

Electrical Conductivity Information Sheet

BACKGROUND

Conductivity is one way to measure of the inorganic materials including calcium, bicarbonate, nitrogen, phosphorus, iron, sulphur and other ions dissolved in a water body. It is measured by placing a conductivity probe in the sample and measuring the flow of electricity between the electrodes.

Salinity is the component of conductivity that is critical to the survival of some aquatic plants and animals. Many species can survive only within certain salinity ranges so changes in salinity levels result in changes to the variety and types of species found.

Salinity problems occur where deep rooted vegetation is removed from the surface and through irrigation practices. This means that much more water can infiltrate the soil and causes the water table to rise. This water can move towards the surface, bringing with it large amounts of salt from underground storage. After the water evaporates, high concentrations of salt remain which can eventually find its way into water courses.

Variation in conductivity can result through changes in geology of an area. It can also be due to seepage of groundwater, Industrial and agricultural effluent, stormwater runoff and sewage effluent flowing into the stream.

Measuring Conductivity

Conductivity is measured with a meter in micro siemens per centimetre units (uS/cm). The natural conductivity of fresh water varies from very low values (30uS/cm) to very high values (2000 uS/cm) which is unsuitable for irrigation.

Conductivity measurements are affected by temperature so the water temperature needs to be measured at the same time as conductivity.

HINTS



Sea water is approximately 50,000 Electrical conductivity units (ECs). Many people can taste salt in water at 1,500 to 2,000 ECs.

One milli siemen/cm = 1,000 micro siemens/cm or ECs.

To convert mS/cm to μ S/cm, multiply the reading on the instrument by 1000.

- Be very attentive to the units that your meter reads. As the conductivity of the solution rises past 2,000 ECs, the meter automatically changes to read milli siemens/cm rather than micro siemens/cm.
- Normal reporting of electrical conductivity is in ECs. To be consistent, you should always encourage reporting by monitors in micro siemens/cm or ECs.
- Normally, conductivity meters stay calibrated for some time. If you do not recalibrate every time you use your meter, the meter should be calibrated weekly. Recalibrate more often if your meter is used heavily.
- Rinse the electrode well with clean water after each test.
- If possible, use a standard solution that is close to the level of conductivity in the sample solution being tested.
- Do not place the electrode directly into the standard bottle when calibrating.



Instructions - Eutech EC Testr 11

Equipment

Distilled Water

KCl Standard Solutions (1413 EC's).

Method

1. Remove cap from tester.
2. Press ON/OFF switch to turn meter on. The "MEAS" indicator appears when the tester is in measurement mode.
3. Immerse probes into water sample (2 cm is sufficient). Stir to clear any trapped air bubbles.
4. The upper display shows the conductivity of the solution, automatically temperature compensated to 25°C. The lower display shows the temperature of the solution.
5. Note the units on screen. The units could be $\mu\text{S}/\text{cm}$ (EC) or mS/cm .
6. Record the EC reading direct if units are $\mu\text{S}/\text{cm}$. Multiply the reading by 1000 if the units are mS/cm to convert to EC.
7. Record EC value on result sheet.

Calibration

Auto calibration is suitable if you are using standard conductivity solutions for the calibration process.

1. Switch on the tester. Ensure the tester is in measuring mode.
2. Press INC or DEC key (in battery compartment) to enter calibration mode.
3. The CAL indicator appears and the number of points the tester will be calibrated.



4. Rinse the electrode with calibration standard and dip the electrode in standard solution. Swirl gently to create an homogeneous solution and allow time for reading to stabilize.
5. Press HOLD/ENT key to confirm the calibration. The tester returns to the measurement mode.

Note: The tester shows the error message Er.1 if you press HOLD/ENT key before the tester recognises the calibration standard.

Range Selection

You can set the instrument to limit its reading to a particular measuring range (Hi, Lo) or full scale.

To select a range:

1. Switch off the tester. Press °C/°F key and then switch the tester on. Release the °C/°F key.
2. The tester goes to range selection mode. The display shows the current selected range. Press the HOLD key repeatedly until you see the required range.
3. The tester automatically confirms the last selection if no key is pressed for 5 seconds. The tester then goes to measurement mode.
4. Thoroughly rinse the cell with distilled water using a wash bottle in preparation for sample testing.

Note: The conductivity meter will only need to be calibrated every few weeks if the conductivity probe is kept clean so rinse well after use with distilled water or tank water.

Electrode Maintenance

1. Always keep the sensor electrodes clean. Rinse the electrodes with de-ionized water and wipe them dry with a clean cloth before



storing with its protective cap. Never scratch electrodes with a hard substance.

2. If the tester fails to calibrate or gives fluctuating readings for calibration standards, you need to change the electrode module.

Checklist

- Sea water is approximately 50,000 EC's
- Taste salt in water at 1,500 to 2,000 EC's
- Be attentive to the units that your meter reads. As the conductivity of the solution rises past 2,000 EC's, the meter automatically changes to reading milli-siemens per cm rather than micro-siemens (Electrical conductivity units or EC's).
- **One milli siemen per cm equals 1,000 micro siemens or EC's.**
- Normal reporting of conductivity is in EC's so to be consistent, you should encourage reporting by monitors in micro-siemens per cm or EC's.
- Normally, conductivity meters will stay calibrated for some time. Calibrate weekly until you are sure that the meter is stable. Recalibrate more often if your meter is heavily used.
- Rinse the electrode well with clean water after each test.
- Use a standard solution that is close to the level of conductivity in the sample solution being tested.

Instructions - La Motte Tracer Pocketester

Equipment

Distilled Water

KCl Standard Solutions (1413 EC's).

Method

1. Remove the cap from the bottom of the TRACER to expose the electrode.
2. Fill a sample cap to the 20 ml line with the test sample (depth must be >3 cm).
3. Immerse the TRACER electrode in the sample.
4. Press the ON/OFF button.
5. Slowly stir the sample with the TRACER to remove air bubbles.
6. The meter will auto range to the required range and the reading will be displayed. (The display flashes "0000" while auto ranging)
7. Record EC value on the result sheet.
8. Rinse the electrode in distilled water and replace the cap.

Calibration

The meter must be in conductivity mode to perform the calibration. The meter can perform a calibration for each of three ranges – low, medium and high. The automatic calibration recognition procedure recognises conductivity standards of 84 μS (Low), 1413 μS (Medium) and 12880 μS (High). Always calibrate in the range closest to expected measurement.

1. Fill a sample cup with conductivity standard.
2. Insert the electrode into the standard. Press the ON/OFF button.
3. Press and hold the CAL button for about 5 seconds until the display begins to flash.
4. The meter will automatically recognise and calibrate to the conductivity standard



5. The display will briefly indicate “SA”, END and then return to the measurement mode.

Notes:

- SA will not appear if the calibration fails.
- The conductivity meter will require calibration less frequently if the conductivity probe is kept clean, so rinse well after use with distilled water or tank water.
- Do not touch the electrodes. Touching can damage the electrodes and reduce the life of the electrodes.
- To replace the batteries, twist the battery compartment cap and replace the four SR-44 button batteries. Ensure that polarities are observed. If the batteries are removed, stored readings are lost but the calibration data is retained.

Maintenance:

To store, rinse the electrode in distilled or deionised water
Store the electrode dry with the cap on.



Instructions - TDScan 20

Equipment

Distilled or Deionized Water

KCl Standard Solutions (1413 EC's).

Method

1. Remove cap from tester.
2. Turn on tester by pressing ON/OFF button and wait for the reading to show zero.
3. Immerse probes into water sample to be tested (2 cm is sufficient).
4. Note number on screen once the display stabilises. Notice that reading changes from micro siemens to milli siemens at 2,000 EC. ($1,000\mu\text{S}/\text{cm} = 1\text{ mS}/\text{cm}$)
5. Press hold to freeze the reading.
6. Press again to release it. Record EC value on result sheet.
7. Press the ON/OFF button to shut the meter off.

Calibration

1. Immerse TDScan 20 probes into the standard solution (1413 EC's).
 2. Turn meter on and allow to stabilize.
 3. Press CAL/CON button to enter calibration mode. Press HOLD/INC button to increment the display up or down so that the display shows the calibration value of the standard.
 4. Press the CAL/CON button again and notice the CO on the display confirming the calibration entry into the memory.
 5. Rinse the electrode in tap or distilled water and recheck reading in calibration standard.
 6. Do not return calibration solutions to the stock bottle
- Note:** Do not forget to turn off meter as batteries are very expensive.