



Sentek[™]
technologies



SENTEK DRILL & DROP

Probe Manual Version 1.1

Sentek Drill & Drop Probe Manual

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Sentek - Statements of Compliance

FCC note of compliance and statement of liability

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorientation or relocation of the receiving antenna.
- Connection of the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consultation with the dealer or an experienced radio/TV technician.

EMC approvals

The Drill & Drop system complies with the following specifications;

- FCC Part 15 Subpart B
Radio Frequency Devices – Unintentional Radiators
- CISPR 11:2010 Ed 5.1
Industrial Scientific and Medical (ISM) radio-frequency equipment – Electromagnetic disturbance characteristics – Limits and methods of measurement
- IEC 6132601:2012 Ed 2
Electrical equipment for measurement, control and laboratory use – EMC requirements. Part 1: General requirements.

RoHS

- EN 50581:2012
Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances.

Marking

The above EMC approvals allow the product to be marked CE, C-tick and FCC.

Modifications

Any modifications to any part of the equipment or to any peripherals may void the EMC compliance of the equipment.

Radio Interference

The probe is not to be operated in free air as it may cause interference to radio communication devices

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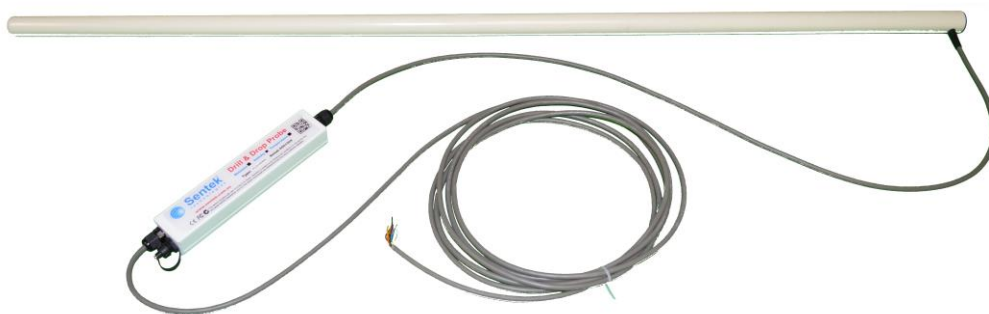
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The Drill & Drop Probe

This manual should be used in combination with the appropriate Sentek Hardware manual for which the probe is configured i.e. Sentek MULTI, Sentek PLUS, Sentek SDI-12 or RS232/485Modbus.

The Drill & Drop probe complements the Sentek EnviroSCAN probe and Sentek EasyAG probe. It comes in two sensor configurations of 6 sensors or 12 sensors.

The probe consists of two components and associated cables:



References

- Drill & Drop Installation Manual
- Sentek Probe Configuration Utility
- TriSCAN Agronomic User Manual
- Sentek SDI-12 Series II Probe Interface Manual
- RS232/485 MODBUS Series II Hardware Manual
- Sentek MULTI Hardware Manual
- Sentek PLUS Hardware Manual

Interface box

The Interface box contains a Sentek interface device preconfigured and normalised to match the probe rod configuration and the communications option.



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There are five communication options for the encapsulated interface box:

Product	Interface	Modem	Firmware Version
Sentek PLUS	RS232	NextG, GPRS and CDMA (Verizon, USA)	Plus-Multi 1.6.2 or later
Sentek MULTI	RS485	NextG, GPRS and CDMA (Verizon,USA)	Plus-Multi 1.6.2 or later
Third party SDI-12 loggers	SDI-12	N/A	SDI-12 1.4.2 or later
Sentek SOLO	RS232	N/A	Solo 1.3.2 or later
MODBUS	RS232 or RS485	N/A	Modbus 1.4.1 or later

The Interface box has two non-removable cables (with non-removable cable glands)

It also has weather proof connector for the Drill & Drop Probe Programming Cable.

Probe

The sensors and cable are encapsulated inside the probe rod:

- 6 or 12 moisture sensors
- 6 or 12 moisture and salinity sensors
- Every sensor has an associated temperature sensor
- Sensors are spaced at 10cm intervals
- Probe length 60 cm (24 inches) or 120 cm (48 inches)
- The probe interface is preconfigured to start sensors at depth 5cm

Cables

- Drill & Drop Probe Programming Cable (for Probe Configuration Utility), USB to Interface box connector (optional)
- Non-removable 1m cable with ends encapsulated in interface box and in probe rod
- Cable encapsulated at interface box, supplied with appropriate Sentek connector or bare wires, Cable length nominally 5m (see section *Wiring the Probe Cable*), Sentek Solo has its cable pre-wired into the Solo Head Unit.
- Custom cable lengths may be available with a special order.

Sentek Probe Configuration Utility

Warning!

Probes are supplied pre-normalised. Modifying information stored in the Drill & Drop probe interface may result in incorrect volumetric water content (mm/10cm) readings being reported to the controlling device.

The Probe Configuration Utility (PConfig) is provided to configure probe interfaces with depth location, normalization values (air and water counts) and calibration information for each sensor installed on the probe. This information is stored in non-volatile memory, and is used to produce the calculated value (value that has been processed via the interfaces calibration formula) from each sensor on the probe.

It is not necessary to configure the sensors or normalise Drill & Drop probes as they are sold fully preconfigured and normalised. An optional Drill & Drop Pconfig cable is available if required.

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The sampling interval, Web URL address etc. in the Interface box must be setup during commissioning the probe.

See the Probe Configuration Utility manual or help for further information.

Setting the SDI-12 Address

Drill & Drop SDI-12 probes are preconfigured to SDI-12 address 0.

If multiple probes are on the one SDI-12 bus it will be necessary to use either your SDI-12 logger or PConfig to change the SDI-12 address of the probe in the range "0" to "9", "A" to "Z" and "a" to "z".

About the SDI-12 Communication

See the Sentek SDI-12 Series II Probe Interface Manual for a description of SDI-12 communication to a Sentek probe.

Installation and setup of the Drill & Drop probe

Physical installation at the desired field location is described in the Drill & Drop Installation Manual.

See the appropriate Sentek PLUS, Sentek SOLO or Sentek MULTI hardware manual for full setup description.

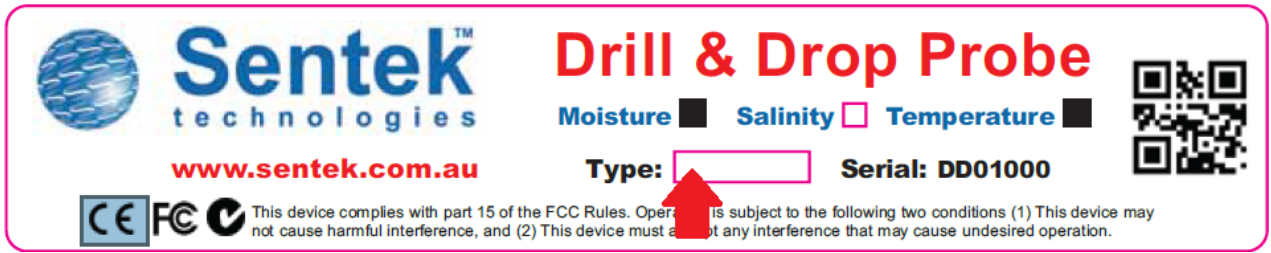
1. Plug the Interface to DTU cable into the probe connector on the DTU (or third part logger).
2. Plug the DTU front panel PConfig cable into your computer
For SDI-12 or Modbus: Plug the Drill & Drop PConfig cable to the Interface box and to your Computer.
3. Open PConfig connection to the probe and set required parameters in the interface:

Note: It is not necessary to Auto-detect sensors, set depths or normalise sensors

- Synchronise Interface clock to computer clock
 - Enter Upload URL
 - Sample interval (preconfigured to 15 minutes)
 - Sample upload count (preconfigured to 12, for upload every 3 hours)
 - Change network tab Initialisation setting if your SIM card is configured to use a PIN
 - Ensure you have a SIM card in the DTU modem
4. Verify the probe is operational by performing a Modem Test, expecting a last response of 040 Success.

Wiring the Probe Cable

Most Drill & Drop probes are pre-configured with the appropriate firmware and cable plug for Sentek PLUS, Sentek SOLO, Sentek MULTI.



For probes that need to be wired, there are three cable configurations. The "Type" label on the Drill & Drop Interface box identifies which type of probe is relevant.

Caution:
Damage to the Drill & Drop cable may result in moisture entering the cable, resulting in corrosion and device failure.

SDI-12 Probe

An SDI-12 probe require connection to a third-party logger, consequently no cable connector can be specified.

SDI-12 Cable	+Vin	0V	DATA	N/C	N/C
5-wire cable	Red	Green	White	Blue	Yellow

Sentek MULTI and Modbus RS485 probes

The Sentek MULTI DTU has a built in connector which uses a four pin "Buccaneer" plug. If required the probe end connector can be ordered as Sentek Part number:

- 04086 Sentek MULTI, Probe Cable Connector



For detailed wiring steps, see section *Sentek MULTI Probe Cable Connector* in the *Sentek MULTI Hardware Manual*.

A Modbus RS485 probe require connection to a third-party logger, consequently no cable connector can be specified.

485 Cable	+Vin	0V	A	B	N/C
5-wire cable	Red	Green	Blue	White	Yellow

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MULTI Connector Pin	1	2	3	4		
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Sentek PLUS and Modbus RS232 probes

The Sentek PLUS DTU has a connector which uses a seven pin "Buccaneer" plug. If required this connector can be ordered as Sentek Part number:

- 61249 Water tight connector, Sentek PLUS, Probe end



For detailed wiring steps, see section *C. Install EnviroSCAN Flat Cap probe* (common to all probe types) in the *Sentek PLUS Hardware Manual*.

A Modbus RS232 probe require connection to a third-party logger, consequently no cable connector can be specified.

232 Cable	+Vin	SWCH In	SWCH out	0V	TX	RX	RTS	CTS	N/C
9 wire cable	Red	Orange	Brown	Black	Blue	Purple	Green	Yellow	Grey
Plus Connector pin	1	1 with Red	2	3	4	5	6	Center	No pin

If the Sentek PLUS DTU does not have a cable with Buccaneer connector, the Drill & Drop probe cable can be wired directly into connector X2 on the PLUS solar charger board. See section *Sentek PLUS DTU* in the *Sentek PLUS Hardware Manual*.

Sentek SOLO probe

A Drill & Drop probe is either supplied:

- Pre-assembled in a Sentek SOLO system, with the cable already wired into the SOLO Head unit.
- With a cable that has a bare end. This end must be joined to the existing SOLO Head Unit cable. This is done using quick connector (PN: 61248) on both Drill & Drop and SOLO Head Unit cables.



Figure 1: 61248 - Water tight connector Kit, Sentek SOLO or PLUS

Instructions on how to install these connectors can be found in the Sentek PLUS hardware manual. Wiring order for the SOLO is identical to PLUS.

Note:

Sentek recommends keeping total cable distance between the probe interface and Sentek SOLO Head unit to 5m or less.

Drill & Drop Technical Specifications

All sensors and electronics are encapsulated within the probe rod. The interface box is also encapsulated and its cable to the probe rod cannot be disconnected.

Sensors are measured starting from the bottom sensor (6 or 12)

Moisture Sensor Resolution: 1:10000

Moisture Sensor Precision: $\pm 0.03\%$ vol.

TriSCAN Sensor Resolution: 1:6000

Temperature Sensor Accuracy: ± 2 Deg. C @ 25 Deg C.

Temperature Sensor Resolution: 0.3 Deg C.

Temperature range (operating): -20 Deg C to +60 Deg C.

RS232/RS485 Interface specification

Voltage Supply (+Vin): Modbus and Plus 4 to 15 Volts DC, Nominal 12V

SOLO 4.5 to 6.5 Volt DC, Nominal 6V

MULTI 6.5 to 15 Volt DC, nominal 12 Volt

Current consumption (RS232/RS485): 400 μ A standby @ 12 V DC

9mA Active @ 12 V DC

25mA @ 12 V DC** Average current over sensor sampling period.

800 μ A standby @ 6 V DC

16mA Active @ 6 V DC

45mA @ 6 V DC ** Average current over sensor sampling period.

Current is measure at the interface, production version 2.4 manufactured in 2013.

Time to sample 12 sensors: 1.8 seconds for Moisture and Temperature

(approx. 150ms per sensor **)

2.2 seconds for Moisture, TriSCAN and Temperature

(approx. 180ms per sensor **)

Time to sample 6 sensors: 1.1 seconds for Moisture and Temperature

(approx. 215ms per sensor **)

1.3 seconds for Moisture, TriSCAN and Temperature

(approx. 180ms per sensor **)

**** Note:** Sensor measurement time is approximate and an average of the total time to measure all sensor types at a single depth.

TTL Interface baud rate: 1200, 2400, 9600 (default), 19200 and 38400 bits per second

SDI-12 Interface Specifications

SDI-12 Protocol: Version 1.2

Time to sample M!, M2!, M4!, C!, C1! commands:

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1.8 seconds for 12 Sensor Moisture and Temperature.

2.2 seconds for 12 Sensor Moisture, TriSCAN and Temperature.

1.1 seconds for 6 Sensor Moisture and Temperature.

1.3 seconds for 6 Sensor Moisture, TriSCAN and Temperature.

Time to sample M1!, M3! & M5! commands:

0.8 seconds for 12 Sensor Moisture and Temperature.

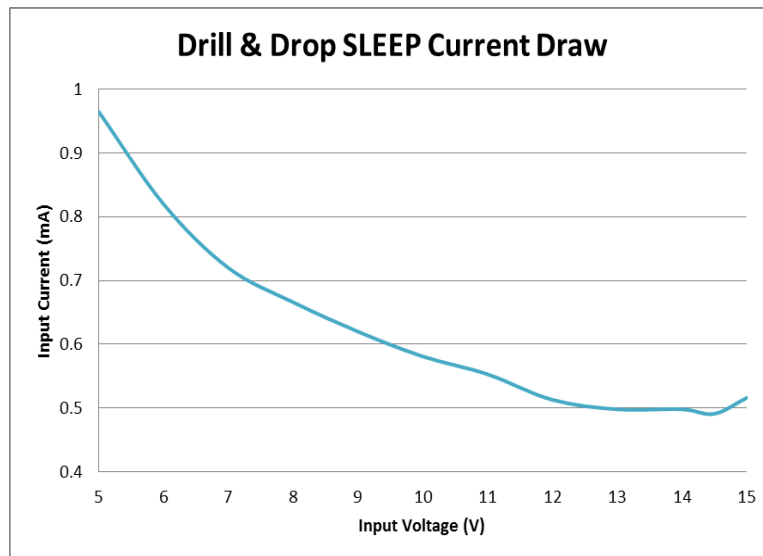
Voltage Supply (+Vin): 5 to 15 Volts DC

Current consumption (SDI-12): Idle and Sleep currents are as per SDI-12 specification.

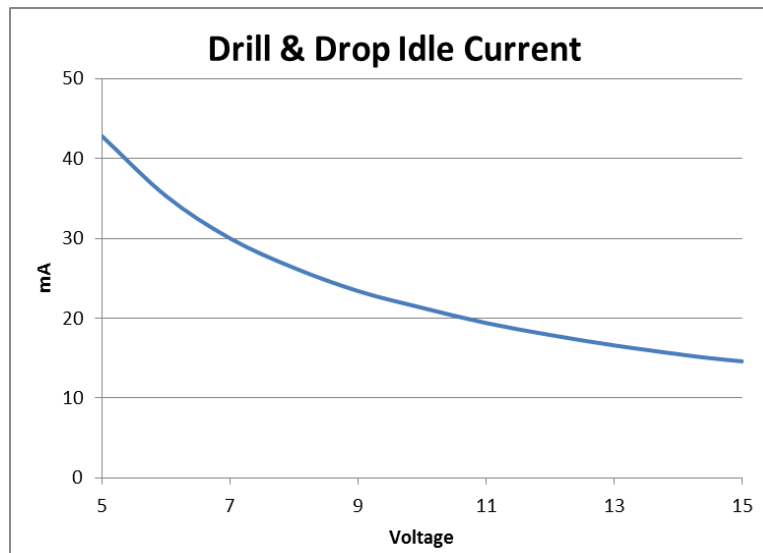
Mode:

Current consumption

SDI-12 Sleep



SDI-12 Idle



Mode:
SDI-12 Sampling

Current consumption

