SENECT
connected
sensor systems

Oxygen Sensor O2S

Manual

Product type

Name of product:	SENECT® Oxygen Sensor O2S
Type:	O2S-20-SC
Art.-No.:	2100
Producer:	SENECT GmbH & Co. KG An 44 – No. 11 76829 Landau / Germany

Important note:

Please read this manual carefully and store it so that you can use it later. Read the warning and safety notes attentive.

Further information and latest software releases or documents can be downloaded from:

www.senect.de

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Table of contents

Product type 2
Table of contents 3
Used symbols and wording 5
General Security Notes 6
Intended use 8
Getting started 9
Getting started – Short version 12
Maintenance and cleaning 13
Cleaning 13
Sensor disinfection 13
Recalibration 14
Oxygen signal: 1-Point-calibration 16
Short-version: Oxygen signal: 1-Point-calibration 18
Oxygen signal: 2-Point-Calibration 18
Temperature: 2-Point-Calibration 19
Salinity / Conductivity correction 20
Technical data 22
Information about the correct disposal 23
Guarantee 24

Used symbols and wording

	DANGER! Warning of life threatening dangers. ***WARNING!*** Warning of possible life threatening and / or severe irreversible injuries. ***ATTENTION!*** Warning of possible medium or slight injury.
	ATTENTION! Follow the notes to avoid damage of equipment.
	NOTE! Further information for the use of the device.
	NOTE! Further information for the use of the device.

General Security Notes

The oxygen sensor O2S is an electronic unit for the measurement of the concentration of dissolved oxygen in water and must be used in combination with SENECT control units.

Since it is an electronic product the common prerequisites for a safe instrument usage must be fulfilled. The corresponding control unit must be operatated with 230 V AC (~50 Hz). Ensure that all cables are installed safely so that no obstacles for persons are built and all. Mount all cables and electric devices protected against direct environmental impacts like overheating by direct sunlight and water. Even if the products are protected against spray water, the product´s lifetime will be elongated, if it is mounted on a protected place. The oxygen sensor O2S uses 24 V DC supply voltage which is therefore not of danger for persons.

For many applications a ground fault circuit interruper (interrupting current <= 30 mA) is required by law. Inform yourself about the valid legislation.

The operating temperature of the device must be between 0°C and +40°C. It is not allowed to modify the sensor, to open the housing or to insert anything into the housing.

The oxygen sensor O2S is designed to be operated by professional users. However, it can be operated by children of the age of at least 8 years and persons with limited physical, sensorial or cognitive ability, if they are supervised and trained in the usage of the instrument, so that no dangers or threats can result of the operation.

Please store this manual. We suggest the storage a copy of the manual in the vicinity of the device.

Technical and optical changes of this manual are subject to alterations.

Warning: Before starting any maintenance work, unplug all electrical devices in the water.

Intended use

The oxygens sensor O2S can be used to measure the concentration and saturation of dissolved oxygen (O_2) in water in aquaculture applications. It has a measurement range from 0 to 200% air saturation (a. s.) or 0 to 20 mg O_2 / l at temperatures between 0°C and +40°C.

The sensor measures the saturation concentration based on the principle of luminescence quenching with a resolution of 1% a.s. and the temperature with a resolution of 0.1°C. Based on these two measurements, the absolute concentration of dissolved oxygen in mg O_2 / l is calculated.

The sensor is intended to be used in industrial aquaculture farms in freshwater.

Getting started

Scope of delivery

- 1 x Oxygen sensor O2S
- 1 x Manual

Note

Please check directly after delivery, that the package is not destroyed or damaged or was opened before. Please check also, that all parts as listed above are included. If anything is missing or broken, please contact us as soon as possible within 14 days. Unfortunately, we cannot accept later information of damage, which happened during the transport.

Installation and start-up

Choose a place for the electronic interface of the O2S which is clean, dry and protected from direct sunlight. Ensure that all cables are placed safely and all regulations are fulfilled.

Remove the blue protection cap from the sensor and mount the sensor so that the sensor is submerged.

It is also possible to mount the sensor so that only the lower sensing part is submerged. Please ensure that the sensor is

at least to 80% submerged, since the temperature is measured on the sensor housing.

When the sensor will be installed at a location with a changing water level, it can be mounted free swimming on a float or completely submerged.

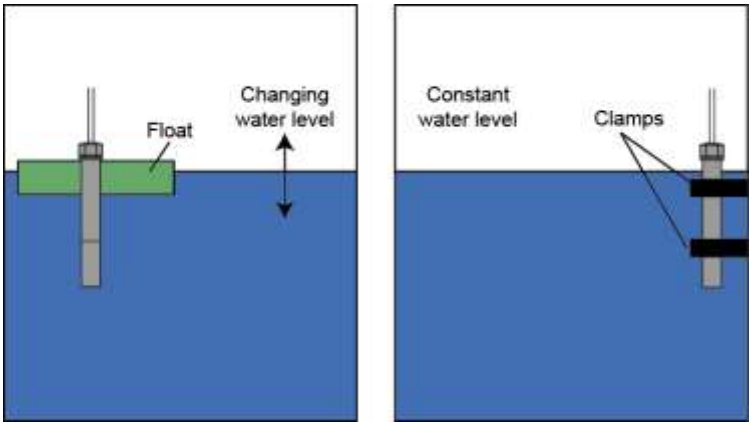


Fig. 1: Mounting possibilities of the sensor.

Please consider when selecting the mounting location that in surface waters like fish ponds the solar radiation can lead to a thermal stratification of the water body, associated with strong gradients in dissolved oxygen.

Ensure to install the sensor at a location, where no rising gas bubbles can be caught under the sensor.

Fig. 2: Stainless steel holder Art. No. 2102.

Protect your sensor from fish biting on the sensor membrane! SENECT offers protection cages.

Connect the blue marked plug of the sensor with a sensor input port (also blue marked) of your control unit.

The SENECT control units recognize the sensor itself and start automatically the measurements.

Take into account that the measurement interval is set to 30 s to elongate the lifetime of the sensing cap.

The oxygen sensor O2S is factory calibrated and need to be recalibrated – under for aquaculture typical environmental conditions – after 6 months.

Getting started – Short version

1. Mount the sensor submerged.
2. Mount the black electronic interface at a protected location.
3. Connect the sensor cable with a control unit (plug „SENSOR“).
4. The control unit recognizes the sensor and starts the measurements.

Maintenance and cleaning

The O2S oxygen sensor measures the oxygen concentration optically. This principle enables long-term stable measurements with a high precision. However, dirt can influence the measurements. For example, a biofilm on the sensing membrane can lead to measurements of the oxygen concentration of the biofilm and not of the surrounding water.

Cleaning

The sensor should be cleaned regularly by wiping with a soft water-dipped paper towel or a cotton swab **without cleaning agents**.

Avoid the contact with organic solvents like for example toluol, acetone or chloroform. These solvents damage the sensing membrane. Also do not steam-sterilize the sensor.

Sensor disinfection

The sensor can be disinfected with peracetic acid (max. 5 mg / l), methanol, ethanol, isopropanol or 3% H2O2 solution. Rinse the sensor afterwards with tap water.

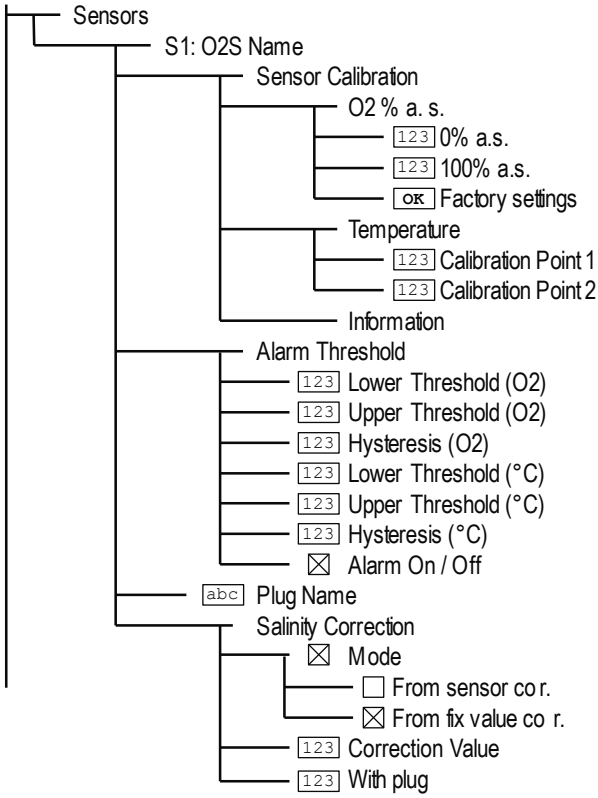
Recalibration

The **recalibration** is recommended for typical applications every 6 months. However, a regular weekly check of the oxygen reading in humid air (should be ~ 100% a.s.) can be used to check if the sensor needs calibration.

In some applications, e.g. under harsh environmental conditions, the sensor must be recalibrated more frequently to guarantee precise measurements. Please check regularly the oxygen reading of the sensor when it is placed in humid air.

Since the florescent membrane is prone to photobleaching effects during the measurement and is therefore an expendable part, it can be changed by replacing the sensor cap (Art.-No.: 2101, Type: O2S-ATK). Please note, that the sensor must be always recalibrated, if the sensing cap is exchanged. A typical lifetime of the sensor cap is > 2 years.

Depending on the actual software version, the menu can be different. You find the latest manuals at www.senect.de.



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Oxygen signal: 1-Point-calibration

Place the sensor for several minutes at humid (100% water vapour saturated) air and ensure, that there are no water drops on the membrane.

Select in the menu „**Sensors**“ the oxygen sensor (O2S) and choose „**Sensor calibration/ O2 % a.s.“**.

Select **100% a.s. (Calibration Point 2)** to take up the 100% a.s. calibration point. Wait the displayed 120 s and save this point with **OK**.

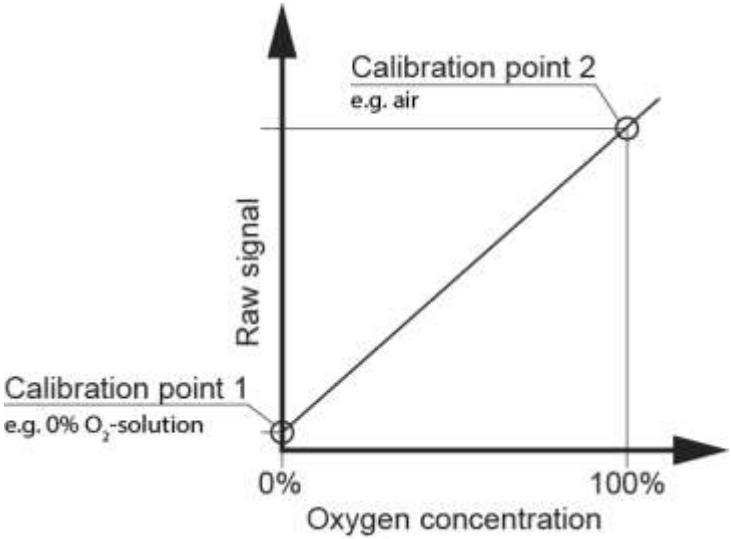

Fig. 1: Calibration diagram with 2 calibration points.

Alternatively, you can use air saturated water to create a 100% a.s. oxygen solution. Aerate therefore water with an air pump and diffusor stone. After several minutes, the water should be equilibrated with the air. This equilibrated water has by definition an oxygen concentration of 100% air saturation.

Attention! By using this method, inaccuracies can be created by:

- The air is injected with a pressure exceeding atmospheric pressure. Therefore, the partial pressure of O_2 can also be slightly increased.
- The exact timing, when 100% saturation is achieved is hard to determine, since oversaturation due to the injection with overpressure can occur.
- Oxygen depleting substances in the water can be present so that 100% a.s. may not be achieved.

Due to these risks, we recommend the calibration on water-saturated air.

The calibration should be carried out at the same temperature like in the measured water.

Short-version: Oxygen signal: 1-Point-calibration

1. Place the sensor in air
2. **Menu / Sensors / O2S / Sensor calibration / O2 % a.s. / 100% a.s.**
3. Wait 120 s.
4. Press **OK**. Finished!

Oxygen signal: 2-Point-Calibration

For the **2-Point-Calibration** perform at first the previous step (calibration of calibration point 2, e.g. in air). Additionally, perform the same procedure when the sensor is submerged in oxygen-free water.

You can create an oxygen-free solution by adding 1 tea spoon of sodium sulphite in 100 ml water (concentration 2 mol / l). Please wait 15 minutes until all oxygen is reduced.

Dip now the sensor in the solution, wait until the measurement value is stabilized and select in the menu: **0% a.s. (calibration point 1)**. Save this calibration point.

More background information about the calibration of oxygen sensors can be found in the DIN EN 25814.

Temperature: 2-Point-Calibration

To calibrate the temperature signal of the O2S, two calibration points are necessary. The calibration point 1 must have a lower temperature (e.g. 0°C) than calibration point 2. This temperature must be lower than 20°C.

The calibration point 2 (higher temperature) must be between 30°C and 50°C.

Submerge the sensor in a water bath with the lower temperature (calibration point 1) and wait, until the sensor has the same temperature as the water. Select in the menu "**Sensors / O2S / Sensor Calibration / Temperature / Calibration point 1**". Measure the water temperature with a reference thermometer and enter this temperature with the cursor keypad. Confirm the calibration point with **OK**.

Repeat this procedure for the upper calibration point 2 with a temperature between 30°C and 50°C.

Tipp: You find the calibration information in the menu under "**Sensors / O2S / Sensor Calibration / Info**".

Abbr.	Description
SN	Serial number
C0	Raw signal O2 at lower calibration point 1 (0% a.s.)
C1	Raw signal O2 at upper calibration point 2 (100% a.s.)
T0	Raw signal temperature at lower calibration point 1 (e.g. 0°C)
T1	Raw signal temperature at upper calibration point 2 (e.g. 0°C)

The SENECT control units measure the atmospheric pressure and use this value for an automatic pressure compensation.

Salinity / Conductivity correction

By connecting an SENECT conductivity sensor CON to the SENECT control unit, an automatic salinity correction based on conductivity measurements for the oxygen measurement can be made (**“Sensors / O2S / Salinity correction” – Mode: From sensor cor.**).

In case there is no conductivity sensor connected, the conductivity can be entered manually under **“Sensors / O2S / Salinity correction / Correction value”.** Select also as **Mode: From fix value cor.**

Technical data

Dimensions probe:	Ø 12 mm, length: 85 mm
Weight probe	ca. 100 g
Cable length total:	10 m
Voltage:	24 V DC
Power consumption:	<< 1 W
Temperature range:	0° to 40 °C
Max. pressure	3 bar
Measurement range:	0 - 200% / 0 - 20 mg O_2 l^{-1}
Precision oxygen:	< 1% FS
Precision temperature	< ± 1°C
Response time:	T_{90} < 30s
Ingress protection	IP68

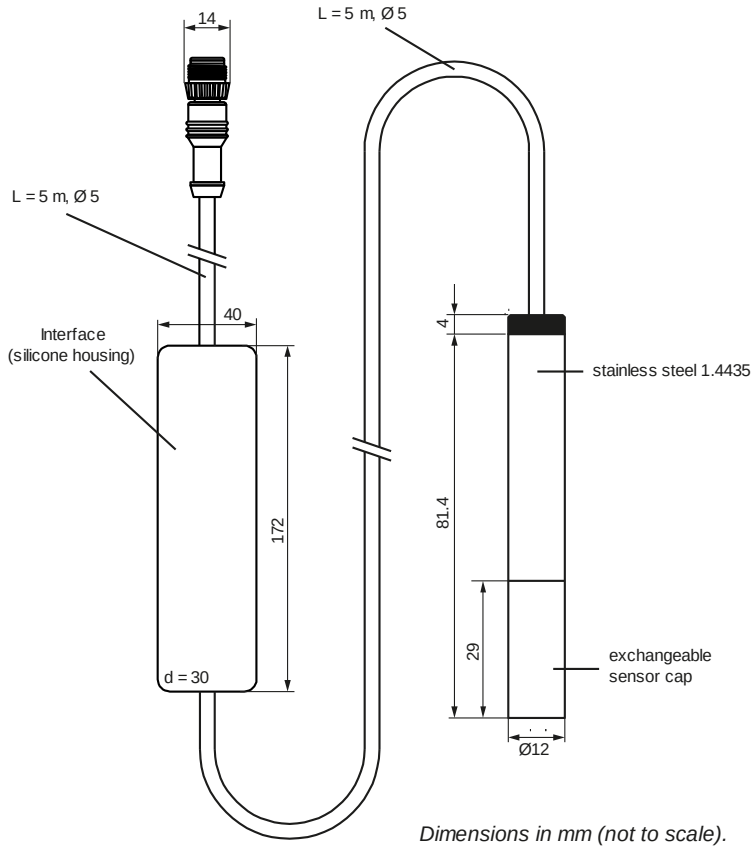

Fig. 3: Sensor dimensions.

Information about the correct disposal

Your device is well packed at delivery. Please dispose the packaging material accordingly to the regulations in your country.

Do not throw the product in the casual litter bin. Make sure you are informed about the local disposal regulations and dispose your product accordingly. Alternatively, you can also send the product back to the producer.

The SENECT GmbH & Co. KG is member of the Stiftung Elektro-Altgeräte Register and the products are registered (WEEE-Reg.-Nr.: DE37193510).

Guarantee

Please check at delivery of your device, that all parts are delivered completely and that they function correctly. In case of any claims, contact us immediately per email or phone (info@senect.de or +49-6341 - 95 95 210). Please describe your claim as detailed as possible so that we can provide a solution as fast as possible. The product has a guarantee of 1 year and a warranty of 2 years. Furthermore, the § 377 HBG (German law) is valid.