

## Oxygen Measuring Device for diving gas mixtures

as of V1.0

Operating Manual

# GOX 100T



WEEE-Reg.-Nr. DE 93889386

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## 1 Intended use

This device measures the oxygen concentration in gas mixtures and air. The actual measurement takes place at the opening of the sensor. Due to the design of the sensor, the device has to be calibrated at regular intervals (at fresh air =20.95% oxygen) to get accurate measuring values. If the sensor is used up, this will be detected at calibration and the sensor element has to be replaced before the next measurement.

By means of the integrated hold-function, the MOD-Display (max. operating depth) and a specialized sensor, it is optimized for the testing of diving gas mixtures (such as NITROX).

## 2 General note

Read this document carefully and get used to the handling of the device before you use it. Keep this paper ready to hand in order to look it up if a question turns up.

## 3 Disposal notes



Dispense exhausted batteries at destined gathering places.

This device and the sensor must not be disposed as 'residual 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 this device and/or the sensor, please send it directly to us (adequately stamped). We will dispose it appropriately and environmentally friendly.

## 4 Safety instructions

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

1. Trouble-free operation and reliability of the device can only be guaranteed if it is not subjected to any other climatic conditions than those stated under "Specification".
2. Transporting the device 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 temp. before trying a new start-up.
3. The circuitry has to be designed most carefully if the device should be connected to other devices. Internal connection in third party devices (e.g. connection GND and earth) may result in not-permissible voltages impairing or destroying the device or another device connected.
4. Whenever there may be 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 or 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.
5. **Warning:** Do not use this product as safety or emergency stop device or in other applications 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.
6. This device only serves as supervision by the monitoring of essential or other for the customer important systems.  
It must not be used instead of compulsory approval monitoring devices and it is not designed for that purpose. If this device is used for the monitoring of such systems on its own, the manufacturer will not assume liability for damages whatsoever.
7. **Caution, acid!** The sensor contains KOH. This 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.

## 5 Operating and maintenance advice

- The battery has to be taken out, when the device is stored above 50°C.
- Handle the device and the sensor with care and only use it according its specification. The connectors have to be saved from humidity and dirt.
- Unplug the sensor not by pulling the cable, but the plug.

**Tip: It is recommended to take the battery out, when the device is stored for a longer period of time.**

## 6 Operation

### Display- and Operation elements



1. display of the oxygen concentration in % or of MOD in meters(n) or feet(F)
2. BAT-warning: battery is used up and has to be replaced (measuring is valid)



**On/Off switch**



Press shortly: change between

	:	actual value % oxygen
	:	hold value % oxygen,
	:	hold value MOD in meters(n) or feet(F)



Press shortly: short display of the sensor rating (calculated after the last calibration) (i.e. "100.P" = 100%)

Press long: start calibration (see also chapter 9 Calibration)

### First start

If not already done: plug the sensor to the device.

Screw flow-diverter on sensor, plug on transparent T-piece

Switch the device on with the key.

Start the calibration by pressing the key for 2 seconds, until is displayed. After the calibration the device is ready for measuring. (see also chapter 9 Calibration)

## 7 Display when switching-on the device



Start and display test



If switch-off delay "P.oF" (power off) is active, this is signalled at the turn-on procedure.

## 8 Oxygen measuring

- Switch on instrument, calibrate (refer to chapter 9 Calibration)  
-> the **current oxygen concentration [%]** will be displayed

- hold sensor to valve like shown (good contact necessary, otherwise there could be measured to low values)



- Open valve a little, until You can hear gas flow.

Attention: Do not open to far!

- When measurement display is stable,

press  -key: 

**hld** (Hold = measurement is held) and

**oxygen concentration [%]** are displayed alternating

- pressing  again: 

The Maximum Operating Depth (**MOD**) is displayed alternating to **hld** (**n** is the symbol for display in meters, **F** for feet)

- pressing  again: return to current oxygen concentration display

The oxygen measurement **depends on air pressure**. The current pressure can be entered during configuration.

If you **measure at atmosphere** and the calibration took place at the same conditions, the pressure value has not to be adjusted necessarily, because the same pressure is used for calibration and measuring.

(If the measurement is carried out at **other pressure conditions** than the calibration: The actual pressure has to be entered in the configuration for measurement and calibration. )

The sensor's **temperature dependency** is compensated internally. However for best results try to keep the same temperature both during calibration and measuring.

**Temperature differences between sensor and gas** may cause additional errors!

Therefore wait an appropriate period of time until the sensor has adjusted its temperature to the gas that is measured. A suitable flow of the gas around the sensor increases the adjustment significantly.

Try to avoid warming of the sensor by touching it during measurement or calibration.

When **measuring bottled gas**, consider that the gas coming out is cooler than the ambient because of the pressure loss! Strong air flows can produce an over pressure at the sensor – possible source of measuring/calibration errors!

**The nominal life time can be shortened by:**

- Wrong storage / operation temperature
- Permanent use with dry gases (compressed gas).  
It helps to put the sensor to normal-humid ambient air in measuring breaks (“flush” system with fresh air).

The **optimum operation position** is: with the sensor inlet pointing downwards

## 9 Calibration

In order to compensate for ageing of the sensor and air pressure fluctuations due to weather changes, the sensor has to be calibrated at regular intervals. The sensor will be calibrated to the atmospheric oxygen concentration of 20.95%. We recommend to calibrate directly before starting the measuring process.

**Calibration:** The sensor has to be subjected to air (make sure that rooms are thoroughly aired).

Press the  key for 2 sec till  appears.

The calibration will be automatically completed as soon as the measuring value is stable (takes a few seconds). Afterwards the rating of the sensor state will be shown for a short time.

**If an error message (CE.3, CE.4, CE.6) is displayed, the sensor signal is invalid. Press any key to restart, the previous calibration will be restored. The display is blinking afterwards until a valid calibration is performed.**

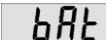
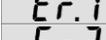
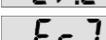
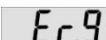
## 10 Sensor rating

The rating of the sensor state is calculated and saved after successful calibration.

**Watch sensor rating:** Press shortly the  key, the display shows for a short time i.e.  = 100%.

The rating is displayed in 10 percent steps: 100% = optimal sensor status. Lower values are indicating that the sensor life time will soon be reached. (50% doesn't mean 50% of the life time, but 50% of the reference signal!). Erroneous P.AbS entries may cause to low ratings.

## 11 Errors and system messages

no display	The battery is used up and has to be exchanged, or the device is defective
blinking display	The last calibration was not successful. A new calibration has to be performed!
	The battery is used up, for a short period further measurements are possible
	The battery is used up and has to be replaced, measurements are no more possible
	Calibration error: sensor voltage is too low (sensor used up or wrong chosen air pressure)
	Calibration error: sensor voltage is too high (wrong chosen air pressure or sensor defective (membrane crack, etc.))
	Calibration error: signal not stable
	Measuring error: range has been exceeded
	Measuring error: measuring value has fallen below permitted range
	System error: the device is defective or considerably out of the allowed ambient temperature range
	Value could not be calculated (e.g. input of MOD-calculation is error)

## 12 Configuration of the device

Follow this instructions to configure the functions of the device:

- Switch the device off.
- Press **mode**-button and keep it pressed, while turning the instrument on.

Release the mode button after the segment test (  ).

The first parameter  is displayed .

- If a parameter should be changed press key up or down (   ), the present setting of the parameter will be shown and can be changed via up/down keys.

Jump to the next parameter by pressing  .

Parameter	Value	Information
	 	
	<b>Auto Power-Off (turn-off delay) <i>factory setting: 20 min</i></b>	
	1 ... 120	Turn-off delay in minutes. If no key is pressed for the time adjusted in this parameter, the device is automatically switched off to safe battery power. (adjustable range 1 to 120 min)
	oFF	auto power-off is deactivated (continuous operation)
	<b>Abs. air pressure <i>factory setting: 1013 mbar</i></b>	
	500 ... 1200	Input of absolute pressure (of measured gas). The absolute pressure is depending on altitude above sea level (refer to following table) and on the weather.
	<b>Max. oxygen partial pressure for MOD display <i>factory setting: 1.40 bar</i></b>	
	1.00 ... 1.60	Input in bar
	<b>Unit for MOD display <i>factory setting: m</i></b>	
	m	meters
	f	feet

Pressing  again stores the settings, the instrument restarts.

**Please note:** *If there is no key pressed within the menu mode within 2 minutes, the configuration will be cancelled, the entered settings are lost!*

### Air pressure depending on the altitude above sea level

Altitude	Abs. air pressure	Altitude	Abs. air pressure
0 m	1013 mbar	800 m	921 mbar
100 m	1001 mbar	1000 m	899 mbar
200 m	989 mbar	1200 m	877 mbar
300 m	978 mbar	1400 m	856 mbar
400 m	966 mbar	1600 m	835 mbar
500 m	954 mbar	1800 m	815 mbar
600 m	943 mbar	2000 m	795 mbar

### 13 Replace sensor element

Unplug the sensor, unscrew the white protection housing and take out sensor element. Remove rubber disks and put it on the new sensor. Put the new sensor element into the housing, screw it down and plug it. Then start the calibration.

### 14 Specification

<b>Measuring range:</b>	0.0 ... 100.0 %O <sub>2</sub> (oxygen concentration) MOD (based on O <sub>2</sub> conc. and max. O <sub>2</sub> -partial pressure)
<b>Accuracy:</b>	calibrated device at nominal temp.: ± 0.1 %O <sub>2</sub> ± 1 digit Sensor linearity: < 2 vol.-%: +/- 0.1%; < 25 vol.-%: +/- 0.5%; < 100 Vol.-%: +/- 1.0%
<b>Sensor connection</b>	0.7m connection cable (fixed to device) with jack connector
<b>Sensor:</b>	electrochemical partial oxygen pressure sensor, integrated in sensor housing (type for replacement: GOEL 370)
Response time:	90% in < 10 sec., depending on temperature
Operating life:	guaranteed 12 months (assuming appropriate usage)
Operating pressure:	0.5 to 2.0 bar absolute. (at one-sided strain: max. 0.25 bar over-/under-pressure)
<b>Display:</b>	approx. 13 mm high, 3½-digit LCD
<b>Pushbuttons:</b>	3 keys for ON/OFF, min-/max-value display, calibration
<b>Nominal temp.:</b>	25°C
<b>Ambient temp.:</b>	0 to 45°C (sensor), -20 to 50°C (device)
<b>Relative humidity:</b>	0 to 95 %RH (not condensing)
<b>Storage temperature:</b>	-15 to 60°C (sensor), -20 to 70°C (device)
<b>Power Supply:</b>	9V-battery type 6F22 (in scope of supply)
Power Consumption:	0.14mA (standard zinc carbon battery: >2100 hours!)
Battery Change Indicator:	automatically if battery is used up: "BAT"
<b>Auto-Power-Off:</b>	when activated, the device switches automatically off, if it is not operated for longer time (selectable 1..120min).
<b>Housing:</b>	impact-resistant ABS, transparent panel, front side IP65
Dimensions:	approx. 106 x 67 x 30 mm (L x W x D) without sensor cable
<b>Weight:</b>	approx. 185g incl. battery and sensor
<b>EMC:</b>	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). Device meets EN 61326-1:2006, Additional fault: <1%