WET150 kit

Rapid measurement of **W**ater content, **EC** and **T**emperature
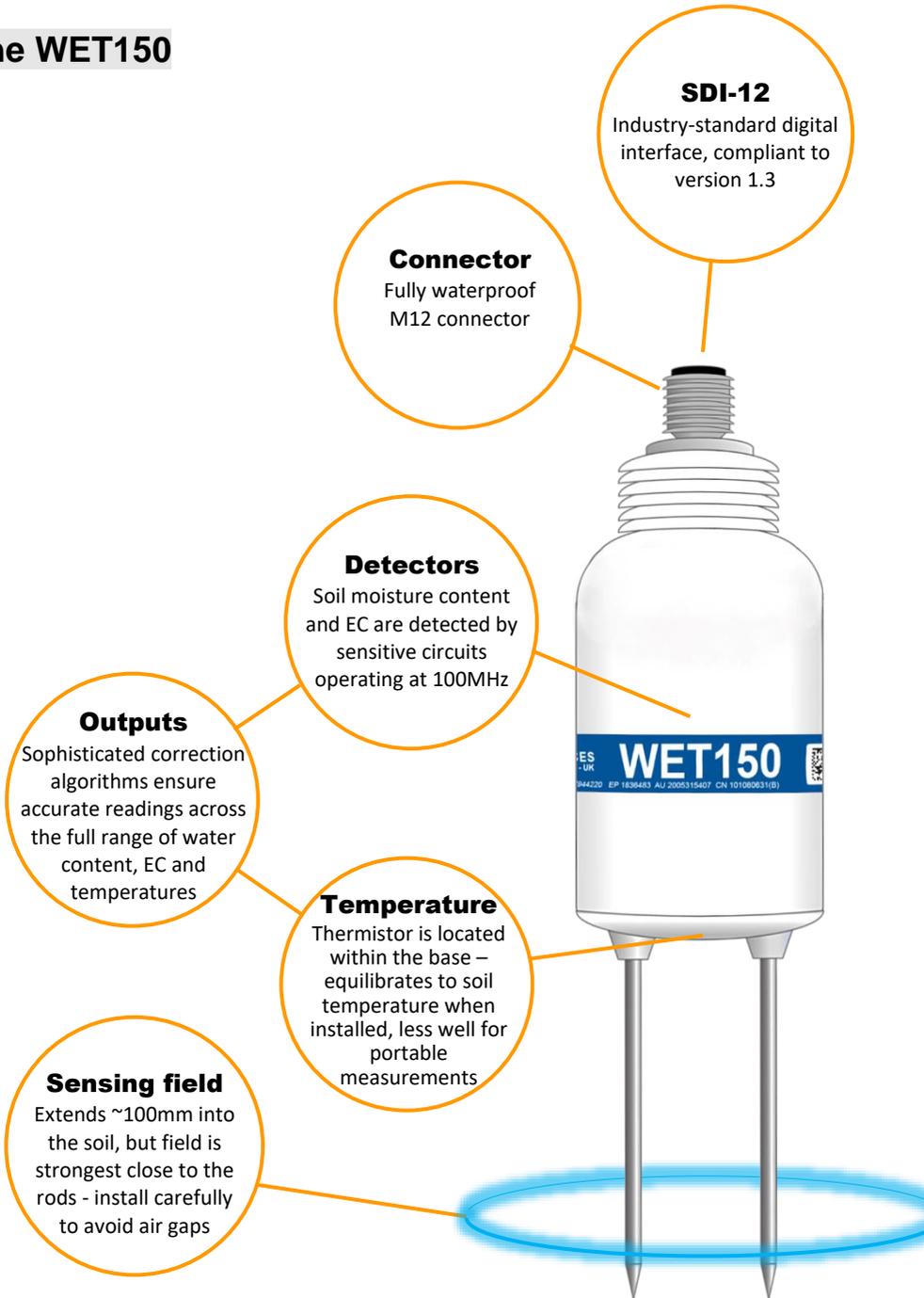
Quick Start Guide version 2.0

Delta-T Devices

The WET150 kit

Kit case
The WET150 kit is supplied in a small protective case with WET150, Meter and a couple of spare batteries

WET150 Meter
Display readings, configure units and soil calibrations, set SDI-12 address

WET150 Sensor
Rapid and accurate measurement of water content, pore water EC (ECp) and temperature

Batteries
Two standard alkaline AA cells

The WET150

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

Connector
Fully waterproof M12 connector

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 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

Taking readings

1. Gently push the WET150 rods into the soil or substrate.

2. Press READ to take and display a reading.

The meter displays all 3 parameters (water content, temperature and pore water EC) using its current configuration.

Water Content

Water content is calculated from the sensor measurements by applying a soil calibration which can be configured using the SET button (see next section).

Water content is displayed in %vol.

If the soil type is set to **RAW**, the meter will instead display the underlying readings of permittivity (ε'), temperature and bulk conductivity (ECb):

> 40.5 ε' 19.6°C
> 100.9mS/m ECb

Temperature

Note: the temperature sensor in the WET150 is internal to the white body, so it takes over a minute to equilibrate. This can potentially affect the EC measurement accuracy as the conductivity of typical plant nutrients changes by ~2% per °C. We recommend the WET150 is used as a portable sensor **only in well-equilibrated environments** where the air temperature doesn't differ significantly from the soil/substrate temperature.

Temperature can be displayed in °C or °F.

Pore Water EC (ECp)

The EC (Electrical Conductivity) of the water in the soil pores is calculated by applying the Hilhorst equation. This is a very useful approximation that works well with the WET150 because the sensor measures permittivity and ECb in the same sample volume at the same frequency (100MHz).

However...the Hilhorst equation ceases to be a good approximation when there is too little water present, so the meter will display "too dry" instead. It is also important to select the correct soil type to match the one being measured as this has a significant effect on the ECp reading.

ECp can be displayed in mS/m, mS/cm or µS/cm.
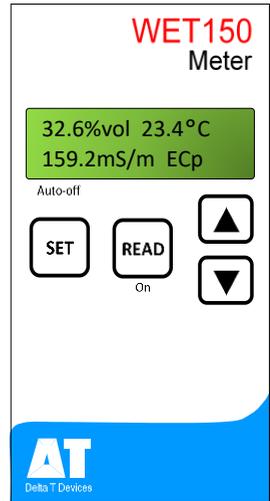
Configuration

Press $\boxed{\textsf{SET}}$ to configure the meter or sensor. Scroll up or down to the option that you want to configure, and press [**SET**] again. There are 4 menu options:

Soil type

Select the calibration that will be used when calculating water content and ECp. The options are:

- **Mineral**
- **Organic**
- **Peat mix**
- **Coir**
- **Mineral wool**
- **RAW**

Once you have scrolled to the appropriate setting, press [**SET**] to select.

If RAW is chosen, the meter will display the base readings: Permittivity (ε'), Bulk EC (ECb) and Temperature.

Units

EC can be configured to display as:

- **mS/m**
- **mS/cm**
- **µS/cm**

Temperature can display as:

- **°C**
- **°F**

Address

Each SDI-12 sensor has an "address", a 1-character code that it uses to recognise when to respond to commands sent over a network of sensors.

The WET150 Meter interrogates the connected sensor and automatically uses that address when taking readings. It can also be used to set sensor addresses prior to their installation in a network. The following 62 addresses are available:

- **a** to **z**
- **0** to **9**
- **A** to **Z**

Contrast

LCD contrast can be adjusted up or down using the scroll buttons.

Troubleshooting SDI-12 sensor networks

Checking sensors

SDI-12 sensor networks can include up to 62 sensors of various types and from different manufacturers. A single malfunctioning sensor may prevent the whole network from operating. The WET150 Meter can conveniently help locate faults.

The WET150 Meter can only take and display readings from WET150 sensors, however it can display the address of most attached SDI-12 sensors with a compatible power requirement*. Displaying the address checks that the attached sensor powers up correctly and responds to an SDI-12 command. This can prove a useful diagnostic aid when troubleshooting networks of SDI-12 sensors:

- Divide the network up into groups of 5 to 10 sensors and attempt to take readings from each group using your data logger / wireless module.
- When a group is identified which does not respond, separate the individual sensors and connect each in turn to the WET150 Meter.
- For each sensor, press [SET], scroll down to Address and press [SET] again to display the current SDI-12 address.
- Remove, repair or replace any sensor that fails to correctly display its address, then reconnect all sensors to the network.

* The WET150 Meter supplies 6 volts to attached sensors. Most SDI-12 sensors will work fine with this, but please check the sensor specifications.

Outline specifications

Volumetric Water Content (%vol)	
Accuracy	**± 3%vol** (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 [1]

Permittivity (ε')	
Accuracy	**± (3%** of reading **+ 0.8 ε')** **1 → 40** for ECp ≤ 800mS.m^{-1} **± 5%** of reading **40 → 80** for ECp ≤ 500mS.m^{-1}
Range	Accurate range: **1 to 80**, full range: 1 to 90

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

Temperature		
(the WET150 must be fully equilibrated with the soil to accurately measure soil temperature)		
Accuracy	**± 0.5 °C**	± 0.7 °C
Range	Accurate range: **0 to +40 °C**	Full range: -20 to +60 °C

WET150	
Interface	SDI-12 v1.3
Sealing	IP68
Sample volume	55 x 70 mm diameter (~1 litre needed for full accuracy)
Dimensions	143 x 40 mm diameter
Weight	77g
Warranty	5 years

Meter	
Power requirement	2x AA alkaline batteries
Battery life	~2,400 readings
Dimensions	130 x 66 x 25 mm
Weight	160g
Warranty	2 years

Note [1]: The WET150 has been carefully optimised to provide accurate readings in soils and substrates - readings taken in water or air may not meet the full specification.

Please refer to the **WET150 User Manual** for further details and important notes:

Changing the batteries

You will need a small cross-head screwdriver to access the batteries.

- Unscrew the 2 screws holding the battery cover in place, taking care not to displace the fitted o-rings.
- Remove and replace the 2 AA batteries, making sure to retain the correct polarity.
- Replace the 2 screws.

Note: All configuration settings will be retained.

Care and maintenance

- Do not touch the WET150 rods or expose them to other sources of static damage, particularly when powered up.
- Ensure that the connector is clean, undamaged and properly aligned before pushing the parts together. Screw together firmly for a water-tight seal.
- If inserting the sensor into soil and you feel strong resistance, it is likely you have encountered a stone. Stop pushing and re-insert at a new location.
- Do not pull the sensor out of soil by its cable.
- Protect the meter from heavy rain or submersion.