

The PR2 Profile Probe provides easy and accurate soil moisture profiles.

- Soil moisture content - not just trends
- Low salinity and temperature sensitivity
- Portable meter option for multi-site measurement
- GP2 and DL6 Logger options for continuous monitoring



Dual purpose

The unique PR2 Profile Probe can be installed for continuous data logging and can also be used for multi-site, portable measurements with an HH2 hand-held readout unit.

The PR2 uses patented* sensing technology, making it possible to measure soil moisture content in a range of soil types and across a wide range of nutrient levels, including saline soil conditions.

Applications

- Soil moisture profiles
- Agriculture
- Hydrology
- Civil engineering

Installation and connection

Users can choose between the PR2/4, measuring at 4 depths down to 40 cm, or the PR2/6, measuring at 6 depths down to 100 cm. The nominal sensing depths are 10, 20, 30, 40, 60 and 100 cm.

Profile probes are used in access tubes inserted into augered holes in the soil. Access tubes require an installation hole only 27 mm in diameter, allowing easy installation and minimal soil disturbance. They are manufactured to strict tolerances and are exceptionally strong and durable in the soil. Correct installation is essential and we recommend the use of our specially designed augering equipment (see next page).

Robust

The PR2 is constructed from the highest grade components and materials to ensure robustness in harsh environments. Reliable, environmentally sealed IP68 connectors provide a wide range of cable length and connectivity options. This flexibility makes sensor connection and disconnection quick and easy.

Data logging

The GP2 and DL6 data loggers are well suited to Profile Probe recording. See comparison table on opposite page.

Brief Specification (full spec on page 14)	
Range	0 to 0.4 m ³ .m ⁻³ [1]
Accuracy	± 0.04 m ³ .m ⁻³
Output	PR2/6: 6 x 0 to 1.0 V [2] PR2/4: 4 x 0 to 1.0 V
Power	5.5 to 15 V [3] PR2/6: ~120 mA for 1 s PR2/4: ~80 mA for 1 s
Sensing depths (nominal)	PR2/6: 10, 20, 30, 40, 60, 100 cm PR2/4: 10, 20, 30, 40 cm
Sampling volume	Vertically: ~95% sensitivity within ± 50 mm of upper rings Horizontally: ~95% sensitivity within 200 mm diameter
Size (length x dia)	PR2/6: 1350 x 25.4 mm PR2/4: 750 x 25.4 mm
Environmental	IP67 (when installed in access tube)
Access tubes	
Size (length x dia)	ATL1: 1154 mm x 28 mm ATS1: 554 mm x 28 mm

[1] Measures full range up to 1.0 m³.m⁻³ with reduced accuracy

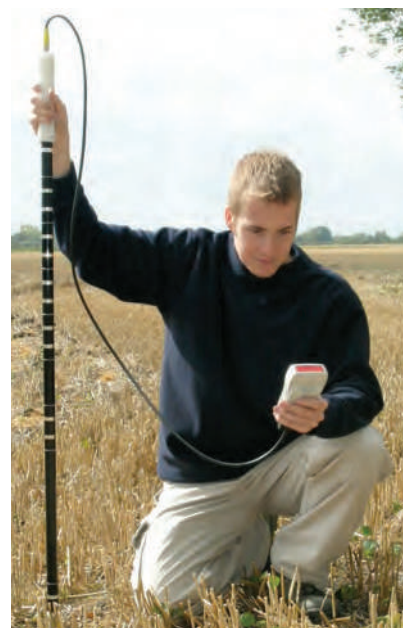
[2] Corresponding to 0 to 0.6 m³.m⁻³

[3] 5.5 V DC with 2 m cable, 7.5 V with 100 m



HH2 Moisture Meter

The HH2 is a versatile readout unit that provides an easy and convenient way to display and store readings from Profile Probes. With the HH2 and PR2 combination, a probe can be moved from access tube to access tube, enabling large amounts of soil moisture data to be collected at multiple sites. (See page 8)



(Above) PR2/6 Profile Probe with HH2 Moisture Meter.
(Right) PR2/4 Profile Probe



Ordering Information

PR2/4	Profile Probe, 40 cm**.
PR2/6	Profile Probe, 100 cm**.

All Profile Probes are fitted with an IP68 connector and come with a protective tube.

****Cable must be ordered separately.**

Standard cables

PRC/d-HH2	1.5 m cable, IP68 M12 connector to 25-way D-socket. Connects PR2 to HH2 Moisture Meter.
PRC/M12-05	5 m cable, IP68 M12 connectors. Connects PR2 to GP2 or DL6 Logger.
PRC/w-05	5 m cable, IP68 M12 connector to bare wire. Connects PR2 to loggers.

Extension cables

EXT/8W-05	5 m extension cable, M12.
EXT/8W-10	10 m extension cable, M12.
EXT/8w-25	25 m extension cable, M12.

The EXT/8W - xx cables can be connected together to create custom lengths - then fitted to a PRC/M12-05 or PRC/w-05 cable for data logger connection.

Access tubes and PR2 accessories

ATS1	Short access tube, includes cap, bung and collar. (PR2/4).
ATL1	Long access tube, includes cap, bung and collar. (PR2/6).
PR2-SP	Profile Probe spares kit.
PR-CB2	Protective carrying bag suitable for PR2 and HH2.

Patents: US7944220, EP1836483, AU2005315407, CN101080631(B)

Augering and Extraction Kits for optimal Access Tube installation.

Profile Probes are used within access tubes inserted into augered holes in the soil - correct installation is vital for accurate measurement of soil moisture profiles. The goal of installation is to produce optimal contact between the soil and the wall of the access tube. The augered holes should be straight, smooth sided and the correct diameter.

Delta-T augering kits help you achieve the best possible access tube installation in virtually any soil. However it may not be possible to install an access tube successfully in very stony soils, or where a site features compaction, voids, foreign bodies, or soil instability.

Three types of augering kit are available (a PR-AUG2 25 mm spiral auger should be ordered in addition to the selected kit for dry sandy soils).

Augering Kit features

The key components are:

Stabilisation plate to keep the auger vertical. Reading errors can arise from conical enlargement of the hole (funnelling) during augering, especially in the top 30 cm. This results in poor contact between the surface of the access tube and the surrounding soil. The stabilisation plate minimises this effect.

Insertion rod to drive the access tube into an augered hole by applying force to the bottom of the tube (normally by hammering). This new technique reduces the flexing that can produce air gaps around the access tube and minimises soil displacement.

Finishing auger to expand augered pilot holes to the exact diameter required for an access tube. This specially designed adjustable finishing auger produces straight, smooth-sided holes in most soil types.

Extraction Kit



The optional PR-EXK1 is a heavy duty system for removing installed access tubes from the ground. The kit includes a cast iron jack, chains, jack foot and a tube clamp.



Finishing auger

Data logger options for Profile Probes

The DL6 and GP2 are versatile loggers that can be connected to many types of soil moisture sensor and other environmental sensors. See pages 16-23 for further information.

	PR2/4 Capacity	PR2/6 Capacity	Notes
DL6 Logger 	1	1	Profile Probe can be instantly connected with dedicated cable and input socket.
GP2 Logger 	3	2	Analog PR2s require GP2-G5-LID Expansion Lid for connection.
To connect larger numbers of Profile Probes, see SDI-12 options on page 12.			

Ordering Information

PR-ASK1-S	Augering starter kit (short). For short access tube installation only, includes 24 mm pilot auger, stabilisation plate and access tube insertion rod.
PR-ASK1-L	Augering starter kit (long). For access tube installation (long or short tubes), includes all items in PR-ASK1-S Kit, plus finishing auger and mallet.
PR-AKC1	Augering kit (complete). For access tube installation (long or short tubes), includes all items in PR-ASK1-L Kit, plus flexicanes, carrying bag and cleaning rod.
PR-AUG2	25 mm spiral auger, for dry sandy soils.
PR-EXK1	Access tube extraction kit.

Augering Kit Selection

Soil type and depth (normal soils)	PR-ASK1-S Starter Kit (short)	PR-ASK1-L Starter Kit (long)	PR-AKC1 Complete Kit
Up to 40 cm depth	✓	✓✓	✓✓✓
Up to 1 m depth	×	✓✓	✓✓✓
<ul style="list-style-type: none"> For dry, sandy soils the PR-AUG2 25 mm spiral auger should be ordered in addition to the selected augering kit Only the complete kit includes a carrying bag All items can be ordered individually 			
Key:			
✓ = Meets basic need			
✓✓ = Well suited			
✓✓✓ = Well suited and includes items for extra convenience			
× = Unsuitable			

The PR2 SDI-12 is a digital alternative to the analog PR2 Profile Probe.

- Multiple PR2 SDI-12s connect to a compatible data logger via a single cable
- Enables the creation of low cost highly flexible sensor networks
- Compatible with existing PR2 access tubes and augering kits
- Flexible integration with 3rd party SDI-12 hardware
- Low power design; ideal for remote sites

Overview

The PR2 SDI-12 Profile Probe builds on the reputation and field proven technology of the analog PR2. By adopting the widely used SDI-12 interface (v1.3) the PR2 SDI-12 can be integrated with an even wider range of data loggers, sensors and equipment.

SDI-12 is an established communication standard adopted by many manufacturers of environmental monitoring and control equipment. It is popular because it allows large numbers of sensors (from many vendors) to be connected to a logger via a simple cable network, thereby reducing the cost and complexity of wiring large sensor installations.

Cables and connectors

The PR2 SDI-12 has a high quality, stainless steel IP67 rated connector (M12 x 5-way) - connecting to the standard Delta-T range of M12 x 5-way cables and accessories. The M12 x 5-way cables are also compatible with Delta-T's ML3, SM150T and EQ3 sensors.

(NB: The M12 x 8-way range of cables used for analog PR2 connection is not compatible with the SDI-12 version of the PR2. Analog and SDI-12 sensors cannot be mixed on the same cable system).

GP2 SDI-12 Data Logger

The SDI-12 enabled GP2 Data Logger and DeltaLINK Software enable quick and easy creation of sensor networks - without the need to resort to the often complex programming methods typically employed by other manufacturers.

The SDI-12 Profile Probe's electronics have been designed to improve power efficiency - reducing the overall power requirement. This is an important advantage for applications at remote sites.

Up to 50 SDI-12 PR2/6 Profile Probes, or up to 62 SDI-12 PR2/4s, can be connected to a single GP2 SDI-12 Data Logger (subject to cable length and power requirements).

In addition to SDI-12 inputs, the GP2 can log 12 analog channels.

Cost saving with SDI-12

- Lower cost cabling- uses standard Delta-T M12 x 5-way cable system
- Lower cost data logging for multi-probe installations
- Same price as analog PR2 Probe

Brief Specification

The PR2 Profile Probe SDI-12 shares its general specification with the analog version of the probe. See page 14

Logger compatibility and power requirements:

SDI-12 protocol version 1.3 (www.sdi-12.org)
Power consumption <60 mA at 12 V DC
Sleep current <2 mA at 12 V DC

Output: Digital

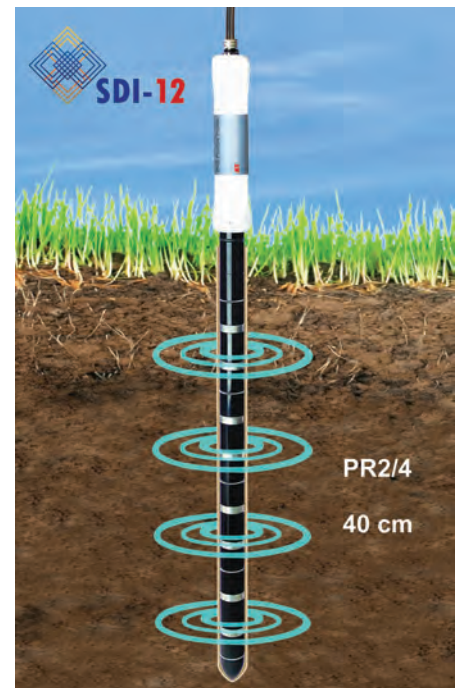
Ordering Information

PR2/4-SDI-12	Profile Probe 40 cm SDI-12 interface.
PR2/6-SDI-12	Profile Probe 100 cm SDI-12 interface.

Cables must be ordered separately - see diagram below and cable information on page 13.

All Profile Probe accessories, such as augering kits and access tubes, are compatible with the SDI-12 version. Cables are an exception: the analog PR2 and SDI-12 PR2 cables are not compatible.

See page 11 for details of PR2 accessories.



Use of PR2 SDI-12 Sensors with Data Logger





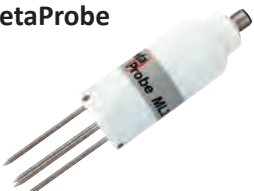
HH2 Moisture Meter

The HH2 Moisture Meter can display readings from the PR2 SDI-12 Profile Probe*. This is a great advantage for customers who value the freedom to use SDI-12 Profile Probes in both installed and portable applications. Pre-February 2017 HH2s can be upgraded at low cost (via firmware) to enable PR2 SDI-12 readout. (Also requires new HH2 to PR2 cable)

For more information on upgrading firmware please contact our Tech Support department: tech.support@delta-t.co.uk

* Please note that the HH2 only reads SDI-12 digital data from the PR2 SDI-12 Probe - it is not a general purpose SDI-12 meter.

Soil Moisture Sensor Specifications

	Soil water content	Multi-parameter	
Sensor	PR2 and PR2 SDI-12 	SM150T 	ML3 ThetaProbe 
Measurement	Volumetric water content	Volumetric water content and soil temperature	Volumetric water content and soil temperature
Accuracy	$\pm 0.04 \text{ m}^3.\text{m}^{-3}$ (4%) With soil-specific calibration	$\pm 0.03 \text{ m}^3.\text{m}^{-3}$ (3%) With soil-specific calibration	$\pm 0.01 \text{ m}^3.\text{m}^{-3}$ (1%) With soil-specific calibration
Soil moisture measurement range	Full accuracy over: 0 to $0.4 \text{ m}^3.\text{m}^{-3}$	Full accuracy over: 0 to $0.7 \text{ m}^3.\text{m}^{-3}$	Full accuracy over: 0 to $0.5 \text{ m}^3.\text{m}^{-3}$
	Full range: 0 to $1.0 \text{ m}^3.\text{m}^{-3}$	Full range: 0 to $1.0 \text{ m}^3.\text{m}^{-3}$	Full range: 0 to $1.0 \text{ m}^3.\text{m}^{-3}$
Salinity range	50 to $400 \text{ mS}.\text{m}^{-1}$	50 to $500 \text{ mS}.\text{m}^{-1}$	50 to $500 \text{ mS}.\text{m}^{-1}$
	Salinity errors included in specification	Salinity errors $< 0.035 \text{ m}^3.\text{m}^{-3}$ from 0.05 to $0.4 \text{ m}^3.\text{m}^{-3}$. Can be calibrated up to $2,000 \text{ mS}.\text{m}^{-1}$	Salinity errors $< 0.035 \text{ m}^3.\text{m}^{-3}$ from 0.05 to $0.4 \text{ m}^3.\text{m}^{-3}$. Can be calibrated up to $2,000 \text{ mS}.\text{m}^{-1}$
Temperature range	Full accuracy over: 0 to 40°C	Full accuracy over: 0 to 40°C	Full accuracy over: 0 to 40°C
Output	0 to 1.0 V differential See page 12 for PR2 SDI-12	0 to 1.0 V differential Corresponding to 0 to $\sim 0.6 \text{ m}^3.\text{m}^{-3}$	0 to 1.0 V differential Corresponding to 0 to $\sim 0.6 \text{ m}^3.\text{m}^{-3}$
	PR2/6: x6 outputs, PR2/4: x4	Resistance 5.8 Ω to 28k Ω for temp sensor	Resistance 5.8 Ω to 28k Ω for temp sensor
Power requirement	5.5 to 15 V PR2/6: $\sim 120 \text{ mA}$ for 1 s PR2/4: $\sim 80 \text{ mA}$ for 1 s See page 12 for PR2 SDI-12	5 to 14 V, $\sim 18 \text{ mA}$ for 1 s	5 to 14 V, $\sim 18 \text{ mA}$ for 1 s
	Minimum 7.5 V with 100 m cable	Minimum 5.5 V with 100 m cable	Minimum 5.5 V with 100 m cable
Environmental	IP67 (when installed in access tube)	IP68 , -40 to $+70^\circ\text{C}$	IP68 , -40 to $+70^\circ\text{C}$
Sample volume	$\sim 95\%$ sensitivity within a cylinder of diameter 200 mm	$\sim 55 \times 70 \text{ mm}$ diameter	$\sim 60 \times 30 \text{ mm}$ diameter
	Sample volume is weighted towards soil immediately surrounding the rods or rings	Sample volume is weighted towards soil immediately surrounding the rods	Sample volume is weighted towards soil immediately surrounding the rods
Dimensions and weight	PR2/6: length 1350 mm PR2/4: length 750 mm Both: 25.4 mm diameter	Overall: 158 x 40 mm dia Rods: 60 mm x 3.2 mm dia	Overall: 158 x 40 mm dia Rods: 60 mm x 3.2 mm dia (Rods are replaceable)
	PR2/6: 1.2 kg, PR2/4: 0.8 kg	Weight: 0.1 kg (excl. cable)	Weight: 0.1 kg (excl. cable)
Sensor calibrations	Individual sensors are interchangeable	Individual sensors are interchangeable	Individual sensors are interchangeable
	Recalibration advised every 3 years (depending on use)	Recalibration advised every 5 years (depending on use)	Recalibration advised every 5 years (depending on use)
Soil calibrations	Generalised Mineral and Organic soil calibrations are supplied	Generalised Mineral and Organic soil calibrations are supplied	Generalised Mineral and Organic soil calibrations are supplied
Applications	Provides rapid moisture content readings in a vertical soil profile. Used in access tubes for easy insertion and removal. Can be left installed for data logging or used with the HH2 for multi-site portable readings.	High quality entry level sensor suited to precision agriculture and research. It is a cost effective alternative where ML3 levels of accuracy are not required. It combines research-grade soil moisture and temperature measurement (when fully buried).	Versatile, high accuracy sensor recognized as the "gold standard" for the precise determination of soil moisture content. Also provides soil temperature when fully buried.