Operating Manual

GGO ..., GOO ...

CE

Specification:	**GGO 369, GOO 369**	**GGO 370, GOO 370**	**GGO 369S, GOO 369S**
Sensor:	Partial oxygen pressure sensor		
Sensor types:			
GGO ... :	closed sensor		
GOO ... :	open sensor		
Application:	**standard**	**diving**	**CO_2 containing gases**
Specific features:		**Stronger membrane**: enhanced life time and more robust against pressure changes. **Coated electronics**: corrosion protection. less **dependence on operating position** and better t**emperature compensation**	**Acidic electrolyte** for application with significant CO_2 levels
Measuring range:			
Partial oxygen pressure:	0 ... 1100 hPa O_2	0 ... 1100 hPa O_2	0 ... 300 hPa O_2
Oxygen concentration:	0,0 ... 100,0 % O_2 (gaseous)	0,0 ... 100,0 % O_2 (gaseous)	0,0 ... 25,0 % O_2 (gaseous)
Temperature:	0,0 ... 50,0 °C	0,0 ... 45,0 °C	0,0 ... 50,0 °C
Electrolyte:	basic electrolyte	basic electrolyte	acidic electrolyte
Response time:	90% in <5 sec., depending on temperature	90% in <10 sec., depending on temperature	90% in <15 sec., depending on temperature
Cross sensitivities:	signal of <0.1 % O_2 15% CO_2 in N_2, 10% CO in N_2, 3000ppm NO in N_2, 3000ppm C_3H_8 in N_2, 500ppm H_2S in N_2, 500ppm SO_2 in N_2, 1000ppm Benzene in N_2	none to He, H_2 and CO	signal of <0.002 % O_2 100% CO_2, 100% CO, 3000ppm NO in N_2, 1000ppm H_2 in N_2, 100% C_3H_8, 2000ppm H_2S in N_2, 2000ppm SO_2 in N_2, 1000ppm Benzene in N_2
Nominal sensor life:	approx. 2 years at standard condition	> 2 years at standard condition	approx. 2 years at standard condition
Operating conditions:	0 - 50 °C, 0 - 95 %RH (non-condensing)	0 - 45 °C, 0 - 95 %RH (non-condensing)	0 - 50 °C, 0 - 95 %RH (non-condensing)
Ambient pressure:	0.5 to 2.0 bar abs.		
Over-/under-pressure:	max. 0.25 bar *(pressure difference sensor membrane to ambient – sensor screwed-in)*		
Storage temperature:	-15 to +60 °C		
Warranty period:	12 months (assuming appropriate usage according to the manual)		
Connection:	approx. 1 m cable with Mini-DIN-plug.		
Dimensions of housing:	GGO369..: approx. Ø 36 mm x 95 mm (150 mm incl. anti-buckling glanding), GOO369..: approx. Ø 40 mm x 105 mm (160 mm incl. anti-buckling glanding) Housing with M16 x 1-screw thread (sensor can be connected to line tubes by means of an additional adapter)		
Weight:	approx. 135 g (GGO...) or approx. 145 g (GOO...)		
EMC:	The GGO.../GOO... 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%		

WEEE-Reg.-Nr. DE93889386

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General information about the oxygen sensors

I.) 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.

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

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.
  It helps, if the sensor is brought to normal humid ambient air in measuring breaks ("flush" system with fresh air).

II.) Operating position:

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

III.) 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.

Application areas for the sensors G... 369, G... 370 and G... 369 S

GGO 369, GOO 369 (basic electrolyte):

Standard sensor for universal application without larger CO_2 concentration. *[1]

GGO 370, GOO 370 (basic electrolyte):

Specialized sensor for diving application e.g. measuring Nitrox. For Application without larger CO_2 concentration. *[1]

*[1]: The Sensors G__ 369 and G__ 370 are designed to measure oxygen-concentration in air or other gases without larger CO_2-concentration. A higher CO_2-concentration reduces the life-time of the sensor.

Short-time exposition at up to 10% CO_2 is not problematic (for example 15 minutes. up to 10 times per day) for the sensor (exhaust measurings eg.) 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 pauses should be made.

Note: 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.

GGO 369 S, GOO 369 S (acidic electrolyte)

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

The G__ 369 S has a slower signal response and should not be used for oxygen concentrations above 25%, as the signal looses precision then.

Application of the different sensor types GGO ... and GOO ...

GGO 369, GGO 370, GGO 369 S (closed sensor)
For measurements at atmosphere and in systems without over or under pressure the GGO 369 is sufficient. Additionally the GGO can be screwed impermeable to systems with low over or under pressure.
Attention! If the sensor cannot be calibrated at exactly the same pressure, the measurement will be faulty! For such applications we suggest the use of a GMH3691 with the manual pressure compensation. Then the GGO can be connected to systems with a known pressure. (Attention: please note the specified operating pressure for one-sided strain). The pressure will be compensated by the GMH3691 and no additional measuring error will occur.

GOO 369, GOO 370, GOO 369 S (open sensor)
The sensor is equipped with drillings at the end and because of its special construction the measuring gas streams optimally around the sensor. No pressure can appear while gas blows to the sensor, which otherwise would result in erroneous measures.
The temperature compensation speed of the sensor also is optimised by this design. The measuring gas escapes into the air. Especially the measuring of gases from compressed gas bottles, where the expansion of the gas leaving the bottle lowers the temperature, is optimised with regard to the temperature compensation and pressure errors. The gas flow should be chosen in a suitable range, where no overpressure can happen, esp. if the sensor is connected directly to the source e.g. by means of a tube.

Measuring Oxygen with the GMH3690 and GMH3691

Calibration and measuring are depending of the absolute pressure at the sensor.
Therefore check the absolute pressure before calibration and measuring. When using a GMH3691 (with manual pressure compensation)the pressure can be entered, when using a GMH3690 the pressure during calibration should be the same as during the measuring (otherwise e.g. 1% deviation results in 1% measuring error).
Sensor temperature and gas temperature should be the same.
Temperature differences may cause additional measuring errors! In worst case conditions it may take up to several hours until both temperatures are adjusted. A suitable flow of the gas around the sensor element increases the adjustment significantly.

How to operate:

a.) Treat device and sensor carefully. Use only in accordance with above specification. (do not throw, hit against etc.).
Protect plug and socket from soiling.

b.) The sensors are only suitable for the devices of the GMH369x series. Unsuitable devices may lead to the destruction of the measuring device and the measuring sensors.

c) When connecting the sensor the connector may not lock to the jack correctly. In such a case hold the connector not at the case but at the buckling protection of the cable during the plug in.
Don't connect sensor canted! If plug is entered correctly, it will slide in smoothly.
To disconnect sensor do not pull at the cable but at the plug

d) Keep the allowable pressure range of the sensor in mind, to high or to low pressure may destroy the sensor.

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. If the device is transported from a cold to a warm environment condensation may result in a failure of the device. In such a case make sure the device temperature has adjusted to the ambient temperature before trying a new start-up.
3. If device is to be connected to other devices (e.g. via serial interface) the circuitry has to be designed most carefully. 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. If there is a risk whatsoever involved in running it, the unit has to be switched off immediately and to be marked accordingly to avoid re-starting.

   Operator safety may be at 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.

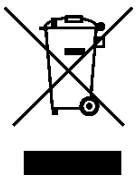
   In case of doubt, please return device to manufacturer for repair or maintenance.
5. **Warning:** do not use these product as safety or emergency stop devices, or in any other application where failure of the product could result in personal injury.
   Failure to comply with these instructions could result in death or serious injury.
6. **Caution, acid!** The sensor contains **KOH** (G__ 369 and G__ 370) or **sulphuric acid** (G__ 369S).

KOH and sulphuric acid 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 of sensor element:



The sensor contains lead and caustic electrolyte. Dispose as special waste.
Do not dispose together with batteries - danger of explosives!
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 sensors.
Please send it directly to us (adequately stamped).
We will dispose it appropriately and environmentally friendly.