

Electrical Conductivity (EC): Units and Conversions

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Soluble salts are the total dissolved salts in the root substrate (root medium) at any given time and is measured by electrical conductivity (EC). Most fertilizer materials, except urea, contribute to the EC content of the medium, and the most common are nitrates (NO_3), ammonium (NH_4), phosphates (PO_4), potassium (K), calcium (Ca), magnesium (Mg), sulfates (SO_4), sodium (Na), bicarbonate (HCO_3), and chlorides (Cl). Organic materials (i.e. urea) also contribute to the EC content after they have been changed from an insoluble to soluble form. In some areas, irrigation water can elevated substrate EC levels.

One must be aware of substrate EC levels because excess salts can accumulate when leaching during irrigation is insufficient, too much fertilizer is applied, or when the irrigation water contains a high amount of

dissolved elements. Excessively high EC readings are associated with poor plant growth. If the substrate is allowed to dry down, plants may exhibit wilting symptoms because of root tip dieback. When the substrate EC is too low, plant growth may be stunted from lack of fertilizer.

It is important to monitor the substrate EC to detect trends over time. Samples can be analyzed either within the operation or sent to a commercial lab.

Electrical conductivity units can vary among commercial labs, making interpretation and comparisons difficult. Table 1 helps compare the different units used to express EC and Table 2 contains conversion factors among the various units.



Method	Abbreviation	Units	Example
millisiemens	mS/cm	EC x 10 ⁻³ /cm	2.25 mS/cm
millimhos	mmhos/cm	EC x 10 ⁻³ /cm	2.25 mmhos/cm
A new term for millimhos is millisiemens, which is the metric (SI) unit of expressing electrical conductance. There is no change in value, just terminology.			
decisiemens	dS/m	EC x 10 ⁻¹ /m	2.25 dS/m
Decisiemens per meter is the common term used in scientific literature of expressing electrical conductance. The term deci- means one-tenth and the term milli- means one-thousandth, so a deci- is 100 times greater than a milli-. While expressing dS/m, the denominator is given in terms per meter (m) and for mS/cm the denominator is given in terms per centimeter (cm). One meter contains 100 cm, therefore when comparing values in dS/m and mS/cm, the zeros cancel out mathematically and the decimal point appears at the same place for both units (i.e. 2.25 dS/m = 2.25 mS/cm).			
	mho x 10 ⁻⁵ /cm	EC x 10 ⁻⁵ /cm	225 mho x 10 ⁻⁵ /cm
Some labs prefer to express EC as a whole number (i.e. 225), therefore the decimal point is shifted two places to the right. (The NSUC Plant Disease and Insect Clinic reports in these units.)			
micromhos	μmhos/cm	EC x 10 ⁻⁶ /cm	2250 μmhos x 10 ⁻⁶ /cm
The term micro- means one-millionth and is 1000 times smaller than a milli-.			

From	To	Multiply by:
mmho/cm or mS/cm or dS/m	mho x 10 ⁻⁵ /cm	100
mho x 10 ⁻⁵ /cm	mmho/cm or mS/cm or dS/m	0.01
mmho/cm or mS/cm or dS/m	μmho or mho x 10 ⁻⁶ /cm	1000
μmho or mho x 10 ⁻⁶ /cm	mmho/cm or mS/cm or dS/m	0.001
mmho/cm or mS/cm or dS/m	ppm	670 ¹
ppm	mmhos/cm or mS/cm or dS/m	0.0014925 ¹
mho x 10 ⁻⁵ /cm	ppm	6.70 ¹
ppm	mho x 10 ⁻⁵ /cm	0.14925 ¹
μmho or mho x 10 ⁻⁶ /cm	ppm	0.670 ¹
ppm	μmho or mho x 10 ⁻⁶ /cm	1.4925 ¹
¹ Some labs report EC in the terms of ppm or convert EC to ppm. Although 670 is the basis used in this example, the conversion factor can vary from 640 to 700. This conversion factor is an average because of the variability in the type of fertilizer salts contributing to the EC of the substrate in each sample. This conversion should be considered a broad approximation. Expressing EC in terms of mS/cm or mmhos/cm is the preferred method.		