ORP SENSOR BT57i

USER GUIDE

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Short description

The ORP sensor BT57i measures the ability of a solution to act as an oxidizing or reducing agent. ORP stands for oxidation-reduction potential also known as Redox Potential.
The ORP sensor consists of an ORP electrode and an amplifier. The ORP electrode has two components: a *measuring* half cell comprised of platinum metal immersed in the test solution in which the redox reaction is taking place, and a *reference* half cell (sealed gel-filled Ag/AgCl) surround by salt solution. The measuring platinum electrode serves as an electron donor or electron acceptor depending upon the test solution and the reference electrode is used to supply a constant stable output for comparison. The ORP electrode measures the redox potential – difference in the voltage generated by the platinum measuring electrode and the voltage produced by the reference electrode - in the range of -450 to +1100 mV. Readings toward the positive region of this range indicate a strong oxidizing agent, while readings toward the negative region indicate a strong reducing agent.

The ORP electrode has been built into a long plastic tube with an opening at the bottom side and is supplied with a storage bottle containing a protective solution. When the ORP electrode is not being used, it must be kept in the storage bottle.
During measurements the electrode must be dipped in the solution for roughly 1 cm. The electrode is connected to the amplifier by means of a coax cable and a BNC connector.

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

Calibration

The CMA ORP Sensor BT57i is supplied calibrated. The output of the sensor is linear with respect to the redox potential. The supplied calibration function is:

$$V(mV) = 464.84 * V_{out}(V) - 557.08$$

As a result, you do not have to perform a new calibration, just use the calibration supplied by the sensor memory (EEPROM) or the calibration stored in the Coach Sensor Library.

If you are doing water quality testing or performing a chemistry experiment that requires a very accurate calibration, you will need to obtain two commercial ORP standards. Using these standards, perform the following 2-point calibration:

- For the first calibration point, rinse the tip of the electrode with distilled water, and place the electrode into the first standard. When the voltage reading displayed by the data-collection program stabilizes, enter the ORP value (mV) of the first ORP standard.
- For the second calibration point, remove the electrode from the first standard, rinse it with distilled water, and place it into the second standard. When the displayed voltage reading stabilizes, enter the ORP value (mV) of the second standard.
- Rinse the electrode with distilled water and place it into the sample to be measured. You are now ready to take measurements with the calibrated ORP sensor.

Suggested experiments

Redox reactions control the behavior of many chemical constituents in drinking water, wastewater and aquatic environments. The reactivity and solubility of critical elements in living systems are strongly dependent on redox conditions. ORP values are used much like pH values to determine water quality. For example for swimming pools at a normal pH value between 7.2 and 7.6, the ORP value must be kept above 700 mV to kill unwanted organisms. In contrast, in order to support life, natural waters need a much lower ORP value. Generally ORP values above 400 mV are harmful to aquatic life.

The ORP sensor can also be used for redox titrations to determine the equivalence point in an oxidation-reduction reaction.

Technical Specifications

Sensor kind	Analog, generates output voltage between 0 .. 5V
Measuring range	-450 mV .. 1100 mV
Resolution using 12-bit AD converter	0.5 mV
Calibration function	V(mV) = 464.84 * V_{out} (V) – 557.08 pH= -7.78 * V_{out} (V) + 16.34
Power	7 mA @ 5 VDC
Connection	IEEE1394 connector for BT-IEEE1394 sensor cable. Sensor cable not delivered with the sensor.
ORP Electrode	
Type	Sealed, gel-filled, epoxy body, Ag/AgCl reference
Storage solution	pH-4/KCl solution (10 g KCl in 100 mL buffer pH-4 solution)
Temperature range	0 - 60^{0}C
Impedance	~20 kΩ at 25^{0}C
ORP element	99% pure platinum band sealed on a glass stem
Connection	coaxial cable with BNC connector

Warranty:

The ORP sensor BT57i 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 designed for educational purposes.*
It is not intended for industrial, medical, research, or commercial applications.

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