## SCOPE

This method is for measurement of electrical conductivity on soils that contain excessive concentrations of either soluble salts or exchangeable sodium or both.

## PRINCIPLE

In the measurement of conductivity, a high frequency alternating voltage is applied by a conductivity meter to two electrodes placed at a fixed distance apart and having a sample of liquid between them. The resistance across the electrodes is recorded by the meter which is normally calibrated in mS/cm. The conductivity value obtained is adjusted to a standard temperature of 25°C.

The electrical conductivity yields a measure of the soil extract's capacity to convey an electric current. Electrical conductivity is generally related to the total solute concentration and can be used as a quantitative expression of dissolved salt concentration, even though it is also affected by the mobilities, valences, and relative concentrations of the individual ions present in the solution.

The determination of EC generally involves the physical measurement of resistance (R). The reciprocal of R is conductance (C). When the cell constant is applied, the measured conductance at a specified temperature is converted to specific C, the reciprocal of the specific R is called electrical conductivity.

Electrical conductivity increases with temperature. Conductivity ideally should be determined at 25°C. However, EC can be measured at other known temperatures and corrected to the 25°C reference using appropriate temperature coefficients (usually based on NaCl).

The presence of the major dissolved inorganic solutes, essentially $Na^+$, $Mg^{2+}$, $Ca^{2+}$, $K^+$, $Cl^-$, $SO_4^{2-}$, $HCO_3^-$ and $CO_3^{2-}$, in aqueous samples refers to the term salinity which is measured through electrical conductivity. The EC determination is often sufficient for purposes of diagnosing, surveying, and monitoring soil salinity, and for assessing the adequacy of leaching and drainage. It also, in other cases minimize the number of samples requiring compositional analyses because correlations frequently exist between salinity and the concentrations of individual solutes and their ratios within the same general area of the landscape.

## TEST PRECAUTIONS

If pH is to be determined also, read the conductivity first, before the pH, as the soil solution may be affected by slight leakage from some types of saturated potassium chloride calomel reference electrodes.

Before using the EC meter, it must be calibrated using standard solution. Hence, the apparatus is calibrated with standard Potassium Chloride solutions (147µS/cm, 1413 µS/cm, 12880 µS/cm and 111.8 mS/cm) to check the linearity of the response of the electrode at different EC values and to detect a faulty electrode.

**EQUIPMENT**

a) Conductivity meter

**LABORATORY WARE**

a) Polyethylene bottles with lid wide-mouth type, 50 mL capacity
b) Wash bottle
c) Beakers, 300ml

**CHEMICALS AND REAGENTS**

a) NIST Traceable EC Standard: 147, 1413, 12880, 111.8 mS/cm at 25°C

**HEALTH AND SAFETY**

Wear proper personal protective equipment (PPE) such as lab coat, close shoes, gas mask or dust masks and appropriate gloves when performing chemical analysis to mitigate the harmful effects of exposure on chemicals.

For Laboratory Use: Always check the SDS and COA for each delivered chemical as to confirm if it is compliant with the specifications provided.

**PROCEDURE**

Calibration of the Conductivity Meter

1. Calibrate the conductivity meter according to the maker's instructions using NIST traceable EC Standard 147 µS/cm, 1413 µS/cm, 12880 µS/cm, 111.8mS/cm.
2. Use 25°C temperature if possible or adjust temperature compensator setting on instrument (if fitted); otherwise take the temperature of the solution.
3. Rinse the conductivity cell with deionized water