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GREISINGER
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Mounting and Operating Manual

Atmospheric Oxygen Sensor Element

GOEL 370, GOEL 381



CE

☞ Please read these instructions carefully before use!

☞ Please consider the safety instructions!

☞ Please keep for future reference!

Made in Germany

WEEE-Reg.-Nr. DE 93889386

GHMGROUP
Specialists by Competence.

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1. Safety

1.1. General note

Read this document carefully and get used to the operation of the product before you use it.
Keep this document within easy reach near the product for consulting in case of doubt.

Mounting, start-up, operating, maintenance and removing from operation must be done by qualified, specially trained staff that have carefully read and understood this manual before starting any work.

The manufacturer will assume no liability or warranty in case of usage for other purpose than the intended one, ignoring advices of this manual, operating by unqualified staff as well as unauthorized modifications to the product.

1.2. Intended use

The sensor elements are suitable for the measuring of gaseous oxygen, in conjunction with appropriate devices (hand-helds, transducers).

Dependent on the application, a suitable sensor-element must be chosen.

See also the specification at the end of the document.
For the use in practice, the sensor element must be mounted in an applicable housing.

Personnel which starts up, operates and maintains the device has to have sufficient knowledge of the measuring procedure and the meaning of the resulting measured values, this manual delivers a valuable help for this. The instructions of the manual have to be understood, regarded and followed.

To be sure that there´s no risk arising due to misinterpretation of measured values, the operator must have further knowledge in case of doubt - the user is liable for any harm/damage resulting from misinterpretation due to insufficient knowledge.

1.3. Skilled personnel

Users of the readily installed product have to be sufficiently skilled in the operation of the product and able to avoid risks. The operator of the arrangement is responsible for sufficient qualification the operators.

1.4. Safety signs and symbols

Warnings are labelled in this document with the followings signs:



Caution!
This symbol warns of imminent danger, which can result in death, severe bodily injury, or severe property damage in case of non-observance



Attention!
This symbol warns of potential dangers or harmful situations, which can cause dam-age to the device or to the environment in case of non-observance



Note!
This symbol point out processes which can indirectly influence operation, possibly cause incorrect measurement or provoke unforeseen reactions at non-observance.



Caution, acid!
This symbol warns of danger to living tissue and many materials, that can be damaged or destroy by exposure to that chemical.

1.5. Safety guidelines

The fault-free function and operational safety of the product can only be guaranteed if applicable safety precautions and the device-specific safety instructions for this document are observed.

If these notices are disregarded, personal injury or death, as well as property damage can occur.

1. Faultless operation and reliability in operation of the measuring device can only be assured if the device is used within the climatic conditions specified in the chapter “Specifications“.

2. 

The product must not be used for diagnostic or other medical purposes on patients!

3. 

The product is not suitable for use in explosion-prone areas!

4. 

Do not use in safety / emergency stop devices!

Not suitable for use with requirements on functional safety, e.g. SIL!

5. 

The product is not suitable for underwater use (rebreather)!

6. 

The sensor contains **KOH** (GOEL 381) or **acid** (GOEL 370).
KOH and acid can cause severe chemical burns!
In case of leaking liquid, avoid contact at all costs!

In case of contact:
- with skin: wash off immediately with plenty of water for several minutes.
- with clothing: remove contaminated, soaked clothing immediately.
- with eyes: rinse under running water for several minutes, consult a doctor.

If swallowed:
- drink plenty of water immediately, DO NOT induce vomiting!
- consult a doctor.

2. Product description

2.1. Scope of supply

- Oxygen sensor
- mounting and operating manual

2.2. General information about application areas

GOEL 370 (acidic electrolyte): Especially long life time of > 3 Years in Air.
Suitable sensor for diving application e.g. measuring Nitrox, recommended for the range of 0.2 … 35 vol.-% O_2.

Also suitable to measure oxygen-concentration in air or other gases with a high CO_2-content or even in a CO_2-atmosphere. The acid electrolyte guarantees that the sensor could not be influenced by CO_2

GOEL 381 (basic electrolyte): Sensor for low oxygen concentration near 0.0 and up to 100 vol.-% O_2. Especially for diving gases above 35 vol.-% O_2 the best choice.
For application without larger CO_2 concentration *)

*)

The GOEL 381 is designed to measure oxygen-concentration in air or other gases with out larger CO_2 concentration. Higher CO_2-concentration reduces the life-time of the sensor.

Short-time exposition of up to 10% CO_2 (for example 15 minutes. up to 10 times per day) is not problematic for the Sensor (e.g. exhaust measuring, protection gases with handhelds). If there is measured more often with elevated CO_2-concentration or at CO_2-concentrations above 10%, the exposition time has to be kept as short as possible and sufficient measuring breaks should be made

If the sensor is not exposed to free air during measuring pauses, the connected tubes etc. have to be flushed with clean air or nitrogen.

2.3. General information about the oxygen sensors

Lifetime: At the end of life time the sensor signal drops relatively fast.
The electrode evaluation in % therefore just can be used for orientation. An evaluation of 70% does not mean that 70% of life time are remaining, but 70% of the reference signal are available, which happens normally at the end of life time
The nominal life time can be shortened significantly by usage. Influencing factors are:

- Storage- / Operation temperature
- Humidity of measured gas: If permanently used with dry gases (technical gases, bottled gas) the life time decreases considerably.



The electrode evaluation is updated by the instrument every time, when the calibration of the sensor was performed successfully. (please also see the referring manual of the instrument)

Operating position: The optimum operation position is with the sensor inlet pointing downwards, maximum differential pressure to ambient is 250 mbar.

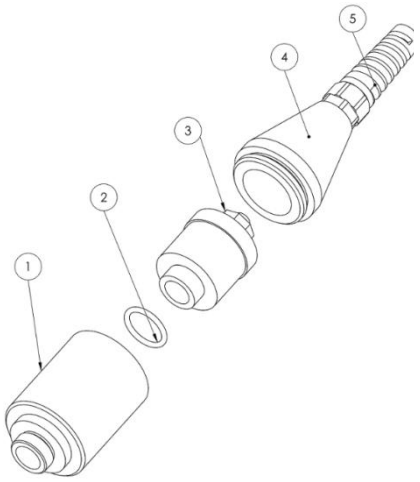
Measuring precision: The measuring precision can be influenced by:

- Liquids at the sensor inlet. Rinse the inlet and dry with lint-free cloth.
  Attention: avoid liquids of any kind at the contacts
- Gas and sensor temperature have to be at same level. Best precision, when calibrated at measuring temperature.
- Pressure fluctuations: The sensor is originally a partial pressure sensor, i.e. changes in the absolute pressure are influencing the measuring result directly proportional. A pressure change of 1% will cause a additional measuring error of 1%!
  For optimum precision calibrate at the same conditions at which You want to measure.

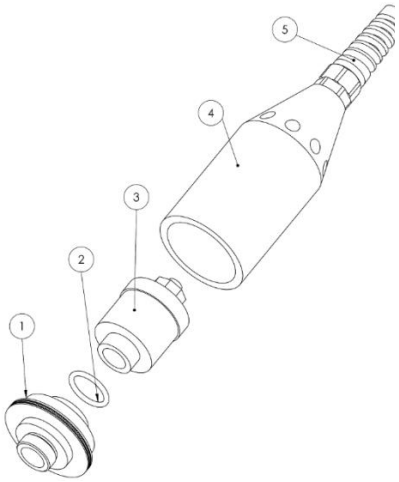
3. Mounting

3.1. GGO/GGA/GOO/GOG sensor housings

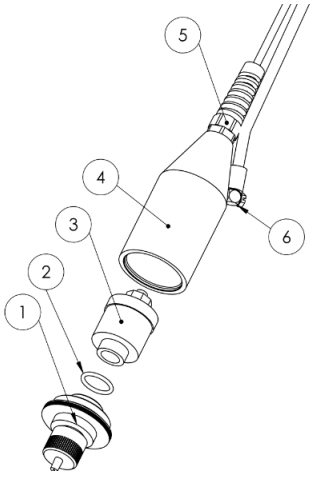
The sensor housings are consisting of two halves (1) and (4) and can be opened by screwing up:



GGO/GGA housing



GOO housing



GOG / ResOx 5695 housing

Changeable part is the sensor element (3). Important when reassembling:

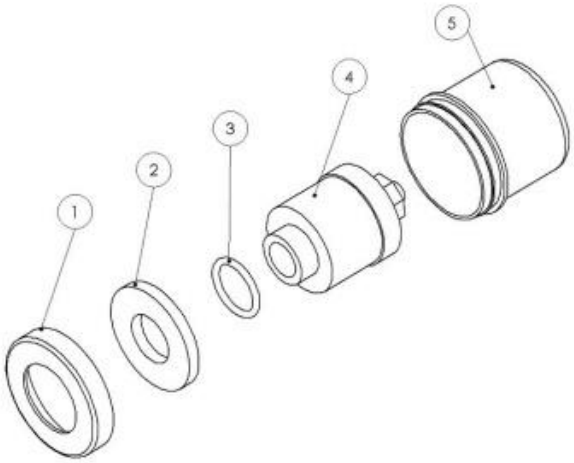
- First screw in sensor (3) in part (1). Do not forget O-Ring (2)
  Unscrew the sensor carefully e.g. by means of suitable nippers.
- The audio plug of part (4) has to be connected to the socket in the sensor. If this makes problems, the cable gland (5) can be opened so that the cable can be shifted further into part (4), until the plug can be connected.
- After that screw together (1) and (4) tightly, if necessary retighten the cable gland (5).



Attention:
do not use force! Case can be destroyed by this!

3.2. GOX 100 sensor housing

1 Screw cap
2 Flat sealing
3 O-Ring (not used)
4 Sensor element
5 Case

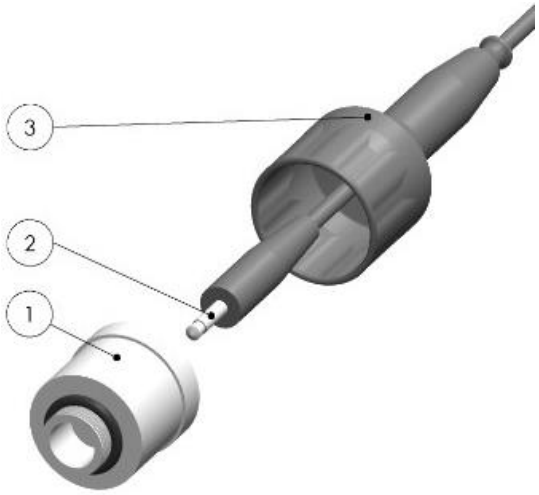




- disconnect the sensor connector
- open screw cap 1, remove flat sealing 2
- remove the sensor 4 from case 5
- take new sensor element from packing
- remove O-ring from new sensor (not needed)
- Place new sensor in case, place the flat sealing
- Close screw cap, reconnect

3.3. G 1690 Sensor sleeve

1	Sensor
2	Sensor cable
3	Sensor protection cap



- Pull the sensor with the connected sensor cable out of the sensor protection cap.
- Disconnect the used sensor and dispose it properly.
- Open the tin can with the new sensor.
- Remove the sensor from the tin can.
- Connect the sensor to the plug of the sensor cable.
- Then push the connected sensor into the sensor protection cap.

ATTENTION

Risk of injury!

The lid of the opened tin can is sharp-edged!

Disconnecting the T-piece and pulling the flow diverter makes it easier to grip the sensor.

If the sensor gets wet or falls into water, the sensor should be pulled out of the protective sensor cover to dry. Measurement can only be resumed after drying.

4. Decommissioning, reshipment and disposal

4.1. Decommissioning

Please also make sure that connected Loads are disconnected also and are in a safe state.

4.2. Reshipment and disposal

DANGER

All products returned to the manufacturer have to be free of any residual of measuring media and other hazardous substances.
Measuring residuals at housing or sensor may be a risk for persons or environment

Use an adequate transport package for reshipment, especially for fully functional products. Please make sure that the product is protected in the package by enough packing materials.

Add the completed reshipment formula of the GHM website.

The sensor must not be disposed in the unsorted municipal waste! Send the sensor directly to us (sufficiently stamped), considering the above if it should be disposed. We will dispose the device appropriate and environmentally sound.

5. Specification

(All specification basis on environment of 25°C, 50 %RH and 1013 hPa)

Sensor		**GOEL 381**	**GOEL 370 (Rev 2)**
application		**Diving gas *1) precise measuring at low O_2 (e.g. <0.5 vol.-% O_2) or concentrations above 35 vol.-% O_2**	**Diving gas *1) Protection gases with CO_2 concentrations and O_2 concentrations below < 35 vol.-% O_2**
Permanent operation with high CO_2-concentrations		**-**	**+++**
Short time exposition to CO_2 *2)		**+**	**+++**
Use up to 100 vol.-% O_2		**+++**	**-**
Use below 0.2 vol.-% O_2		**+++**	**+**
Speed /t_{90}		**++ / <10s**	**++ / <10s**
Lifetime hours per vol.-% O_2, / at air		**+ /500 000 %h/ >2 years**	**++ /1 200 000 %h/ max. 6 years**
Diving gas application *1)		**+++**	**+++**
Meas. ranges	O_2 partial pressure	0 ... 1100 hPa	0 ... 350 hPa
	O_2 concentration	0.0 ... 100.0 vol. % O_2	0.0 … 35.0 vol. % O_2 (lower accuracy above)
Accuracy:	< 35 vol. % O_2	±0.25 vol. % O_2	-0.2 … +0.35 vol. % O_2
	35 - 100 vol. % O_2	±2.0% * (value – 20.9 vol. % O_2)	*not specified*
Electrolyte:		basic	acidic
Storage temperature:		-15 to +60 °C	
Operating ambient		0 … +45 °C	
Ambient pressure:		0.6 … 1.75 bar abs.	
Over-/under pressure:		max. 0.25 bar *(pressure difference sensor membrane to ambient – sensor screwed-in)*	
Material in contact media		PA, PPS, PTFE, stainless steel	ABS, PPS, PTFE, stainless steel, NBR
Cross sensitive		No to He, H_2 und CO	<20 ppm O_2 response to 100 vol.-% CO , 100 vol.-% CO_2 100 vol.-% C_3H_8 1000 ppm Benzene balance N_2 3000 ppm NO_2 balance to N_2 1000 ppm H_2 balance to N_2 2000 ppm H_2S balance to N_2 1000 ppm SO_2 balance to N_2
Sensor signal: (at dry air, 1013 hPa, 25°C)		8.0 … 12.0 mV	9.0 … 14.0 mV
Weight		**26 g**	**22 g**
Dimension		approx. Ø 30 x 44 mm Housing with M16 x 1-screw thread (sensor can be connected to line tubes by means of an additional adapter)	
Directives, standards:		The product conform to the following Directives of the Council for the harmonisation of legal regulations of the Member States 2011/65/EU, incl. 2015/863 RoHS 2 and RoHS 3 Applied harmonised standards: EN IEC 63000:2018	

*1) Sensors are not allowed to use in „under-water-diving-application" (e.g. Rebreather)
*2) please refer chapter 2.2