

Salinity Sensor

(Order Code NavSA)

The Salinity Sensor measures the conductivity of a solution to determine its salinity.

Collecting Data with the Salinity Sensor

Here is the general procedure to follow when using the Salinity Sensor:

1. Connect the Salinity Sensor to the LabNavigator.
2. The software will identify the Salinity Sensor and load a default data-collection setup. You are now ready to collect data.

Specifications

Range of Salinity Sensor:	0 to 50 ppt (0 to 50,000 ppm)
Resolution	0.02 ppt (20 ppm)
Accuracy:	±1% of full-scale reading
Response time:	98% of full-scale reading in 5s
Temperature compensation:	automatic from 5 to 35°C
Temperature range (can be placed in):	0 to 80°C
Cell constant:	10 cm ⁻¹
Description:	dip type, epoxy body, parallel platinum electrodes
Dimensions:	12 mm OD and 150 mm length
Calibration Values:	
Slope:	16.3 ppt/V
Intercept:	0

How the Salinity Sensor Works

The Forston Labs Salinity Sensor measures the ability of a solution to conduct an electric current between two electrodes. In solution, the current flows by ion transport; therefore, an increasing concentration of ions in the solution will result in higher conductivity values.

The Salinity Sensor is actually measuring *conductance*, defined as the reciprocal of resistance. When resistance is measured in ohms, conductance is measured using the SI unit, *siemens* (formerly known as a *mho*). Since the siemens is a very large unit, aqueous samples are commonly measured in microsiemens, or μS .

Even though the Salinity Sensor is measuring conductance, we are interested in finding *conductivity* of a solution. Conductivity, C , is found using the following formula:

$$C = G \cdot k_C$$

where G is the conductance, and k_C is the cell constant. The cell constant is determined for a probe using the following formula:

$$k_C = d/A$$

where d is the distance between the two electrodes, and A is the area of the electrode surface. For example, the Salinity Sensor has a cell constant:

$$k_C = d/A = 1.0 \text{ cm} / 0.1 \text{ cm}^2 = 10 \text{ cm}^{-1}$$

The conductivity value is found by multiplying conductance and the cell constant.

A potential difference is applied to the two probe electrodes in the Salinity Sensor. The resulting current is proportional to the conductivity of the solution. This current is converted into a voltage.

This sensor is equipped with circuitry that supports auto-ID.

Taking Measurements with the Salinity Sensor

- Rinse the tip of the Salinity Sensor with distilled water. Shake the Sensor as if using a thermometer to remove water droplets that could dilute or contaminate the test sample.
- Insert the tip of the sensor into the sample to be tested. **Important:** Be sure the electrode surfaces in the elongated cell are completely submerged in the liquid.
Note: Do not completely submerge the sensor. The handle is not waterproof.
- Wait for the reading to stabilize. This should take no more than 5 to 10 seconds.
- Rinse the end of the probe with distilled water before taking another measurement.
- If you are taking readings at temperatures below 15°C or above 30°C, allow more time for the temperature compensation to adjust and provide a stable salinity reading.
- **Important:** Do not place the electrode in viscous, organic liquids, such as heavy oils, glycerin (glycerol), or ethylene glycol. Do not place the probe in acetone or non-polar solvents, such as pentane or hexane.

Do I Need to Calibrate the Salinity Sensor?

In most cases, no. Each Forston Labs Salinity Sensor is individually calibrated before it is shipped. This calibration is stored on the sensor and will be used by default.

If you wish to calibrate the Salinity Sensor yourself, you may do so using a two-point calibration.

- **Zero Calibration Point:** Simply perform this calibration point with the probe out of any liquid or solution (e.g., in the air). A very small voltage reading will be displayed on the LabNavigator. Call this value 0 ppt.
- **Standard Solution Calibration Point:** Place the Salinity Sensor into a standard solution (solution of known concentration). Be sure the entire elongated hole with the electrode surfaces is submerged in the solution. Wait for the displayed voltage to stabilize. Enter the value of the standard solution (e.g., 35 ppt). For further information on preparing standard solutions, see the next section.

Storage and Maintenance of the Salinity Sensor

When you have finished using the Salinity Sensor, simply rinse it off with distilled water and blot it dry using a paper towel or lab wipe. The probe can then be stored dry.

Making Standard Calibration Solutions

If you choose to calibrate the Salinity Sensor, you will want an accurate standard solution. Forston Labs sells a 35 ppt standard solution. To prepare your own 35 ppt standard solution using solid NaCl:

- Use a container with accurate volume markings (e.g., volumetric flask).
- Add 33.03g NaCl to enough distilled water to make 1 liter of solution. **Important:** Do not use iodized salt. Use reagent grade NaCl.
- Note also that standard solutions of lower concentration can be prepared by diluting standard solutions of higher concentration.

Note: The Practical Salinity Scale 1978 was developed relative to a KCl solution. *Standard Methods for the Examination of Water and Wastewater* has stated that “A seawater with a conductivity at 15°C equal to that of a KCl solution containing a mass of 32.4356 g in a mass of 1 kg of solution is defined as having a practical salinity of 35.” A standard solution can be made using this definition, but the sodium chloride standard above is easier and just as accurate.

Automatic Temperature Compensation

Your Forston Labs Salinity Sensor is automatically temperature compensated between temperatures of 5 and 35°C. Readings are automatically referenced to a conductivity value at 25°C; therefore, the Salinity Sensor will give the same conductivity reading in a solution that is at 15°C as it would if the same solution were warmed to 25°C. This means you can calibrate your probe in the lab, and then use these stored calibrations to take readings in colder (or warmer) samples. If the probe was not temperature compensated, you would notice a change in the conductivity reading as temperature changed, even though the actual ion concentration did not change.

Using the Salinity Sensor with Other Forston Labs Sensors

It is very important to know that the Salinity Sensor will interact with some other Forston Labs sensors and probes, *if* they are placed in the same solution (in the same aquarium or beaker, for example), *and*

they are connected to the same interface. This situation arises because the Salinity Sensor outputs a signal in the solution, and this signal can affect the reading of another probe.

The following probes *cannot* be connected to the *same interface* as a Salinity Sensor and placed in the same solution:

- Dissolved Oxygen Probe
- pH System
- Ion Selective Electrodes
- Conductivity Probe

If you wish to take simultaneous readings using any of the probe combinations listed above, here are some alternative methods:

- To take simultaneous conductivity and dissolved oxygen or conductivity and pH readings, you can connect the probes to *two different* LabNavigators. If the two probes in question are connected to separate interfaces, the two probes will read correctly in the same solution.
- If you are sampling a lake or stream and want to use two of the probes with a single interface, you can connect the two probes in question to the same interface. Place one probe in the water first and take its reading. Then remove it and place the second probe in the solution to take its reading.

The Stainless Steel Temperature Probe can be used in the same container with the Salinity Sensor.

Sampling in the Field

It is best to sample away from shore and below the water surface, if possible. We do not recommend that you drop the Forston Labs Salinity Sensor into the water such that the entire electrode is submerged. The electrode is not constructed to withstand higher pressures, so seepage into electronic components of the electrode might result. Although it is better to take readings at the collection site, salinity readings should not change significantly if you collect samples and take readings at a later time. However, be sure that samples are capped to prevent evaporation. If sample bottles are filled brim full, then a gas such as carbon dioxide, which is capable of forming ionic species in solution, is prevented from dissolving in the water sample.

Since the probe has built-in temperature compensation, you can do your calibration in the lab. This means that even though you will be sampling in water that has a different temperature than your calibration temperature, the probe will take correct readings at the new sampling temperature.

Warranty

Forston Labs warrants this product to be free from defects in materials and workmanship for a period of one year from the date of shipment to the customer. This warranty does not cover damage to the product caused by abuse or improper use.



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