OxyScan

Light

UMS oxygen sensor 201®

Microprocessor-controlled measuring device

Operating instructions

Introduction

Thank you for choosing the UMS Oxygen Measuring Unit 201® - a highly advanced product! Please read these operating instructions carefully to avoid damaging the sensor and the measuring device.

Contents

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1. Scope of delivery

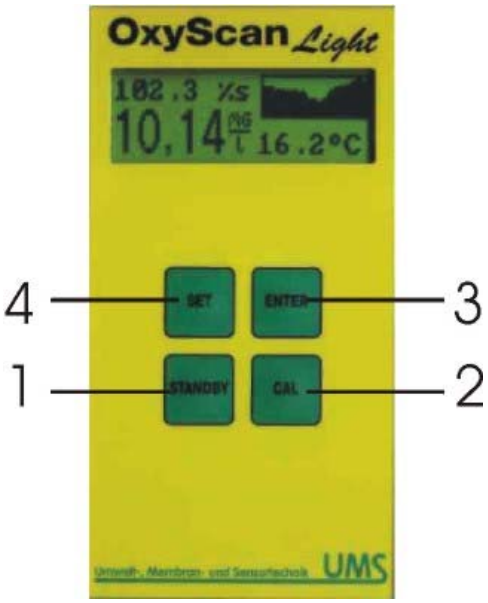
- Hand-held measuring unit
- - Sensor with calibration chamber
- - 9V – block battery (in the measuring device)
- - Carrying case
- - These operating instructions

Carefully unpack the measuring system and check that all components have been supplied.

2. Instructions for handling the unit

The delicate sensor tip forms the core component of the oxygen sensor.
The membrane at the tip of the sensor of the oxygen electrode can be damaged if it is accidentally struck against an object. If the values displayed on the screen constantly increase, this indicates that the membrane is damaged. If this is the case, the sensor must be replaced or regenerated.

3. Description of the control elements



1 On / off switch
2 Calibration button
3 SET: for opening the menu or selecting items from the menu
4 ENTER: for saving a measuring value (measuring mode) or confirming a selection made in the menu

4. Commissioning

The connection for the oxygen sensor is located at the top of the measuring device. Connect the plug of the sensor cable with the connection at the measuring unit. If not yet available, fit a 9V block battery (battery or accumulator) into the battery compartment on the back at the bottom of the measuring device (locked with 2 screws). Enter the current air pressure as described under point 9.5 in order to calibrate the measuring unit as accurately as possible.

5. Calibration

Place the sensor inside the calibration chamber and press the “CAL” button on the measuring device. The calibration process then starts automatically and stops once a sufficiently stable calibration value has been reached. While doing so, the sensor and the sensor cable in particular should not be moved, as this prolongs the time required for the calibration or will cause an error message to be issued (“unstable value”).
Please ensure that the temperature of the sensor does not change during the calibration process. In the event that the sensor was exposed to colder or warmer temperatures before the calibration, the sensor should be left inside the calibration chamber for a couple of minutes before starting the calibration process.
If the sensor has not been used for a long period of time, the measuring unit should be turned on with the sensor being connected for 10 minutes before use, after which the unit can be accurately calibrated.
The bottom part of the calibration chamber is fitted with a white plug, which holds a plastic sponge. The sponge must be moistened approx. every 4 weeks. To do so, proceed as follows:
- Pull out the plug.

- Sprinkle a little water onto the plastic sponge until it is damp.
- Close the calibration chamber.

The sensor is usually stored in the calibration chamber. It must be ensured that the sponge in the calibration chamber is always damp (see above).

Note:

This oxygen measuring system is a highly advanced product. Your contribution to achieving accurate oxygen content measurements is to calibrate the system.

Frequent calibration increases the accuracy of the measurements!

6. Measuring

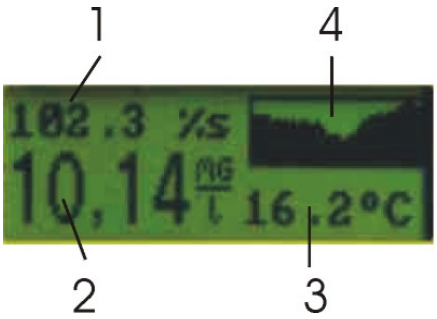
Once the measuring system has been calibrated, the oxygen content of the respective medium can be measured.

Note:

The tip of the sensor must be positioned at a medium depth inside the container, although at a minimum of 5 cm below the surface.

The sensor always needs a minimum level of flow. This must also be taken into account when the sensor is permanently installed in a system!

7. Description of the display in measuring mode



1: Oxygen content in % saturation
2: Oxygen content in mg/l
3: Temperature in °C
4: Diagram of the last 50 measuring values in mg/l or, if the battery is low, the LowBat symbol

8. Measurement memory

The measuring unit has a measurement memory for 50 measurements (in %sat, mg/l and temperature respectively). The current measuring values can be saved by pressing the "ENTER" button in measuring mode. When doing so, the memory location of the measuring values (0…49) is also briefly displayed. Point 9.1 and 9.2 contain a detailed description of how the saved values can be retrieved and deleted.

9. Description of the menu items

You can enter the menu, in which the settings described in the following can be selected, by pressing the "SET" button.

Individual menu items are also selected by using the "SET" button. Once the required menu item has been selected, the selected option can be opened by pressing "ENTER". Pressing the "BACK" button will bring you back to the measurement display. Some of the menu items contain fields for entering values. The top line always contains the relevant designation and the next line contains the value that is to be adjusted. The last line contains a small menu for

reducing/increasing the respective value and/or closing the display. The values in these menus are also selected by using the “SET” button and confirmed by pressing the “ENTER” button.

9.1. Delete values

The “Delete values” function can be selected to delete all saved measuring values.

CAUTION: Deleted values cannot be restored.

9.2. Display values

When using this function, the saved measuring values are displayed in the top three lines. The last line contains a small menu through which measuring values can be selected and deleted. Selections in this menu are also made as described under point 9 with the aid of the “SET” and “ENTER” buttons.

9.3. Automatic switch off

The measuring unit automatically switches itself off after a specific period of time in order to preserve the battery. This period of time can be selected in the “Automatic switch off” menu. To prevent the unit from automatically switching itself off, select 0:00 minutes.
When the voltage of the battery has dropped below a certain value, a LowBat warning is shown on the display instead of the diagram. When this happens, the automatic switch off function is automatically set to approx. 1 minute to prevent the battery from totally discharging. In this case, the battery must be changed and the required value for the automatic switch off function must be re-adjusted.

9.4. NTC correction

The NTC correction value depends on the sensor that is being used and has been adjusted at the factory to the supplied sensor. This value normally only has to be changed if a sensor other than the one supplied is being used.

If the displayed temperature and the actual temperature differ, this can be corrected by reducing the “NTC correction” value by the difference between the two values (e.g. if the measuring unit displays 20.2 °C instead of the actual 20°C, the value must be reduced by 0.2 K)

9.5. Air pressure

This function should be used to enter the current air pressure in order to ensure that the calibration and the displayed oxygen saturation value (%sat) are as accurate as possible.

9.6. Cal. end value

The end value of the calibration is the value to which the measuring unit is calibrated. When using the calibration chamber for calibrating, this values amounts to 102.3 %sat at room temperature. If other calibration methods are used, this value must be changed accordingly.

9.7. Device information

This function displays the serial number of the unit and of the supplied sensor, as well as the firmware version (software version).

10. Storing the sensor

The sensor is supplied inside the calibration chamber and should always be stored inside it. When doing so, it must be ensured that the calibration chamber is always kept damp (see point 5, calibration).
If it is not possible to regularly check the calibration chamber to make sure it is damp, the sensor can also be stored in a container filled with water. In this case, it must be ensured that the tip of the sensor is always immersed in water or that the atmosphere inside the container is damp.

11. Additional functions / firmware

Depending on its equipment, the microprocessor-controlled measuring device may have additional functions that are not listed in these operating instructions. If this is the case, a description of these functions is usually provided on a separate enclosed sheet.
The measuring unit can also be equipped with additional functions at a later date. Due to the special microcontroller technology used in the device, we are also able to equip the device with customer-specific functions. Please get in touch for further information on this option!
All of the measuring unit's functions are controlled by a mircrocontrller in accordance with a program developed by UMS. This program (= firmware) is stored in a memory module that should only be replaced by UMS or other authorised personnel.
The firmware used in the measuring unit has been thoroughly tested. We are nonetheless constantly working on upgrades and improvements. If you would like to obtain the latest firmware for your unit, just give us a call and give us your current firmware version (see 9.6 "Device information"). We will then be able to inform you about the additional functions provided through the firmware upgrade.

12. Operating principle of the sensor

The oxygen sensor is based on the Clark principle and measures the dissolved oxygen in the water. The oxygen diffuses through the membrane at the tip of the sensor and is reduced at the cathode. The electrons released during this process flow to the anode and generate a current that can be electronically analysed in the measuring unit.
The current flow in the sensor is, however, not only determined by the oxygen content of the water, but also by the temperature of the water and the air pressure. In order to compensate for these factors, the measuring device for our oxygen sensor is equipped with an automatic temperature and air pressure compensation function.

13. Liability and warranty

We reserve the right to make technical changes!
We do not accept any liability for any damage caused by improper use, incorrect application or functional failures of the device.
The entire measuring system is covered by a statutory 6 month guarantee. If the device fails during the warranty period, please return the sensor or measuring unit to us together with the test certificate.

14. Technical data

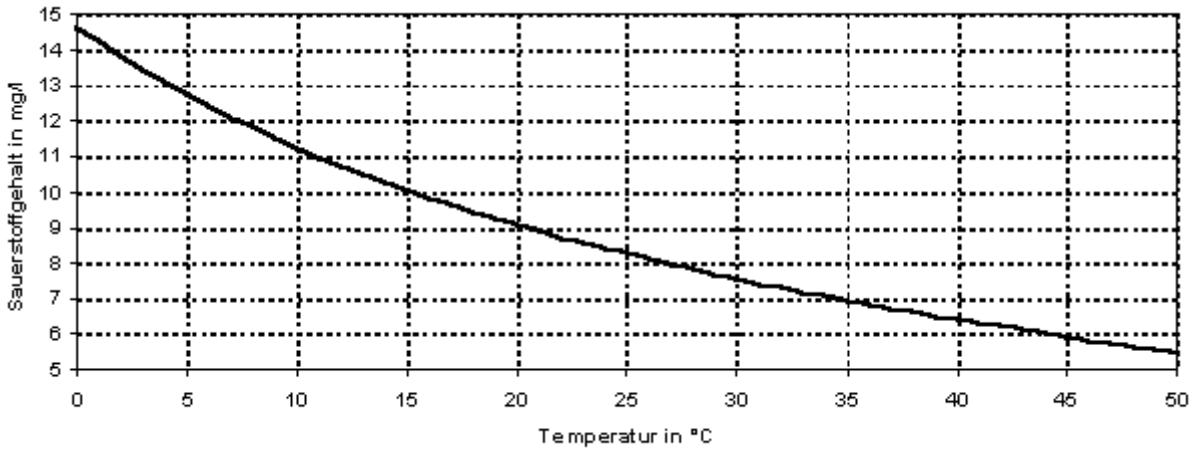
Measuring ranges
O_2 concentration range: 0.0 – 19.99 mg/l
Resolution: 0.01 mg/l
Accuracy: ± 0.1 mg/l
O_2 saturation range: 0.0 – 199.9 %sat
Resolution: 0.1 %sat
Accuracy: ± 0.5%
Temperature range: 0.0 – 50.0 °C
Resolution: 0.1 K
Accuracy: 0.5 K
Temperature compensation: automatic, range: 0 ... 50 °C
Air pressure correction by manual input, automatic calculation
Ambient temperature: 0°C-50°C sensor, 0°C - 70°C measuring unit
Display: graphics capable LCD 120 x 32 pixels
Electrode: Pt cathode, Ag anode
Power supply: 9 V – block battery (it is also possible to use a 8.2 V accumulator)
Measuring device dimensions: 151 x 8:2 x 33 (LxWxH, mm)
Sensor dimensions: 15 x 1.45 (Lx∅, mm)
Measuring device weight: approx. 295 g (incl. battery)
Sensor weight: approx. 128 g (incl. cable)
Sensor polarisation voltage: 750 mV
Sensor polarisation time: max. 5 min
Sensor response time: approx. 30s
The useful life of the electrolytes amounts to approx. 2 years. The sensor cannot be regenerated by the user and has therefore been designed for a long service life. This also eliminates a number of potential error sources that can arise as a result of the regeneration process.

You can obtain a cost-efficient regenerated sensor by returning the worn out sensor.

15. Appendix

(The following tables only apply in reference to the outlined conditions!)

Oxygen content of freshwater at saturation
in dependence on water temperature



Maximum dissolved oxygen content in freshwater
in mg/l at different temperatures and normal pressure (1013hPa = 760Torr)

°C	mg/l	°C	mg/l	°C	mg/l	°C	mg/l
0	14.64	10	11.25	20	9.08	30	7.55
1	14.23	11	10.99	21	8.90	31	7.42
2	13.83	12	10.75	22	8.73	32	7.30
3	13.45	13	10.51	23	8.57	33	7.18
4	13.09	14	10.28	24	8.41	34	7.06
5	12.75	15	10.06	25	8.25	35	6.94
6	12.42	16	9.85	26	8.11	36	6.83
7	12.11	17	9.64	27	7.96	37	6.72
8	11.81	18	9.45	28	7.82	38	6.61
9	11.53	19	9.26	29	7.69	39	6.51
10	11.25	20	9.08	30	7.55	40	6.41

Oxygen content of seawater at saturation
in dependence on salt content (through density) and temperature
at normal pressure (1013hPa = 760Torr)

Density in g/cm^3	**10°C O_2 in mg/l**	**15°C O_2 in mg/l**	**20°C O_2 in mg/l**	**25°C O_2 in mg/l**	**30°C O_2 in mg/l**
1.000	11.25	10.06	9.09	8.26	7.49
1.005	10.81	9.69	8.76	7.96	7.21
1.010	10.38	9.32	8.44	7.65	6.93
1.015	9.94	8.95	8.11	7.35	6.65
1.020	9.51	8.58	7.79	7.05	6.38
1.025	9.07	8.21	7.46	6.74	6.10
1.030	8.64	7.85	7.14	6.44	5.82

Salt content (salinity in g/l = ‰) **of seawater** in dependence on temperature and density

Density in g/cm^3	**10°C Salinity in ‰**	**15°C Salinity in ‰**	**20°C Salinity in ‰**	**25°C Salinity in ‰**	**30°C Salinity in ‰**
1.000	0	0	0	0	0
1.005	6.7	7.5	8.5	10.8	13.1
1.010	13.2	14.4	15.6	17.2	18.8
1.015	19.6	20.9	22.1	23.6	25.1
1.020	26.0	27.3	28.6	30.6	32.6
1.025	32.5	33.9	35.3	37.1	38.9
1.030	38.8	40.4	42.0	44.2	46.4

If you have any technical queries or want to order additional accessories or sensors, please contact:

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