WET150 sensor

Water content, **EC** and **T**emperature sensor for irrigation monitoring

Quick Start Guide version 1.1

Delta-T Devices

The WET150

Cables

Extension cables

To GP2 and other loggers

Connector
Fully waterproof M12 connector

SDI-12
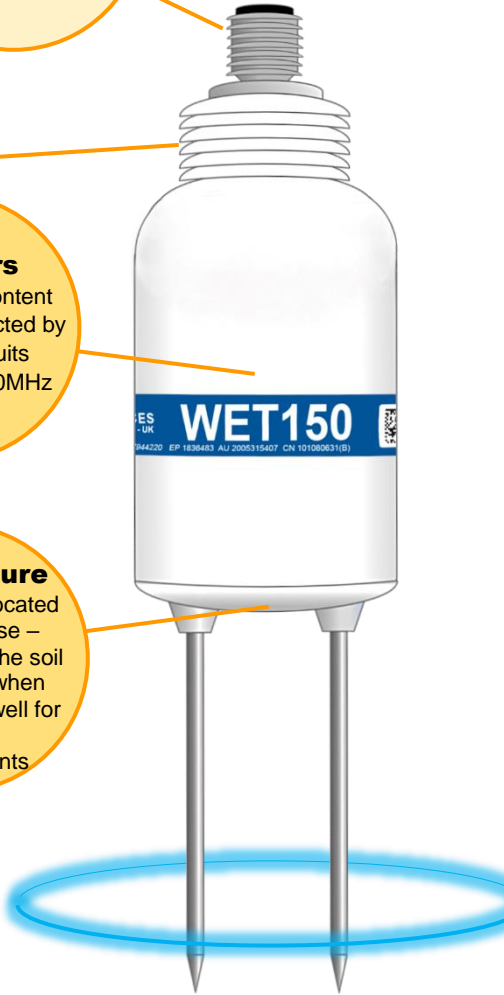Industry-standard digital interface, compliant to version 1.3

Installation
Threads enable extension rods to be screwed on for easy insertion in augered holes, minimising soil disturbance

Detectors
Soil moisture content and EC are detected by sensitive circuits operating at 100MHz

Outputs
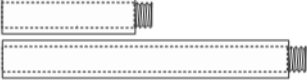Sophisticated correction algorithms ensure accurate readings across the full range of water content, EC and temperatures

Temperature
Thermistor is located within the base – equilibrates to the soil temperature when installed, less well for portable measurements

Sensing field
Extends ~100mm into the soil, but field is strongest close to the rods - install carefully to avoid air gaps
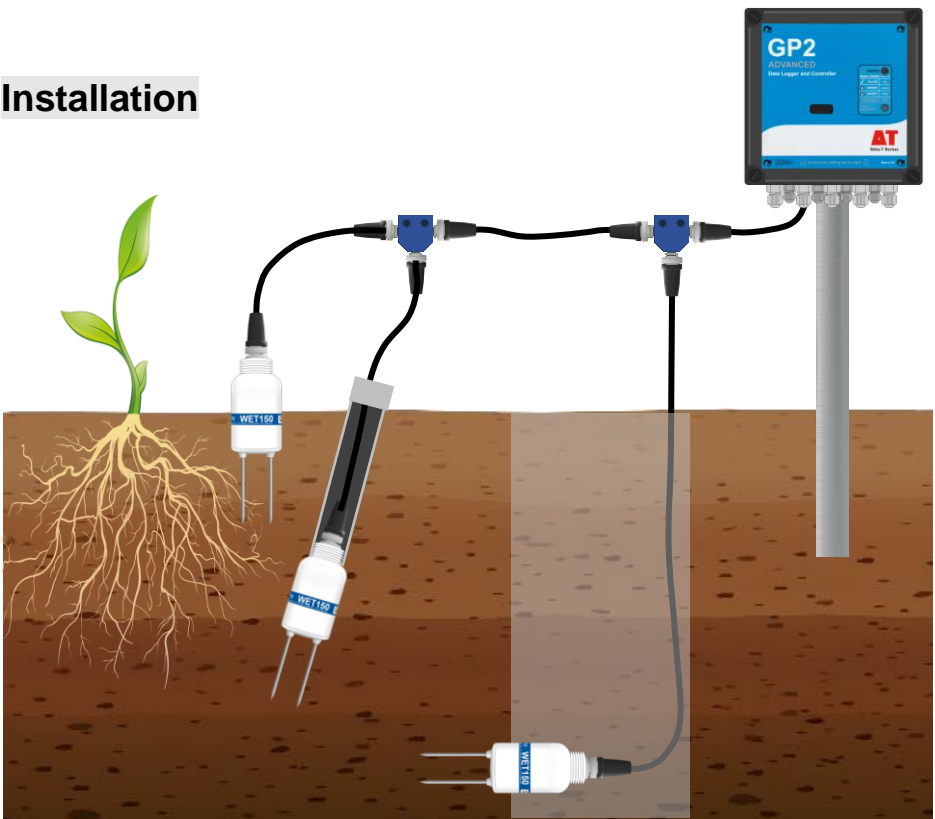
WET150

System parts (not to scale)

	WET150 sensor	**Note:** the WET150 and Meter are sold together as the WET150 kit with a dedicated Quick Start Guide
	WET150 Meter	
	SMSC/lw-05m 5m cable with 200mm flying leads	
	EXT/5w-01 **EXT/5w-05** **EXT/5w-10** **EXT/5w-25** } 1, 5, 10 and 25m extension cables	
	GP2-NTP T-connector	
	ML/EX50 **ML/EX100** } extension tubes	
	SM-AUG-100 45mm spiral auger	

Care and maintenance

■ Do not touch the WET150 rods or expose them to other sources of static damage, particularly when powered up.

■ Ensure that connectors are clean, undamaged and <u>properly</u> <u>aligned</u> *before* pushing the parts together. Screw together firmly for a water-tight seal.

■ Do not pull the sensor out of the soil by its cable.

■ If you feel strong resistance when inserting into soil, it is likely you have encountered a stone - stop pushing and re-insert at a new location.

Installation

Surface installation and spot measurements

- ■ Clear away any stones. Pre-form holes in very hard soils before insertion.
- ■ Push the WET150 into the soil, fully inserting the rods to ensure good soil contact.
- ■ If you feel strong resistance when inserting the WET150, you have probably hit a stone. Stop, and re-insert at a new location.

Note: With surface installation, air temperature and radiant heat on the sensor body can affect temperature readings. Partial or full burial of the WET150 will improve temperature accuracy, particularly where there is a large temperature difference between the air and the soil or substrate.

Installing at depth

- ■ Auger a 45mm diameter hole, ~10° to vertical is recommended.
- ■ Fit an extension tube to the WET150 – remember to fit the connector and pass the cable through the extension tube first.
- ■ Push the WET150 into the soil, fully inserting the rods to ensure good soil contact.

Alternatively

- ■ Dig a trench, and install horizontally into the wall of the trench.

Connections
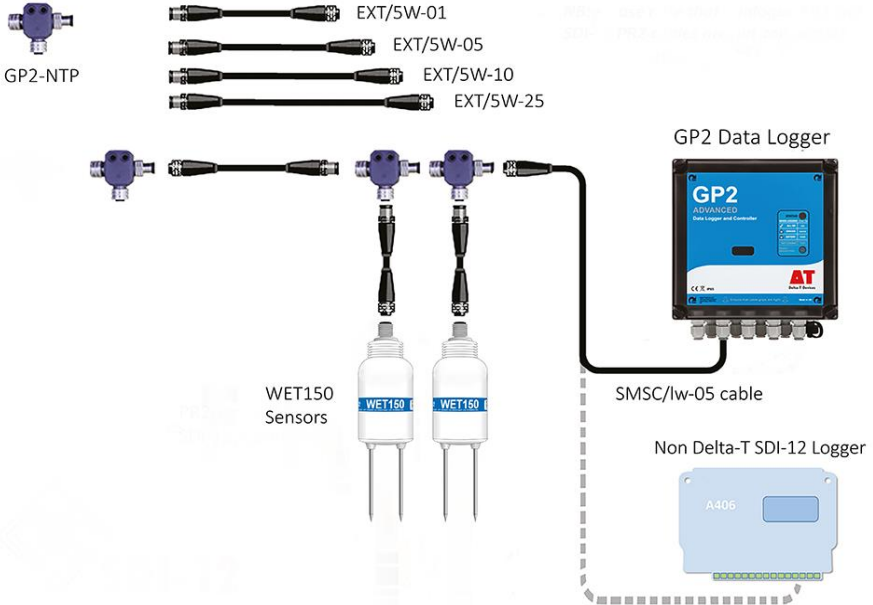
Cables can be joined via extension cables and T-connectors. Maximum cable lengths depend on configuration details. As an example, 200m with 10 WET150s each connected via a 5m extension cable works reliably with the GP2 Data Logger.

Connection to a GP2 data logger

Using logger power

Wire colour		GP2 terminal		M12 plug pins	
Black	■	DATA	SDI-12 Data	4	
Blue	■	GND	Sensor ground / power return	3	
White		12V	Sensor power	2	

Wiring diagram for connecting a WET150 (or SDI-12 network) to the SDI-12 channel in the GP2 using the SMSC/lw-05 cable and the logger's internal +12V Power channel.

Note: the grey and brown wires are not connected and can be trimmed off.

Set DeltaLINK program's **Measurement**, **Power channel** to **+12V.**

Power is only applied to the SDI-12 cable when required by a sensor.

Using external power

Wiring diagram for connecting a WET150 (or SDI-12 network) to the SDI-12 channel of a GP2 logger using an external permanent power supply or battery connection (which should be appropriately fused).
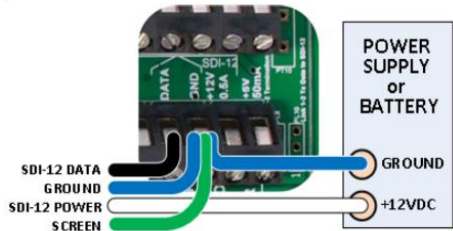
Here the SDI-12 power is permanently on. If you only want the external power switched on when needed then feed the 12V (white) cable through one of the GP2 relays and select the relay, e.g. RLY1, for the DeltaLINK program's **Measurement**, **Power channel**

See also **SDI-12 for GP2 User Manual**.

GP2 configuration

You need a PC running **DeltaLINK** version 3.9 or later and connected to the GP2. For help on this see DeltaLINK Help "How to Connect to the logger"

1. Connect the WET150 directly to the GP2 with the supplied cable.

2. Start DeltaLINK:

   ■ Click on **Program** and select **Change**.

   ■ Right click on Channel 1 and select **WET150** from the drop-down menu.

   ■ To change the default settings, double click on an Input channel to open **Input Channel Properties**, where you can change the **Units**, **Soil type** and **Data storage** settings.

   ■ Set the **Recording Interval** in the **Program** window...
   … there are many other options - refer to the GP2 user manual for details.

   ■ When finished, click on **Apply** to install the program in the logger.

3. To check the connections, select the **Sensors** tab and click on **Read now** to see the WET150 readings.

4. When ready, select the **Logger** window and click on **Start** to start logging…

5. …later to collect the data, connect to the GP2 and select the **Dataset** window from which you can retrieve and display all stored readings.
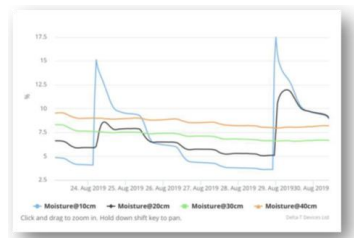
SDI-12 commands

The WET150 supports a full set of SDI-12 commands for configuring the sensor and its outputs and for taking readings. The full set can be found in the online **WET150 User Manual** (SDI-12 supplement), the following table lists just the 4 basic commands:
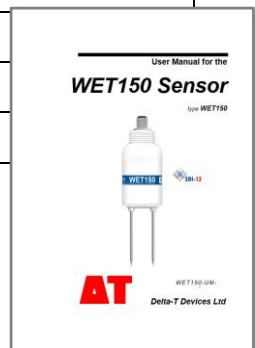
Command	Sensor response	Notes
?!	a<CR><LF>	The connected sensor responds with its address (a in this example). Cannot be used if more than one sensor is connected.
aAb!	b<CR><LF>	Changes the address of sensor a from a to b
aM!	atttn<CR><LF>	Sensor a begins a measurement and responds with the time in seconds until the measurement will be ready (ttt) and the number of values to be returned (n).
aD0!	a<values><CR><LF>	Sensor a returns 3 default values: • Permittivity** (ε') • Pore water conductivity (EC_p, mS.m^{-1}) compensated to 25°C at 2%/°C. • Soil temperature (°C)

** Permittivity is an electrical property of soils and substrates that is largely determined by water content and is measured by the WET150. See the online **WET150 User Manual** for details on how permittivity is used to calculate water content.

Specifications

Volumetric Water Content	
Accuracy	**± 3%** (with a calibration matching the soil / substrate)
Range	Accurate range: **5 to 100%vol**, EC_b 0 to 500mS.m^{-1} Full range: 0 to 100%vol

EC_b (bulk conductivity)	
Accuracy	± (**6% + 10mS.m^{-1}**)
Range	Accurate range: **0 to 1200mS.m^{-1}** Full range: 0 to 2000mS.m^{-1}

Temperature *(WET150 must be fully buried to accurately measure soil temperature)*	
Accuracy	**± 1°C**
Range	Accurate range: **-20 to +50°C** Full range: -20 to +60°C

Operating specifications	
Interface	SDI-12 version 1.3
Maximum cable length	>100m (see User Manual for tested configurations)
Power requirement	6 to 20V, ~22mA over 12ms (includes short 45mA peak)
Operating range	-20 to +60°C (sensor does not detect ice)
Environmental	IP68
Sample volume	55 x 70 mm diameter
Dimensions	143 x 40 mm diameter
Weight	77g

Please refer to the online **WET150 User Manual** for full specification and further details:

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