

4. Soil Moisture Sensors

In this section, the maintenance requirements and best practices for a variety of soil moisture sensors is provided. Information regarding soil moisture sensors calibration and installation can be found from Decagon's [website](#) and in the module [Sensor Installation and Calibration](#). It is recommended that readers go through these resources first to have a basic understanding of the soil moisture sensors.

Decagon Devices, Inc. provides a variety of soil moisture sensors that have different attributes and applications. In addition, sensors that measure electrical conductivity and soil temperature in addition to soil moisture are available.

4.1. EC-5 and 10HS Soil Moisture sensors

These are low cost soil moisture sensors that can be deployed in sensor networks to provide accurate soil moisture reading with minimal interference from soil salinity and texture. Due to its relatively small volume of influence, EC-5 sensor (Figure 11) is suitable for use when accurate soil moisture reading from a specific area is required, for example in small sized pots. The 10HS sensor (Figure 12), on the other hand, has a large volume of influence and is suitable for use with large pots and when accurate measurements over large areas are required.

Both 10HS and EC-5 are analog sensors with row/voltage output. Although row readings from these sensors can be utilized to estimate soil moisture conditions, it is strongly recommended to calibrate the sensors for the specific substrate they are to be used with. During installation, these sensors need to have a good contact with the substrate/soil for proper reading. Presence of air gaps between sensor surface and substrate/soil can easily lead to inaccurate reading.

The sensors are easy to install in soils in the field and can simply be installed in nursery pots as well. Their sharp prongs and flat surface makes them suitable for use in soils/substrates without any type of disturbance. When working with hard surface and in soils with gravels, care must be taken not to break the sensor prongs.



Figure 11. EC5 sensor (Courtesy of Decagon Devices)



Figure 12. 10HS sensor (courtesy of Decagon Devices)

4.2. 5TM Sensor

The 5TM sensor measures soil moisture and soil temperature (Figure 13.) The sensor gives accurate readings in most soils and soilless substrates with minimal interference from soil salinity and textural effects. The small and compact size makes this sensor easy to install and use in fields and get undisturbed readings. It can also be used in greenhouse conditions as well as laboratories.

4.3. GS3 Sensor

The GS3 is a rugged soil moisture, electrical conductivity and soil temperature sensor (Figure 14). The sensor has stainless steel needles that make it suitable for insertion into dry soil and hard substrates. The extended surface area of the stainless steel needles optimizes EC measurements and makes it suitable for use in very porous media such as soilless substrates. With proper installation, the GS3 sensor can give continuous data without need for any maintenance.



Figure 13. 5TM sensor (Courtesy of Decagon Devices)



Figure 14. GS3 sensor (Courtesy of Decagon Devices)

All of the sensors provided by Decagon are compatible with all types of data loggers (Em50, nM50 and nC24) and can be used without any need of complex programming. However, these sensors are also compatible for use with other data loggers (such as Campbell Scientific data loggers) as they have SDI-12 communication options. **However, since various sensors have different excitation voltages, it is important to consult with Campbell Scientific to ensure that any programs are correctly written for each sensor. Not having the correct excitation voltage will result in inaccurate data readings.**

4.4. Flow meter and Solenoids

Sensors and solenoids manufactured by other companies can be integrated to work with Em50 series and nR5 data loggers provided by Decagon Devices, Inc. When such sensors are to be used in the sensor network system, the proper maintenance and troubleshooting guidelines provided by the manufacturer need to be followed.

Reference

Decagon Devices, 2014. Accessed on 12/15/2014 from www.decagon.com.