

Field Scout Soil EC Meter



The Field Scout Direct Soil EC probe permits instant, accurate measurement of salts directly in the soil as well as water or nutrient solutions. Use this portable EC meter and probe to measure soil salinity directly on golf greens, fairways and athletic fields right on the spot, without conducting tedious soil sampling and soil preparation.

You can test different levels in the soil profile with the eight inch long probe. You can also use the probe to fine-tune your fertility program. Measurement can be made directly in the soil without pulling soil cores. Turf managers can monitor for high salt levels on golf course greens and determine when to flush (leach) salts before turf quality declines. Check your water quality or nutrient solutions using the same probe.



Resolution 0.01 mS/cm. Accuracy $\pm 2\%$.
Automatic temperature compensation.
Includes case, calibration standards, and battery.

Field Scout Soil EC Meter - ECM1-N

Introduction

Congratulations on the purchase of your FieldScout Direct Soil EC Meter. This instrument has been specifically designed for direct measurement of salts in soil media as well as water or nutrient solutions. This manual describes how to use your meter and keep it working accurately for many years. Please read it thoroughly to get effective performance from your meter. The salinity of the soil solution, irrigation water or fertilizer solution is an important parameter affecting the root zone environment. Any of these factors can have a significant effect on plant growth and physiology. The easiest way to monitor salinity is by measuring the electrical conductivity (EC). EC is strongly correlated to the salinity of the soil solution. EC measurement is also affected by temperature and, to a lesser degree, by soil moisture content.

Use this portable EC meter and probe to measure salinity in greenhouse soil media right on the spot without tedious soil sampling and preparation. Greenhouse production managers can compare readings from plant to plant and fine-tune their fertility program because measurements can be made directly in a plug tray cell without cannibalizing the seedlings. Turf managers can monitor for high salt levels on golf course greens and determine when to flush (leach) salts before turf quality declines. The meter comes with the Field Scout Soil/Water EC probe. This single, stainless steel probe has a specially designed conical tip. It can measure liquid EC (water or nutrient solutions) or in-situ soil salinity. The probe automatically compensates for temperature.

EC Probe



Electrical conductivity (EC) is an important parameter in evaluating irrigation water and fertilizer solutions. Crops can be damaged if irrigated with water with a high conductivity. The quality of irrigation water has been classified into 5 separate categories (See Appendix 3, p. 21). EC is also an indicator of the strength of fertilizer solutions. In greenhouse applications and other situations requiring frequent fertilization, EC should be checked regularly to ensure the plants are getting sufficient nutrients while avoiding the effects of salt toxicity.

See Appendix 2 for a list of preferred EC values for some common plants. Typically, younger plants will require lower EC than mature plants. The stainless steel soil EC probe is designed to be inserted directly into soil. The sensing surface is composed of 2 pairs of electrodes on the probe tip. Additionally, the probe is narrow in diameter so it can be used effectively in plug trays.

Because EC readings are affected by moisture content, it is important that soil moisture content does not differ significantly between readings. An easy way to achieve this condition is by taking measurements approximately 30 to 60 minutes after an irrigation. This should ensure the soil moisture level has approximately reached field capacity. The probe should be inserted in the root zone. The measurement region is at the tip of the probe. For turf, the root zone is approximately 2" - 4". For vegetables and small plants, this is about 8" - 12". Wait until the meter reading stabilizes before withdrawing the probe. Taking several measurements will allow a representative average to be computed.

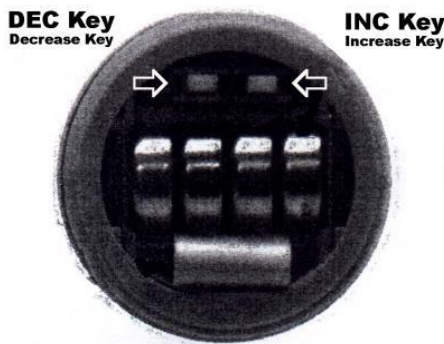
Important: Do not touch the sensor tip with your fingers. The oils on the skin will affect the probe's measurement accuracy.

Probe Calibration

The meter and probe is factory calibrated. However, to ensure accuracy, the meter should be calibrated at least once a month. The meter is calibrated to an EC of 2764 US/cm (2.76 mS/cm) calibration solution. Periodically, the calibration of the meter can be checked by immersing the sensor in this solution. This solution should not be re-used at a later date.

Calibration Procedure

1. Open battery compartment lid (located near the LCD screen) to access the small white Increase (INC) and Decrease (DEC) calibration keys. When looking at the battery compartment with the calibration keys above the batteries, the DEC key will be to the left.
2. Rinse the electrode tip in de-ionized (or distilled) water and then rinse it in the calibration standard.
3. Switch unit on with the ON/OFF key. Place probe tip into a container of calibration standard (2.76 mS/cm). Wait for display to stabilize (display value is unchanged and stable for 3 seconds).



4. Pressing either calibration key will put the meter into CALIBRATION mode. Press the Increase (INC) or Decrease (DEC) key to adjust the reading. If a key is held down, the adjustment will happen more rapidly.
5. When the EC of the calibration standard is reached, release the keys for 3 seconds. The display will flash 3 times, and then show "ENT". The Waterproof EC Tester accepts the calibration value and returns to MEASUREMENT mode.

Important - The meter will NOT calibrate to the common 1314 US/cm (1.31 mS/cm) conductivity standard.

Direct Soil EC Readings

Golf Course Greens/Sports Turf

For golf course greens and athletic fields, following irrigation or deep-soaking rain event the stainless steel probe of the EC Meter can be inserted directly into the soil. By taking measurements at different soil depths, you can determine where the salts are concentrated in the soil profile. Soil moisture content will significantly influence the measured EC value. To ensure accurate measurements, it is recommended the readings be taken when soil moisture is close to field capacity by taking measurements approximately 30 to 60 minutes after irrigation. This should ensure the soil moisture level has approximately reached field capacity. Or use the Turf-Tec Moisture Sensor and record soil moisture readings along with EC Readings.

Probe to the depth of the turf root zone. Measurements exceeding 0.7 mS/cm (approximately equivalent to 2.7 mS/cm in a saturated paste extract) will result in cool season turf grass stress.

Procedure

1. Be sure soil is at field capacity or record moisture content reading from the Turf-Tec Moisture Sensor in percent of soil moisture.
2. Press On/Off to power up the meter.
3. Insert Stainless steel probe tip into the soil to the desired depth.
4. Hold probe still as possible.
5. Wait for reading to stabilize (Stable 3 seconds)
6. Repeat for each one inch increment.

SME Measurement

Saturated Media Extract (SME) Measurements

Growth media used in most greenhouse operations is high in organic material and processed materials and low in mineral soil. These materials are easier to handle, are well aerated and have good moisture-holding properties but have limited ability to retain nutrients. Therefore, tests developed for field soils do not always yield meaningful results. Saturated Media Extract (SME) analysis has been shown to eliminate these problems. The samples should not be fired, sieved or pulverized as this will affect the growth medium properties and alter the results. Traditionally, the soil solution from the saturated medium is extracted by a vacuum pump. However, the Field Scout Soil & Water EC Meter allows the saturated sample to be tested directly.

Procedure

- Moisten the media sample with distilled water to reach a consistent “saturated” moisture level. When saturated, the media should glisten and slide from the mixing spatula with little or no free water.
- Wait 15 minutes and add more water if needed. The sample should have the consistency of a paste with slightly more water than if the media was in a pot and fully irrigated.
- Press On/Off button to power up the meter.
- Insert the probe tip into the media and read the results.

Liquid Measurement/Other Functions

Water (Liquid) Measurements

The Field Scout Soil & Water EC Meter can also measure the EC of liquids. Simply dip the electrode tip into the solution and wait for the reading to stabilize (a stable reading occurs when the readout has not changed for 3 seconds).

Converting Meter Readings to PPM

To convert ms/cm to Parts per Million (PPM) simply take the meter reading and multiply it by 640.
Example $2.75 \text{ mc/cm} \times 640 = 1760 \text{ ppm}$

Other Functions

Hold

Pressing the HOLD key will freeze the display. Press HOLD again to release.

Temperature Measurement

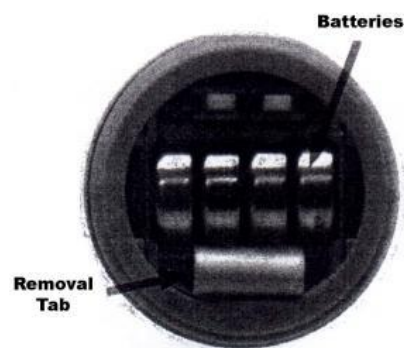
If the temperature of the sample is desired, press the MODE key to toggle between displaying temperature (C) and conductivity on the LCD.

Maintenance/Battery Replacement

Maintenance:

- To improve performance and avoid transferring soil borne diseases, clean the sensor tip by rinsing in alcohol for 5 - 10 minutes.
- Replace all batteries if low battery indicator appears, or if readings are faint or unstable.
- Store the probe sensor dry.

Important: Do not touch the sensor tip with your fingers. The oils on the skin will affect to probe's measurement accuracy.



Changing Batteries:

1. Open battery compartment lid (located near the LCD screen).
2. Remove and replace the old batteries. Note polarity shown in battery compartment. When inserting new batteries, take care to place them over the white removal tab. This will make future battery removal much easier.
3. Recalibrate meter after every battery change.

Specifications

Readout	LCD digital display
EC Range	0.00 - 19.99 mS/cm
Temperature Range	-5 - 55 C
Accuracy	EC: +/-2% Full Scale
Temperature	+0.5 C
EC Resolution	0.01 mS/cm
Operating Environment	0 to 50C
Calibration	1-point with 2.76 mS/cm standard
Temperature Compensation	Automatic form 0 to 50C
Power	Four LR44 1.5V alkaline batteries

Appendix 1

Classification of Irrigation Water

Excellent	EC < 0.25 mS/cm
Good	0.25 mS/cm < EC < 0,75 mS/cm
Permissible	0.75 mS/cm < EC < 2.0 mS/cm
Doubtful	2.0 mS/cm < EC < 3.0 mS/cm
Unsuitable	EC > 3.0 mS/cm

Categories of irrigation water quality based on electrical conductivity. (USDA Tech Bulletin 962)

Appendix 2

Preferred EC Values For Selected Turfgrasses

Sensitive <3 mS/cm	Moderately Sensitive 3 -6 mS/cm	Moderately Tolerant 6 -10 mS/cm	Tolerant >10 mS/cm
Annual Bluegrass	Annual Ryegrass	Bent cv. Seaside	Alkaligrass
Colonial Bluegrass	Chewings Fescue	Perennial Ryegrass	Bermudagrass
Kentucky Bluegrass	Creeping Bentgrass	Tall Fescue	Seashore Paspalum
Rough Bluegrass	Hard Fescue	Buffalograss	St. Augustine grass
Centipedegrass	Bahia grass	Zoysiagrass	

Relative tolerance of turfgrasses to soil salinity measured by the SME Method (“Salinity in Turfgrass”, Harivandi M.A. Butler J.D., Lin w. 1992).

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Hold Harmless Agreement

The seller shall protect, defend, indemnify and hold the purchaser and their respective assigns and their attorneys, accountants, employees, officers and directors harmless from and against all losses, costs, liabilities, claims, damages and expenses of every kind and character, as incurred, resulting from or relating to or arising out of the inaccuracy of results, injury of user, injury of sports participant, turfgrass loss, warranty, covenant or any agreement made by the seller in this agreement.