SALINITY SENSOR BT78i

USER'S GUIDE

CENTRE FOR MICROCOMPUTER APPLICATIONS

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Short description

The Salinity sensor BT78i measures the salinity of a solution in the range from 0 to 50 ppt. The Salinity sensor consists of a Salinity electrode and an amplifier.

Salinity is the measure of all the salts dissolved in water. Salinity is often expressed as parts per thousand (ppt), which is approximately equal to grams of salt per liter of solution. The average ocean salinity is 35 ppt[1] and the average river water salinity is 0.5 ppt or less.

The CMA Salinity sensor can be directly connected to the analog BT inputs of the CMA interfaces. The sensor cable BT - IEEE1394 needed to connect the sensor to an interface is not supplied with the sensor and has to be purchased separately (CMA Article BTsc_1).

Sensor recognition

The Salinity sensor has a memory chip (EEPROM) with information about the sensor: its name, measured quantity, unit and calibration. Through a simple protocol this information is read by the CMA interfaces and the sensor is automatically recognized when it is connected to these interfaces.

If your Salinity sensor is not automatically detected by an interface you have to manually set up your sensor by selecting it from the Coach Sensor Library.

How the sensor works

The sensor determines salinity based on electrical conductivity. The salinity probe measures how much electrical current flows through the water. Water that has dissolved salt in it will conduct electricity better than water with no dissolved salt. The more salt that is dissolved in the water, the better the water will conduct electricity. Salinity is then calculated from the measured conductivity value.

The sensor has a built in compensation for changes in conductivity due to temperature.

Calibration

The CMA Salinity Sensor BT78i is supplied calibrated. The output of the sensor is linear with respect to the salinity. The supplied calibration function is:

Salinity (ppt) = 16.325 * V_{out} (V)

The Coach program allows selecting the calibration supplied by the sensor memory (EEPROM) or the calibration stored in the Coach Sensor Library. The Coach program allows shifting the pre-defined calibration or creating a new two-point calibration if needed.

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[1] 35 grams of salt per 1 liter ocean water

- **Zero calibration point**
  Keep the salinity probe out of any solution e.g. in air. Call this value 0 ppt.
- **Standard solution calibration point**
  Place the salinity probe into a standard solution e.g. 35 ppt and wait for the value to stabilize. Enter the value of the standard solution 35 ppt.

To prepare a solution with salinity value of 35 ppt at 25°C:
- Pour 500 mL of distilled water into a container.
- Add 33.03 g sodium chloride (NaCl) and stir the mixture until all salt has dissolved.
- Add enough distilled water to make 1 L of solution (1000 mL).

Taking measurements

To take measurements with the Salinity sensor:
- Soak the tip of the Salinity electrode in distilled water for about 10 minutes. If this is not possible, rinse the tip thoroughly with distilled water.
- Wipe the outer part of the electrode body with a clean paper towel. Shake vigorously to remove any droplets from the cell chamber.
- Place the Salinity electrode in the sample to be tested. The sample must be at least 3 cm deep to ensure the cell chamber is fully submerged.
- Stir the solution gently, wait for 10 seconds to allow the readings to stabilize.
- If you are taking readings in a solution that has a temperature below 10°C or above 35°C, allow more time for the readings to stabilize.
- Clean thoroughly after the measurement is completed to avoid any contamination for the electrode's next use. The probe can then be stored dry.

WARNING:
- ***Do not*** place the salinity 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*.

Using the Salinity sensor with other CMA sensors
It is very important to know that the Salinity sensor will interact with other CMA sensors, if they are placed in the same solution and 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 sensor. The following sensors cannot be connected to the same interface and placed in the same solutions:
- Dissolved oxygen sensor,
- pH sensor,

- Conductivity sensor.

More sensors can be connected at the same time to the interface but only one at a time can be placed inside the same solution to take readings.

Suggested experiments

The Salinity sensor can be used in the following experiments:

- Measurements of salinity of water sources.
- Measure the change in salinity of saltwater as the water evaporates.
- Monitor the rate of reaction in a chemical reaction in which dissolved salt-ions and solution conductivity varies with time due to an ionic specie being consumed or produced.

Technical Specifications

Sensor kind	Analog, generates an output voltage between 0 .. 5 V
Measuring range	0 .. 50 ppt
Uncertainty (accuracy)	Typical ± 1% after calibration at 25°C
Response time	98% of full scale reading in 5 seconds
Temperature range	0°C to 80°C
Temperature compensation	Automatic between 5°C and 35°C
Cell constant	10 cm^{-1}
Connector	IEEE1394 connector for BT-IEEE1394 sensor cable. Sensor cable not delivered with the sensor.

Warranty:

The Salinity sensor BT78i is warranted to be free from defects in materials and workmanship for a period of 24 months from the date of purchase provided that it has been used under normal laboratory conditions. This warranty does not apply if the sensor has been damaged by accident or misuse.

Note: This product is to be used for educational purposes only. It is not appropriate for industrial, medical, research, or commercial applications.

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