Operating Manual
Hand-held Measuring Device
GMH 3690 GL
for Gaseous Oxygen and Temperature with Alarm Function

Version 1.3
How to Operate and Maintain Device:

a) When to replace battery:
   If Δ and 'bAt' are shown in the lower display the battery has been used up and needs to be replaced. The device will, however, operate correctly for a certain time.
   If 'bAt' is shown in the upper display the voltage is too low to operate the device; the battery has been completely used up.
   Please note: We recommend to take out battery if device is not used for a longer period of time.

b) Treat device and sensor carefully. Use only in accordance with above specification. (do not throw, hit against etc.).
   Protect plug and socket from soiling.
   Make sure to use sensors that are suitable for the GMH3690. Unsuitable measuring probes may lead to the destruction of the measuring device and the measuring probes.

c) When connecting the electrode 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 electrode 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) Mains operation:
   When using a power supply device please note that operating voltage has to be 10.5 to 12 V DC.
   Do not apply overvoltage!! Cheap 12V-power supply devices often have excessive no-load voltage. We, therefore, recommend using regulated voltage power supply devices. Trouble-free operation is guaranteed by our power supply GNG10/3000.
   Prior to connecting the plug power supply device with the mains supply make sure that the operating voltage stated at the power supply device is identical to the mains voltage.

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 devide 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 cause 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.

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.
   Warning: If device is operated with a defective mains power supply (short circuit from mains voltage to output voltage) this may result in hazardous voltages at the device (e.g. sensor socket, serial interface).

4. 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.

5. This device has not been designed for monitoring life-saving equipment. If this device is used to monitor such systems the manufacturer shall assume no liability for damages whatsoever.

Connections

The mains socket is located at the left-hand side of the measuring instrument.
Displays

Main display
- Oxygen concentration in % ($%O_2$)

Secondary display
- Sensor temperature (°C or °F)

Special Display Elements:

1. Min/Max/Hold: indicates if min., max. or hold values are displayed in the main and secondary display.
2. ok-arrow: indicates that oxygen and temperature values have been stable for a longer period of time.
3. CAL-arrow: indicates that an automatic oxygen calibration is carried out.
4. Alarm-arrow: indicates an alarm by blinking.
5. Warning triangle: indicates a low battery.

Pushbuttons

1. On/off key:
   - min/max when taking measurements: press shortly: min. or max. meas. value will be displayed
   - press for 1 sec.: the min. or max. value will be deleted

2. Up/down when configuring:
   - entering/changing of settings.

3. CAL:
   - press shortly: show state of the electrode
   - press for 2 sec: start oxygen calibration

4. Set/Menu:
   - press for 2 sec. (Menu): configuration call-up

5. Store/Quit:
   - measuring: holds current meas. value ('HLD' in display)
   - Set/Menu: acknowledge setting, return to measuring.
Configuration

For configuration of the device press "Set"-key (key 4) for 2 seconds.

Choose between the individual values that can be set by pressing the "Set"-key (key 4) again.

The individual values are changed by pressing the keys "↑" (key 2) or "↓" (key 5).

Use key "Store" (key 6) to leave configuration and to store settings.

'Offset': Zero Point Displacement when Temperature is Measured

The zero point of the measurement will be displaced by the value set to compensate for sensor and measuring device deviations.

-3.0°C .. 3.0°C
or
-5.4°F .. 5.4°F:
off:

Zero displacement not activated. (=0.0°)

'AL.': Alarm Functions

off: alarm function switched off
no.So: alarm function active, alarm will be displayed by the 'AL'-arrow.
on: alarm function active, alarm will be displayed by the 'AL'-arrow., additionally a short alarm will be sounded every 2 s.

'AL.Lo': Lower Alarm Limit (if alarm is active, only)

enter lower alarm limit.
the values entered have to be smaller or equal to the lower alarm limit (s.a.).

'AL.Hi': Upper Alarm Limit (if alarm is active, only)

enter upper alarm limit.
the values entered have to be larger or equal to the lower alarm limit (s.a.).

'Unit': Selection of Temperature Unit °C /°F

°C: All temperature values in degrees Celsius
°F: All temperature values in degrees Fahrenheit

'Power.off': Selection of Power-off Delay

1 .. 120: Power-off delay in minutes. Device will be automatically switched off as soon as this time has elapsed if no key is pressed/no interface communication takes place.
off: automatic power-off function deactivated (continuous operation, e.g. in case of mains operation)

'Address': Selection of Base Address

01, 11, 21, ..., 91: Base address for interface communication.
Channel 1 will be addressed by the base address set, channels 2 will have the following address.
(Example: base address 21 - channel 1 = 21, channel 2 = 22)

Using the interface converter GRS3105 it is possible to connect several devices to a single interface. As a precondition the base addresses of all devices must not be identical. In case several devices will be connected via one interface make sure to configure the base addresses accordingly.
Special Functions - please note:

Zero Point Displacement ('Offset') Temperature
A zero point displacement can be carried out for the temperature measurements:
\[ \text{temperature displayed} = \text{temperature measured} - \text{offset} \]
Standard setting: 'off' = 0.0°, i.e. no zero displacement taking place. The zero displacement is mainly used to compensate for sensor deviations. An offset, if any, will be displayed for a short while upon switching on of the device.

Alarm Functions
If the alarm function has been activated (p.r.t. configuration), an alarm will be issued under the following circumstances:
- measuring value smaller or equalling lower alarm limit 'AL.Lo'
- measuring value higher or equalling upper alarm limit 'AL.Hi'
- no electrode connected or error in sensor
- measuring values exceeding/falling below measuring ranges
- battery voltage too low
- error in device ('Err.7')

The alarm function is supported by the interface, thus, it can easily be monitored by a computer connected.

Oxygen Measuring - please note
When measuring gases, please consider the following:

- **The absolute pressure at the sensor membrane has to be the same during measuring AND calibration!**
  The measuring refers to the absolute pressure during calibration. If the pressure changes after calibration, the instrument has to be calibrated again (see page 5 of Users Manual). A air pressure change of 10% causes a measuring error of 10%! Also keep in mind, that gas flow may change the actual absolute pressure at the sensor membrane!
  At pressures below 800mBar or above 1100mBar we suggest to use the GMH3691 instrument instead!

- **Sensor temperature AND gas temperature have to be the same!**
  Temperature differences may cause additional measuring errors! It may take from several minutes up to several hours (depending on the measurement setup) until both temperatures are adjusted. A suitable flow of the gas around the sensor element increases the adjustment significantly.

Application of the different sensor types GGO 369 and GOO 369

GGO 369 (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 an measuring error occurs. For this applications we suggest the use of the GMH3691 instrument instead!

GOO 369 (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 measurings. At 'P.Abs' the atmospheric pressure has to be entered. The temperature compensation speed of the sensor also is optimized 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 optimized 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.

Calibration Of The Oxygen Sensor
In order to compensate for changes in the atmospheric pressure and for the ageing of the sensor, the oxygen sensor will have to be calibrated at regular intervals. The device is equipped with a simple calibration function for automatic calibration to the atmospheric oxygen content of air (20.95%) (1-point calibration, permissible atmospheric pressure: 800 .. 1100 mbar.
We recommend to calibrate sensor at least once a week or, for optimum measuring results, directly before starting the measuring process.

How to carry out calibration
Electrode has to be subjected to air (make sure that rooms are thoroughly aired).
Start calibration: press \( \text{key for 2 sec.} \)
The display will show ‘CAL’; calibration will be automatically completed as soon as the measuring values for oxygen and temperature are stable. Then the electrode state will be shown for a short time (evaluation in 10% steps).

In case of error messages being displayed during the calibration process, please refer to our notes at the end of this manual! If a calibration cannot be carried out after an extended period of time, at least one of the measuring values in unstable (oxygen content, temperature). Please check your measuring arrangements.
The Serial Interface

All measuring and setting data of the device can be read and changed by means of the serial interface and a suitable electrically isolated interface adapter (GRS3100 or GRS3105). In order to avoid transmission errors, there are several security detects implemented.

The following standard software packages are available for data transfer:
- **EBS9M**: 9-channel software to display the measuring value (channel 1) and the temperature (channel 2)
- **EASYCONTROL**: Universal multi-channel software (EASYBUS-, RS485-, or GMH3000- operation possible) for real-time recording and presentation of measuring data in the ACCESS®-data base format.

In case you want to develop your own software we offer a **GMH3000-development package** including:
- a universally applicable Windows functions library ("GMH3000.DLL") with documentation that can be used by all 'serious' programming languages, suitable for:
  - Programming examples Visual Basic 4.0™, Delphi 1.0™, Testpoint™

The following interface functions will be supported:

<table>
<thead>
<tr>
<th>Oxygen concentr.</th>
<th>Temperature</th>
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</thead>
<tbody>
<tr>
<td>Channel 1</td>
<td>Channel 2</td>
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</table>
## Fault and System Messages

<table>
<thead>
<tr>
<th>Display</th>
<th>Description</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>S En</td>
<td>No sensor or sensor defective</td>
<td>connect sensor sensor defective -&gt; return sensor to manufacturer for repair</td>
</tr>
<tr>
<td>bat</td>
<td>Battery voltage too low, the device will only continue operation for a short time</td>
<td>replace battery</td>
</tr>
<tr>
<td>bat</td>
<td>Battery voltage low In case of mains op.: wrong voltage</td>
<td>replace battery replace power supply, if error continues to exist: device damaged</td>
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<tr>
<td></td>
<td>Battery voltage too low - If mains op.: power supply defective or wrong voltage/polarity</td>
<td>replace battery check/replace mains supply</td>
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<tr>
<td></td>
<td>System error - Device defective</td>
<td>disconnect battery or power supply, wait for a short time, reconnect return to manufacturer for repair</td>
</tr>
<tr>
<td>Err.1</td>
<td>Values exceeding measuring range Sensor/cable defective</td>
<td>check: are there any values exceeding the measuring range specified? -&gt; meas. value too high -&gt; replace</td>
</tr>
<tr>
<td>Err.2</td>
<td>Values below measuring range Sensor/cable defective</td>
<td>check: are there any values below the measuring range specified? -&gt; meas. value too low -&gt; replace</td>
</tr>
<tr>
<td>Err.7</td>
<td>System fault</td>
<td>switch on again: if fault continues to exist, device is damaged -&gt; return to manufacturer for repair</td>
</tr>
<tr>
<td>Err.9</td>
<td>No sensor or error in sensor Temperature display correct, oxygen display incorrect</td>
<td>connect suitable sensor sensor defective -&gt; return to manufacturer for repair check: mini-DIN plug in sensor housing connected? open PG-glanding and pull up plug as far as possible</td>
</tr>
<tr>
<td>Er.11</td>
<td>Value could not be calculated</td>
<td>one of the measuring values required for calculation is missing sensor missing or damaged (overflow/underflow)</td>
</tr>
</tbody>
</table>

## Error and System Messages During Oxygen Calibration

<table>
<thead>
<tr>
<th>Display</th>
<th>Description</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cal</td>
<td>Wrong temperature</td>
<td>temperature has to be between 5 and 40°C</td>
</tr>
<tr>
<td>Err.1</td>
<td>Sensor signal too low</td>
<td>check calibration environment (p.r.t. 'How to calibrate oxygen electrode')</td>
</tr>
<tr>
<td>Cal</td>
<td>Sensor signal too high</td>
<td>check calibration environment (p.r.t. 'How to calibrate oxygen electrode')</td>
</tr>
</tbody>
</table>
Specification

Measuring ranges
Oxygen content 0.0..100.0 %
Sensor temperature -20.0..50.0 °C

Accuracy device
Oxygen measuring - please note: To get accurate measurings take notice of $t$ (± 1 digit)
Oxygen concentration ± 0.1%
Sensor temperature ± 0.2 °C

Nominal temperature 25°C
Operating temperature 0 to +50°C
Relative humidity 0 to +95% r.h. (non-condensing)
Storage temperature -20 to +70°C

Housing dimensions
142 x 71 x 26 mm (L x W x D)
impact-resistant ABS plastic housing, membrane keyboard, transparent panel. Front side IP65, integrated pop-up clip for table top or suspended use.

Weight
approx. 155 g (device incl. battery)

Alarm function:
monitoring of alarm limits (% oxygen), measuring range limits (% oxygen and temperature) and device faults
alarm via display element and interface, additional audio alarm optional

Sensor connection:
6-pin Mini-DIN-socket

Interface
serial interface (3.5mm jack), serial interface can be connected to RS232 interface of a PC via electrically isolated interface adapter GRS3100 or GRS3105 (see accessories).

Power supply
9V-battery, type IEC 6F22 (included) as well as additional d.c. connector (dia of internal pin 1.9 mm) for external 10.5-12V direct voltage supply. (suitable power supply: GNG10/3000)

Power consumption
approx. 1.5 mA, during audio alarm approx. 2 mA

Display
2 four-digit LCD-displays (12.4mm or 7mm high) for measuring values or for min., max., values, Hold-function etc. as well as additional arrows.

Pushbuttons
6 membrane keys altogether for on/off switch etc.

Min-/max-value memory
both the max. and the min. value for each measurement are memorized.

Hold function
press button to memorize current measuring values

Automatic-off-function
Device will be automatically switched off if no key is pressed/no interface communication takes place for the time of the power-off delay. The power-off delay can be set to values between 1 and 120 min. it can be completely deactivated.

EMC:
The GMH 3690 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 (89/336/EWG).
Additional fault: <1%
Bedienungshinweise

GGO369, GOO369
Luftsauerstoff-Sensor für GMH369x

Technische Daten:

Sensortypen:  
GGO369: geschlossener Sensor  
GOO369: offener Sensor

Meßbereich:

Sauerstoffpartialdruck: 0 ... 1100 hPa O₂
Sauerstoffkonzentration: 0,0 ... 100,0 % O₂ (gasförmig)
Temperatur: -5,0 ... 50,0 °C

Sensor:  
Sauerstoff-Partialdrucksensor, eingebaut in Gehäuse.

Querempfindlichkeiten:  
Signal von <0.1 % O₂  
15% CO in N₂, 10% CO in N₂, 3000ppm NO in N₂, 3000ppm C₂H₄ in N₂,  
500ppm H₂S in N₂, 500ppm SO₂ in N₂, 1000ppm Benzene in N₂
Das Sensorelement entspricht den Anforderungen PTB-A 18.10 der Genauigkeitsklasse 1 für den Einsatz in Kraftfahrzeug-Abgasmeßgeräten.

Ansprechzeit:  
90% in <10sec., temperaturabhängig.

Lebensdauer:  
Garantie auf Sensorelement: 12 Monate  
(Voraussetzung: sachgemäße Anwendung gemäß Bedienungsanleitung)

Betriebsdruck:  
0.5 bis 2.0 bar abs.

Geräteanschluß:  
ca. 1m langes Kabel mit Mini-DIN-Stecker

Arbeitstemperatur:  
-5 bis +50°C (Sensor)

Relative Feuchte:  
0 bis +95% r.F. (nicht betauend)

Lager temperatur:  
-15 bis +60°C

Gehäuseabmessungen:  
ca. Ø 38 mm, Gehäuse mit M16 x 1-Schraubgewinde (Sensor mittels zusätzlichem Adapter in Leitungsschläuche einkoppelbar.),  
Länge: GGO369: ca. 95 mm (150 mm inkl. Knickschutz),  
GOO369: ca. 105 mm (160 mm inkl. Knickschutz)

Gewicht:  
ca. 155 g

EMV:  
Die GGO.../GOO... entsprechen den wesentlichen Schutzanforderungen, die in der Richtlinie des Rates zur Angleichung der Rechtsvorschriften der Mitgliedsstaaten über die elektromagnetische Verträglichkeit (89/336/EWG) festgelegt sind. zusätzlicher Fehler: <1%

Betriebshinweise:

a.) Gerät und Sensor müssen pfleglich behandelt werden und gemäß den vorstehenden technischen Daten eingesetzt werden (nicht werfen, aufschlagen, etc.). Stecker und Steckerbuchse sind vor Verschmutzung zu schützen.

b.) Die Sensoren dürfen nur mit den entsprechenden Geräten (GMH369x) verwendet werden. Bei Verwendung ungeeigneter Geräte kann es zur Zerstörung von Meßgerät und Sensoren kommen!

c) Falls beim Anstecken des Luftsauerstoff-Sensors an das GMH369x der Mini-DIN-Stecker nicht einwandfrei in der Gerätebuchse einrastet den Stecker beim Anstecken nicht an der Steckhülse, sondern am Knickschutz halten.  
Stecker nicht verkantet anstecken. Bei richtig angesetztem Stecker kann dieser ohne größeren Kraftaufwand eingesteckt werden.

Beim Abstecken des Sensors ist nicht am Kabel zu ziehen, sondern immer an der Stecherhülse.

d) Beachten Sie den zulässigen Betriebsdruck des Sensors. Zu großer Über-/Unterdruck zerstört das Sensorelement.
**Sauerstoffmessung mit den Geräten GMH3690 und GMH3691**

Die Kalibration und die Messung sind druckabhängig.
Kontrollieren Sie deshalb vor der Kalibration und bei der Messung den aktuellen abs. Luftdruck. Bei Verwendung mit einem GMH3691 (mit manueller Luftdruckkompensation) können Sie den Druck entsprechend eingeben, bei Verwendung eines GMH3690 muß der Luftdruck bei der Kalibrierung und bei der Messung möglichst der gleiche sein (sonst liefert z.B. 1% Abweichung 1% Meßfehler).

**Sensortemperatur muß gleich der Gastemperatur sein.**
Temperaturunterschiede können das Meßergebnis erheblich verfälschen! Beachten Sie auch, daß es je nach Umgebung bis zu mehrere Stunden dauern kann, bis sich beide Temperaturen angeglichen haben. Eine entsprechende Umwälzung des Gases oder Anströmung des Sensors beschleunigt die Anpassung erheblich.

**Verwendung der beiden Sensoren GGO 369 und GOO 369**

**GGO 369 (geschlossener Sensor)**

**GOO 369 (offener Sensor)**

**Sicherheitshinweise:**
Dieses Gerät ist gemäß den Sicherheitsbestimmungen für elektronische Meßgeräte gebaut und geprüft. Die einwandfreie Funktion und Betriebssicherheit des Gerätes kann nur dann gewährleistet werden, wenn bei der Benutzung die allgemein üblichen Sicherheitsvorkehrungen sowie die gerätespezifischen Sicherheitshinweise in dieser Bedienungsanleitung beachtet werden.

1. Die einwandfreie Funktion und Betriebssicherheit des Gerätes kann nur unter den klimatischen Verhältnissen, die im Kapitel "Technische Daten" spezifiziert sind, eingehalten werden.
2. Wird das Gerät von einer kalten in eine warme Umgebung transportiert, so kann durch Kondensatbildung eine Störung der Gerätefunktion eintreten. In diesem Fall muß die Angleichung der Gerätetemperatur an die Raumtemperatur vor einer erneuten Inbetriebnahme abgewartet werden.
   Unter Umständen können interne Verbindungen in Fremdgeräten (z.B. Verbindung GND mit Erde) zu nicht erlaubten Spannungspotentialen führen, die das Gerät selbst oder ein angeschlossenes Gerät in seiner Funktion beeinträchtigen oder sogar zerstören können.
4. Wenn anzunehmen ist, daß das Gerät nicht mehr gefahrlos betrieben werden kann, so ist es außer Betrieb zu setzen und vor einer weiteren Inbetriebnahme durch Kennzeichnung zu sichern.
   Die Sicherheit des Benutzers kann durch das Gerät beeinträchtigt sein, wenn es zum Beispiel:
   - sichtbare Schäden aufweist.
   - nicht mehr wie vorgeschrieben arbeitet.
   - längere Zeit unter ungeeigneten Bedingungen gelagert wurde.
   In Zweifelsfällen sollte das Gerät grundsätzlich an den Hersteller zur Reparatur bzw. Wartung eingeschickt werden.
5. **Warnung:** Benützen Sie dieses Produkt nicht in Sicherheits- oder in Notaus-Einrichtungen oder in Anwendungen wo ein Fehlverhalten des Gerätes die Verletzung von Personen zur Folge haben kann. Wird dieser Hinweis nicht beachtet so kann dies zu Verletzung oder zum Tod von Personen führen.
Operating Manual

GGO369, GOO369
Atmospheric Oxygen Sensor for GMH369x

Specification:

Sensor types:
- GGO369: closed sensor
- GOO369: open sensor

Measuring range:
- Partial oxygen pressure: 0 ... 1100 hPa O$_2$
- Oxygen concentration: 0,0 ... 100,0 % O$_2$ (gaseous)
- Temperature: -5,0 ... 50,0 °C

Sensor: Partial oxygen pressure sensor, integrated in case

Cross sensitivities:
- Signal of <0.1 % O$_2$ in 15% CO in N$_2$, 10% CO in N$_2$, 3000ppm NO in N$_2$, 3000ppm C$_3$H$_8$ in N$_2$, 500ppm H$_2$S in N$_2$, 500ppm SO$_2$ in N$_2$, 1000ppm Benzene in N$_2$

The sensor element meets the requirements of PTB-A18.10 of precision class 1 for automotive exhaust measuring instruments.

Response time: 90% in <1sec., depending on temperature.

Operation life: Warranty for sensor element: 12 months (assuming appropriate usage according to the manual)

Operating pressure: 0,5 to 2,0 bar abs.

Connection: approx. 1m cable with Mini-DIN-plug.

Working temperature: -5 to +50°C (sensor)

Relative humidity: 0 to +95% r.h. (non-condensing)

Storage temperature: -15 to +60°C

Dimensions of housing:
- Ø approx. 38 mm, housing with M16 x 1-screw thread (sensor can be connected to line tubes by means of an additional adapter), length: GGO369: approx. 95 mm (150 mm incl. anti-buckling glanding), GOO369: approx. 105 mm (160 mm incl. anti-buckling glanding)

Weight: approx. 155 g.

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 (89/336/EWG) additional fault: <1%

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.

- 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.

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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.

Application of the different sensor types GGO 369 und GOO 369

GGO 369 (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 in the range of 0.5 ... 2 bar. The pressure will be compensated by the GMH3691 and no additional measuring error will occur.

GOO 369 (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 measurements.

The temperature compensation speed of the sensor also is optimized 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 optimized 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.

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.