (complete set). For automatic soil moisture data logging we supply a datalogger with sensors and accessories			Probe and accessories for deeper measurements (in the bottom of a borehole-borehole Ø minimal 7 cm):	
14.27.SA	Watermark monitor. Complete set for automatic logging of soil moisture data, consisting of datalogger, 7 Watermark sensor (5x with 6 m cable and 2x with 10 m cable), temperature sensor, software and RS232 communication cable. Incl. quick connectors and PVC installation pipe.		14.62.23	Three-pin hand probe P3Z, borehole design, for Trime FM-3 meter or ES-3 module, cable length 2.5 m, with waterproof plug IP 67, length of pins 160 mm, Ø of pins 8 mm, distance between pins 40 mm	
	In our product range two soil moisture measurement systems are included according to the TDR method: - TRIME FM-3 system - TRASE system		14.60.37.C	Adapter for connection of borehole probe (14.60.23 and 14.62.23) to extension rods, conical screwthread	
14.62	TRIME FM-3 soil moisture measuring system:		01.10.12.C	Extension rod, 100 cm, c.sc.	
	Hand read-out unit		01.10.10.01.C	Handle, normal, 60 cm, c.sc.	
14.62.01	Trime FM-3 soil moisture meter for tube probe and three-pin probes P3 and P3Z, aluminium housing IP65, LC display, re-		99.50.22	Spanner 20x22 mm	
				Probe and accessories for deeper measurements (to be used in synthetic tubes which are installed in the soil):	
			14.62.26	Tube probe for Trime FM-3 meter, for measurements in thin wall tubes up to 2 m length, cable length 2.5 m, measuring range 0 - 60 % of volumetric soil moisture. Suitable for measuring in materials with an electrical conductivity up to 4 mS	



Art.no.	Description	Qty. in set	Art.no.	Description	Qty. in set
14.62.33	Thin-wall tube for Trime tube probe (14.62.26), polycarbonate, design with cutting shoe and rubber closing stopper, Ø 44 x 42 mm, length 100 cm (with rubber bottom stopper)		14.62.51	Connection cable between Data Pilot and Trime FM meter.	
14.62.34	Thin-wall tube for Trime tube probe (14.62.26), polycarbonate, design with cutting shoe and rubber closing stopper, Ø 44x42 mm, length 200 cm (with rubber bottom stopper)			Stand-alone sensors for surface measurements and measurements in bottoms of bore holes (Ø min. 7 cm)	
14.62.35.C	Adaptor for securing the rubber stopper at the bottom of the tube (to make a water proof closing), conical screw thread connection		14.62.53	Two pin intelligent sensor EZ for Data Pilot. Cable length 1.5 m, length of pins 160 mm, distance between pins 40 mm, with RS232/V24 interface. For soils with bulk electrical conductivity of up to 2 dS/m.	
01.02.02.45.C	Edelman auger, bottom part, comb. type, c.sc., Ø 45 mm		14.62.54	Two pin intelligent sensor EZC for Data Pilot. Cable length 1.5 m, length of pins 160 mm, distance between pins 40 mm, with RS232/V24 interface. For soils with bulk electrical conductivity of up to 8 dS/m.	
01.10.12.C	Extension rod, 100 cm, c.sc.			Spares and accessories	
01.10.10.01.C	Handle, normal, 60 cm, c.sc.		14.62.58.01	Extension tube for EZ/EZC sensor, length 50 cm.	
99.50.22	Spanner 20x22 mm		14.62.58.02	Extension tube for EZ/EZC sensor, length 100 cm.	
	Calibration of TRIME soil moisture meter:				
14.60.40	Calibration set for basic calibrations of Trime soil moisture meters. Complete standard set, incl. 2 calibration containers, glass beads, calibration plug and software				
**14.60.40.01	Calibration container, pvc, volume 8.5 liter, with lid, incl. adapter for calibration of tube probes, suitable for polycarbonate tube	2	14.62.59	Extension cable for EZ/EZC sensor, length 150 cm.	
**14.60.40.03	Glass beads for calibration container, Ø approx. 0.5 mm, bag at 22 kg	2	14.62.53.01	Spare pin for EZ sensor 14.62.53	
**14.60.40.04	Calibration plug for Trime FM soil moisture meters	1	14.62.54.01	Spare pin for EZC sensor 14.62.54	
**14.60.40.06	CD-rom with calibration software for Trime soil moisture meters, incl. operating instructions. Suitable for Windows 95/98/NT/ME/2000 and XP.	1		Stand alone sensor for measurements in synthetic tubes which are installed in the soil:	
	Optional software for calibration set:		14.62.56	Intelligent tube probe IPH for Data Pilot. For measurements in thin wall tubes up to 2 m length. With RS232/V24 interface. Cable length 2.5 m.	
14.60.40.05	Calibration software SM-CAL for Trime soil moisture meters, incl. operating instructions.				
	For users who want to use modern PC technology we supply the TRIME Data Pilot with palm PC under Window - CE. It can be used as an extension of the FM meter, or with stand-alone sensors		14.62.33	Thin-wall tube for Trime tube probe (14.62.26), polycarbonate, design with cutting shoe and rubber closing stopper, Ø 44x42 mm, length 100 cm (with rubber bottom stopper)	
			14.62.34	Thin-wall tube for Trime tube probe (14.62.26), polycarbonate, design with cutting shoe and rubber closing stopper, Ø 44x42 mm, length 200 cm (with rubber bottom stopper)	
			14.62.35.C	Adaptor for securing the rubber stopper at the bottom of the tube (to make a water proof closing), conical screw thread connection	
14.62.50	Trime Data Pilot set. Complete set consisting of Data Pilot base module, HP IPAC Palm PC, software, battery charger and protective pouch. Complete in carrying case.		01.02.02.45.C	Edelman auger, bottom part, comb. type, c.sc., Ø 45 mm	
	Accessories for connection to TRIME FM meter.		01.10.12.C	Extension rod, 100 cm, c.sc.	
			01.10.10.01.C	Handle, normal, 60 cm, c.sc.	
			99.50.22	Spanner 20 x 22 mm	



PARTS LIST

Art.no.	Description	Qty. in set	Art.no.	Description	Qty. in set
14.63	TRASE soil moisture measuring system				
	Standard system:				
14.63.01	Trase time domain reflectometer for soil moisture measurements, range 0-100%, accuracy 2%, supplied inclusive wave guides (length 15 cm), connector for guides, battery 6 AH and battery charger 220V-50Hz				
	Comprehensive system:				
14.63.02	Trase time domain reflectometer for soil moisture measurements with built-in multiplexer control card, range 0-100%, accuracy 2%, supplied inclusive wave guides (length 15 cm), connector for guides, battery 6 AH and battery charger 220V-50Hz				
	Accessories for comprehensive system:				
14.63.05	Enclosure for 5 multiplexer cards, for maximal 76 channels				
14.63.07	Multiplexer card (16 channels)				
	General accessories for TRASE systems:				
14.63.11	Buriable waveguide, length of waveguides 20 cm, cable length 2 m				
14.63.15	Buriable waveguide, length of waveguides 20 cm, cable length 2 m. Coated design for soils with high electrical conductivity > 3.5 mS				
14.63.20	Extension cable for connection between Trase waveguides and Trase soil moisture meter or multiplexer, cable length 10 m				
14.63.22	Extension cable for connection between Trase waveguides and Trase soil moisture meter or multiplexer, cable length 20 m				
14.63.24	Extension cable for connection between Trase waveguides and Trase soil moisture meter or multiplexer, cable length 30 m				
14.63.26	Extension cable for connection between Trase waveguides and Trase soil moisture meter or multiplexer, cable length 40 m				
	MiniTrase Kit:				
14.63.SA	Minitrase TDR soil moisture meter, range 0-100%, accuracy 2%. Compl. kit incl. meter with multiplexer card, standard wave guide connector, Palm IIIc terminal, backpack, battery, cables, chargers and software to use and download data to a PC.				