Operating Manual for

Oxymeter GOX 20

measuring device for dissolved oxygen in liquids

Specification:

Measuring range:
Oxygen: 0.0 ... 20.0 mg/l O_2
Temperature: 0.0 ... 40.0 °C

Resolution:
Oxygen: 0.1 mg/l O_2
Temperature: 0.1 °C

Accuracy: (at nominal temperature) ±1digit
Oxygen: ± 2 % of meas. value ± 0.2 mg/l
Temperature: ± 0.3 °C (ranging from 0-30°C)

Electrode: active type. electrode dia front: approx. 12mm, length: approx. 220mm (incl. anti-buckling protection), cable, approx. 2m long, permanently connected to measuring device

Response time: 95% in 10sec., depending on temperature.
Service life: 3 years or more depending on proper maintenance
Operating pressure: max. 3 bar.

Temperature compensation: automatically via temperature sensor integrated in electrode.

Calibration: electrode may be calibrated quite simply in atmospheric air.

Display: 3½-digit, 13mm high LCD-display

Nominal temperature: 25 °C

Operating conditions: 0 to 50 °C, 0 to 95 %RH (non condensing)

Storage temperature: -20 to 70 °C

Power supply: 9 V-battery, type IEC 6F22 (included)

Power consumption: max. 1 mA

Low battery warning: „BAT“ will be displayed automatically at the left hand corner of the display as soon as battery is low .

Dimensions: 106 x 69 x 30 mm. shock-resistant ABS housing.

Weight: approx. 250 g (cpl. with battery and probe)

EMC: The device corresponds to the essential protection ratings established in the Regulations of the Council for the Approximation of Legislation for the member countries regarding electromagnetic compatibility (2004/108/EG) additional fault: <1%

Please note:

Store the oxygen electrode always in water, either in the protective flask, or directly in a vessel filled with dechlorinated water. For storage in the protective flask first push the cap oh the electrode second the o-ring and thereafter put the electrode in the flask and screw the cap down the flask.
Note: for measuring remove the protective flask!
If the diaphragm has dried up the electrode must be soaked in water for approx. 2 h prior to measuring start-up. Then a calibration can be carried out without any problems.

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Oxygen measurements:

Please observe the following rules when measuring dissolved oxygen:

- As it is subject to an ageing process the electrode needs to be calibrated at regular intervals. To do so the electrode has to be adjusted according to the oxygen content of the atmospheric air. We recommend that a calibration is carried out before a new measuring series is started.
- The electrode temperature has to be identical to those of the liquid to be measured. This can be checked as follows:
  Switch device to temperature display mode and stirr electrode in water till the temperature display shows a steady measuring value.
- To obtain accurate oxygen measuring results the electrode needs to be stirred with **at least 30cm/s**.
  A sufficient flow speed is achieved by moving the electrode by hand or by means of a stirring apparaturs. The minimum required flow speed is achieved when an even quicker movement of the electrode does not result in an increased value being displayed.

How to carry out measurements:

1. Switch on device and set to temperature display.
2. Place electrode in object to be measured and wait for the temperature display to become steady.
3. Switch over device to oxygen measuring. Generate flow speed required by stirring. Read-off measuring value as soon as it is steady.

Calibration in air:

Each device has been tested and calibrated in our works.
As mentioned above the oxygen electrode is subject to ageing; we, therefore, recommend to check calibration prior to starting a new measuring series:

- Clean membrane with a soft cloth. Put electrode on table wrapped in Kleenex or a towel to protect it from draughts.
- Switch over to temperature measurements and wait for the electrode to adopt the ambient temperature (approx. 15 minutes). Make sure that electrode is not subjected to any external heat sources (e.g. lamp etc).
- As soon as the temperature is steady, switch over device to oxygen measuring and compare the oxygen concentration shown with the values given in the table below.

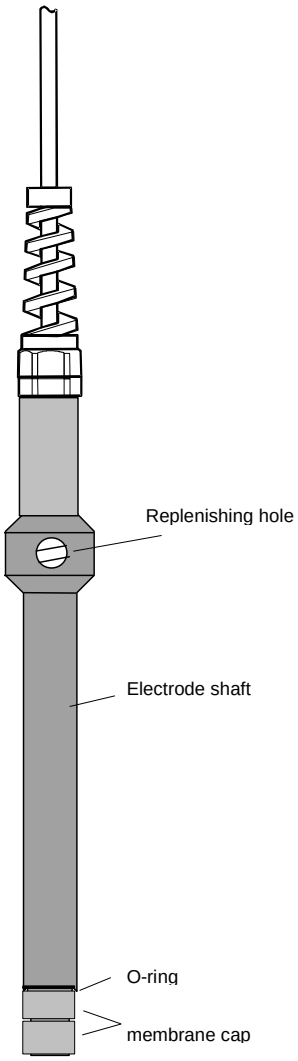
Air temp. (°C)	O_2-value (mg/l)	Air temp. (° C)	O_2-value (mg/l)	Air temp. (°C)	O_2-value (mg/l)
0	14,1	11	11,1	22	9,1
1	13,8	12	10,9	23	9,0
2	13,5	13	10,7	24	8,9
3	13,2	14	10,5	25	8,7
4	12,9	15	10,3	26	8,6
5	12,6	16	10,1	27	8,5
6	12,3	17	9,9	28	8,3
7	12,1	18	9,8	29	8,2
8	11,8	19	9,6	30	8,1
9	11,6	20	9,4	31	8,0
10	11,3	21	9,3	32	7,9

If the value displayed on the **GOX 20** differs from the one given in the table, it may be adjusted by means of the „slope-knob“.

If it can no longer be adapted to the values given, the oxygen electrode needs maintenance or is used up and needs to be replaced.

GOX 20 can also be calibrated in water. We, nevertheless, recommend air calibration as, without additional equipment, it is quite difficult to determine if the water used for calibration is oxygen saturated or not.

The oxygen electrode:



The oxygen electrode is an active electrode consisting of a silver cathode and a lead anode using potassium hydroxide (KOH) as an electrolyte. In case of oxygen being present it will be reduced at the silver cathode and the electrode produces electric current. In case of no oxygen being present not current will be produced. Both the silver cathode and the lead anode will be used up during oxygen measuring. The electrode ages. We, therefore, recommend regular maintenance of the electrode at monthly intervals (p.r.t. 'Electrode maintenance').

When is electrode maintenance required:

- Unless it is used the electrode is to be stored in the protective flask filled with water or directly in a vessel filled with dechlorinated water.
- Residues of bacteria, fungi or algae must be removed prior to measuring using a soft paper towel .
- If a calibration can no longer be carried out or if the membrane is damaged the electrode needs maintenance.
- In the course of the time air bubbles may accumulated underneath the membrane. As long as they are small and do not affect the silver cathode the measurements will not be influenced. If, however, there is a large ring of air bubbles underneath the membrane covering the silver cathode, the electrode needs maintenance.

Safety advice:

! Attention during maintenance is required as the electrolyte is highly corrosive!

Use disposable gloves during maintenance, if available, or rinse hands thoroughly with water.

Electrode maintenance:

1. Prepare liquid absorbing paper towel.
2. Remove membrane cap and wipe off electrolyte solution with paper cloth.
3. Clean silver cathode using sand paper (grain size 240). Do not shine silver cathode as its surface needs to be rough so that the electrolyte can be dispersed evenly. Remove any dust from grinding.
4. Take out replenishing screw and top up with electrolyte till it is spilling out (e.g. using a disposable syringe). Put back replenishing screw.
5. Put new membrane cap on the paper towel and fill up with electrolyte making sure there are no air bubbles.
6. Put electrode into cap vertically from above till the thread catches. Then take up cap with paper towel and screw onto electrode from underneath. Electrolyte will be displaced from the membrane head, flowing over.
7. Mop up excess electrolyte using paper towel.
8. Turn electrode around and check for air bubbles. If there are no air bubbles or only tiny ones the maintenance has been completed. If there are large air bubbles the process has to be repeated.

If O-ring has been damaged, it has to be replaced.

Please note: Prior to its being calibrated again the electrode needs to be lying on a table for at least 3 hours.

If electrode can no longer be calibrated although it has been properly maintained, the electrode needs to be returned to manufacturer for check up and may have to be replaced.

What to observe during operation:

a.) As soon as "BAT" is displayed the battery is used up and needs to be replaced immediately as too low operating voltage may result in incorrect measurements. Unless the battery is replaced immediately the voltage will not even be enough to display „BAT“. Therefore, make it a rule to always check the battery – even if no ‘BAT’ warning is displayed – if measuring results are incorrect.

b.) For measuring remove the protective flask of the electrode

c.) **Please note:** the electrode measurement is sensitive against shocks!
By stirring of the electrode in the measured liquid be careful that the electrode does not hit the container. A vibration of the electrode has a effect to the measured value.

Safety Requirements:

This device has been designed and tested in accordance with the safety regulations for electronic devices.
However, its trouble-free operation and reliability cannot be guaranteed unless the standard safety measures and special safety advises given in this manual will be adhered to when using the device.

1. Trouble-free operation and reliability of the device can only be guaranteed if the device is not subjected to any other climatic conditions than those stated under "Specification".
2. The battery has to be taken out, when storing device above 50°C.
   It is recommended to take the battery out, when storing device for a longer period of time.
3. If the device is transported from a cold to a warm environment condensation may result in a failure of the function. In such a case make sure the device temperature has adjusted to the ambient temperature before trying a new start-up.
4. If device is to be connected to other devices the circuitry has to be designed most carefully.
5. If there is a risk whatsoever involved in running it, the device has to be switched off immediately and to be marked accordingly to avoid re-starting.
   Operator safety may be a risk if:
   - there is visible damage to the device.
   - the device is not working as specified
   - the device has been stored under unsuitable conditions for a longer time.

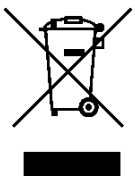
   In case of doubt, please return device to manufacturer for repair or maintenance.
6. **Warning:** Do not use this product as safety or emergency stop device, or in any other application where failure of the product could result in personal injury or material damage.
   Failure to comply with these instructions could result in death or serious injury and material damage.

5. **Caution, acid!** The electrode contains **KOH**. KOH can cause severe chemical burns!
   If leaking, avoid contact!

If there was contact:
- to skin: Flush contacted area with large amounts of water for several minutes.
- to clothing: remove contaminated clothing.
- to eyes: Flush with large amounts of water for several minutes, obtain medical treatment.

After swallowing:
- give large volumes of water. DO NOT induce vomiting!
- Obtain medical treatment.

Disposal instructions



- Dispense exhausted batteries at destined gathering places.
- The electrode contains lead and caustic electrolyte. Dispose as special waste.
  According to the ElektroG *(law for bringing into market, the return and the environmentally friendly disposal of electronic equipment)* we accept the return of the electrode and the device.
  Send the device or electrode directly to us (sufficiently stamped), if it should be disposed. We will dispose it appropriately and environmentally friendly.