H36.0.12.6C-09

EN

GREISINGER electronic GmbH

Hand-held measuring device with alarm function

for gaseous oxygen and temperature

as of version V1.6

Operating Manual

GMH 3691

CE

Made in Germany

WEEE-Reg.-Nr. DE93889386

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1 Designated Use

The GMH 3691 measures the oxygen partial pressure and the oxygen concentration in gas mixtures and air.
For the measurement a external sensor of the type GOO ... or GGO ... is required. The measurement takes place at the opening of the external 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.

2 General Note

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

3 Operating and Maintenance Advice

a) When to replace battery:
If ⚠ 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: The battery has to be taken out, when storing device above 50°C.
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.

c) Make sure to use sensors that are suitable for the device. Unsuitable measuring probes may lead to the destruction of the measuring device and the measuring probes.

d) 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

e) 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 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.

4 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 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.

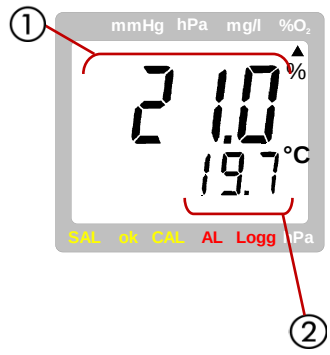
   Operator safety may be a risk if:
   - there is visible damage to the device
   - the device is not working as specified
   - the device has been stored under unsuitable conditions for a longer time.

   In case of doubt, please return device to manufacturer for repair or maintenance.
5. **Warning:** Do not use these products as safety or emergency stop devices 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.
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 an it is not planed 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.

5 Display and control elements

5.1 Display elements

Display with two sensors connected:

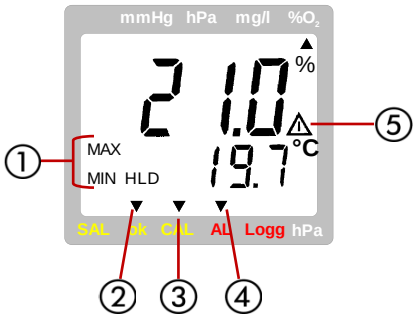


① **Main display:** possible views:
- **Oxygen concentration in %** (% O_2)
- **Oxygen partial pressure** (hPa)

② **Secondary display**:
- **Sensor temperature** (°C or °F)

The desired view can be selected by pressing the Set Menu -key.

Special display elements:



① **Min/Max/Hold**:
shows if a min., max. or hold value is displayed in either the main or the 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

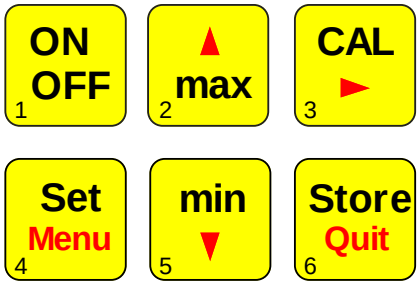
⑤ **Warning triangle:**
indicates a low battery, full logger storage, etc.

Display at reboot:

After switching on the instrument performs a segment test of 2 seconds.
Afterwards some configurations are displayed sequentially: alarm function, air pressure and if activated: offset settings. (p.r.t Chapter 6)

Tip: The display of these settings can be aborted by pressing a key after the segment test (keys 2 - 6).

5.2 Pushbuttons



On/off key

min/max when taking measurements:

press shortly: min. or max. measuring value will be displayed

\+

press for 1 sec.: the min. or max. value will be deleted

up/down for configuration:

to enter values, or change settings

CAL:

press shortly: show state of the electrode

press for 2 sec.: start oxygen calibration

Set/Menu:

press (Set) shortly: change between oxygen concentration[%] and oxygen partial pressure [hPa].

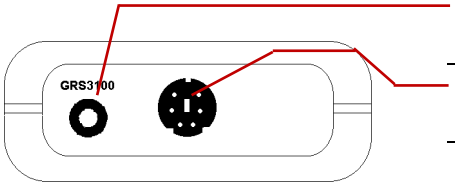
press (Menu) for 2 sec.: configuration will activated

Store/Quit:

Measurement: Hold current measuring value ('HLD' in display)

Set/Menu: Acknowledge setting, return to measuring

5.3 Connections



Interface: connection for electrically isolated interface adapter (accessory: GRS 3100, GRS3105 or USB3100)

Connection for oxygen sensor with integrated temperature probe

The mains socket is located at the left side of the instrument.

6 Configuration

For configuration of the device press Set Menu -key for 2 seconds: the main menu of the configuration will be called up. Use key Set Menu to select a sub-menu, use the key Tara to actually go into the selected sub-menu and to change parameters.

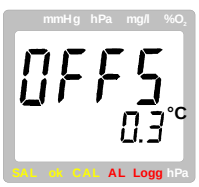
Use the keys max and min to set the individual value for the parameter. Press the key Set Menu again to memorize the changes ant to change to the main menu. Use key Store Quit to leave the configuration.

'Pressure ABs.': Input of Absolute Pressure

max / min

500 … 2000 hPa abs.

The calculated oxygen values will refer to the entered absolute.



'Offset': Zero Point Displacement of the Temperature

max / min

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

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

off:

Zero point displacement is deactivated (=0.0°)

'AL.': Alarm Functions

max

min

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)

max

min

0.0 … 100.0 %

Enter lower alarm limit.

The values entered have to be smaller or equal to the upper alarm limit.

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

max

min

0.0 … 100.0 %

Enter upper alarm limit.

The values entered have to be greater or equal to the lower alarm limit.

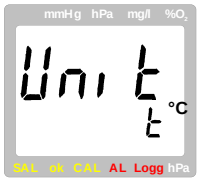
'CAL': Choice of Calibration

max

min

Air: Simple 1 point calibration at atmospheric air (= 20.95 %)

2-Pt: 2 point calibration: one point = air, another point can be entered manually



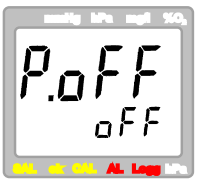
'Unit t': Selection of Temperature Unit °C /°F

max

min

°C: All temperature values in degrees Celsius

°F: All temperature values in degrees Fahrenheit



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

max

min

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. (automatically deactivated for cyclic loggers)

off: automatic power-off function deactivated (continuous operation, e.g. in case of mains operation)

'Address': Selection of Base Address'

max

min

01, 11, 21, …, 91:

Base address for interface communication. Channel 1 will be addressed by the set base address, channel 2 and 3 will have the following addresses.

(Example: base address 21 - channel 1 = 21, channel 2 = 22, channel 3 = 23)

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 are connected via one interface make sure to configurate the base addresses accordingly.

7 Notes to Special Functions

7.1 Input of absolute pressure ('P.Abs')

To get most accurate measurings the absolute pressure should be inspected both before calibration and measuring. The determining pressure is the actual pressure at the sensor membrane. Keep in mind that gas flows may change the absolute pressure at the membrane and therefore may cause measuring errors!

7.2 Zero Displacement (’Offset’) temperature

A zero displacement can be carried out for the temperature measurement.

temperature displayed = temperature measured - offset

Standard setting: ’off’ = 0.0°, i.e. no zero displacement will be carried out. The zero displacement is mainly used to compensate for sensor deviations. Unless ’off’ is set, this value will be displayed shortly after the device is switched on.

7.3 Alarm function

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.

7.4 Base Address (’Adr.’)

Using the interface converter GRS3105 it is possible to connect several instruments 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 configurate the base addresses accordingly. Channel 1 will be addressed by the base address set, channels 2 and 3 will have the following addresses.
(Example: base address 21 - channel 1 = 21, channel 2 = 22, channel 3 = 23)

8 Oxygen Measuring - please note

When measuring gases, please consider the following:

- **Calibration and measuring are depending of the absolute pressure at the sensor!**
  Therefore check absolute pressure before calibration and measuring.
- **Sensor temperature and gas temperature should 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.
  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..

8.1 Application of the different sensor types GGO 369 / 370 and GOO 369 / 370

GGO 369 / 370 (closed sensor)

For measurements at atmosphere and in systems without over or under pressure the GGO ... is sufficient. Additionally the GGO ... can be screwed impermeable to systems with a known pressure. (Attention: please note the specified operating pressure for one-sided strain).

The actual pressure has to be entered (p.r.t. ‚Configuration‘). The pressure will be compensated and no additional mesuring error will occur.

GOO 369 / 370 (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.

9 Calibration of The Oxygen Sensor

In order to compensate for ageing of the sensor, the sensor has to be calibrated at regular intervals.
The device is equipped with two easy to handle calibration functions. We recommend to calibrate at least once a week or, for optimum measuring results, directly before starting the measuring process.
Check the absolute pressure which you have preset in the device before carrying out any calibration!

9.1 1-Point air calibration ('CAL Air')

Electrode has to be subjected to air (make sure that rooms are thoroughly aired).

Start calibration: press CAL-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 resulting of the successful calibration will be shown for a short time (evaluation in 10% steps).

9.2 2-Point calibration ('CAL 2-Pt')

The electrode will be automatically calibrated to the oxygen concentration of atmospheric air (20.95%) and additionally to a second oxygen concentration of your choice.

1. **Start calibration: press CAL-key for 2 sec.**
2. **Choice of first calibration point:**
   The calibration can be carried out starting with the "manual value" or the fixed value "air".
   To change the selection for the first calibration point between "manual value" (display = '----') and "atmospheric air" (display = 'air') press CAL-key.
   Please note: If You started editing the manual value once, the change to "air" is no more possible.
3. **Calibration point 1: (Pt.1)**
   Expose sensor to the chosen gas and wait until temperatures of gas and sensor have adjusted.
   Calibration point = manual value:
   - enter current oxygen concentration of your gas with max and min-keys. (input range: 0.0..10.0%; 30.0..100.0%)
   Please note: If no key is pressed within 2 minutes, the entry will be cancelled and the display returns to "----".
   Calibration point = Air:
   - the calibration will carried out to a value of 20.95%
   After detection of a stable value - permanent display - the calibration value can be acknowledged by Store Quit.
4. **Calibration point 2: (Pt.2)**
   same procedure as calibration point 1
5. After successful ending of the calibration the electrode state resulting of the calibration 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!

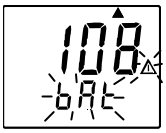
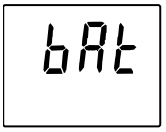
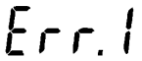
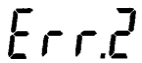
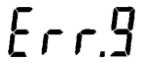
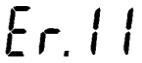
9.3 Valuation of sensor state (ELEC)

Watch sensor state: press key "CAL" shortly once display show for a short time xx% ELEC

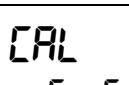
It will show the electrode state resulting of the last successful calibration carried out.
The valuation is displayed in 10 Percent steps: 100% means optimal sensor condition. Lower values are indicating that the sensor life time will be reached soon.

Remark: But also a erroneous pressure entry may be the cause of low valuation values.

10 Error And System Messages

Display	Description / Reason	Remedy
	No sensor or sensor defective	Connect sensor sensor defective => return sensor to manufacturer for repair
	Low battery voltage device will only continue operation for a short time	replace battery
	Low battery voltage	replace battery
	- If mains operation: wrong voltage	replace power supply, if fault continues to exist: device damaged
No display or **mazy characters**	- Battery voltage too low	replace battery
	- If mains op.: power supply defective or wrong voltage/polarity	check/replace mains supply
	- System error	disconnect battery or power supply, wait for a short time, re-connect
	- Device defective	return to manufacturer for repair
	Values exceeding measuring range	Are there any values exceeding the measuring range specified? ->measuring value too high
	Sensor/cable defective	-> replace probe
	Values below measuring range	Are there any values below the measuring range specified? -> measuring value too low
	Sensor/cable defective	-> replace probe
	System fault	switch on again: if fault continues to exist, device is damaged -> return to manufacturer for repair
	No sensor	connect suitable sensor
	Error in sensor	Sensor defective => return to manufacturer for repair
	Temperature display correct, oxygen display incorrect	check: plug in sensor housing connected? Open PG-glanding and pull up plug as far as possible.
	Value could not be calculated	One measuring variable required for calculation is missing (no sensor) or incorrect (overflow/underflow)

10.1 Error and System Messages during Oxygen Calibration

Display	Description / Reason	Remedy
	Wrong temperature	temperature has to be between 5 and 40°C
	Sensor slope to low	check calibration environment (p.r.t. 'Calibration of the oxygen sensor'). If error are unremedied replace sensor element.
	sensor slope to high	check calibration environment (p.r.t. 'Calibration of the oxygen sensor')
	calculated offset to large	check calibration environment (p.r.t. 'Calibration of the oxygen sensor'). If error are unremedied replace sensor element.

CAL Err.6	input signal (O2-partial pressure) to high	check calibration environment (p.r.t. 'Calibration of the oxygen sensor'). If error are unremedied replace sensor element.

11 The serial interface

All measuring data and settings of the device can be read and changed by means of the serial interface and a suitable electrically isolated interface adapter (GRS3100, GRS3105 or USB3100).
In order to avoid faulty transmission, we have designed elaborate security measures for interface communication.

The following **standard software packages** are available for data transfer:

- **EBS20M** more channel software to display of all measuring value (channel 1 ... 4)
- **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, can be used by all 'established' programming languages, suitable for: Windows XP™, Windows Vista™, Windows 7™.
- Programming examples Visual Basic 4.0, Delphi 1.0, Testpoint

11.1 The following interface functions will be supported:

Channel				Dll-Code	Name / function
1 (oxygen concentration)	2 (oxygen partial pressure)	3 (Temperature)	4 (abs. air pressure)		
x	x	x	x	0	Read nominal value
			x	1	Set nominal value
x	x	x	x	3	Read system status
x	x	x	x	6	Read min. value
x	x	x	x	7	Read max. value
x				12	Read ID-no.
x				22	Read min. alarm limit
x				23	Read max. alarm limit
x				32	Read configuration flags
x				102	Set min. alarm limit
x				103	Set max. alarm limit
x				160	Set configuration flags
x				174	Delete min. value
x				175	Delete max. value
x	x	x	x	176	Read min. measuring range
x	x	x	x	177	Read max. measuring range
x	x	x	x	178	Read meas. range unit
x	x	x	x	179	Read meas. range decimal point
x	x	x	x	180	Read meas. range meas. mode
		x		194	Set display unit
x	x	x	x	199	Read meas. type in display
x	x	x	x	200	Read min. display range
x	x	x	x	201	Read max. display range
x	x	x	x	202	Read unit of display
x	x	x	x	204	Read decimal point of display
x				208	Read channel count
x				210	Read electrode state
		x		216	Read offset correction
		x		217	Set offset correction
x				222	Read power-off delay
x				223	Set power-off delay
x				240	Reset unit
x				254	Read program identification

12 Specification

Measuring range:

Oxygen concentration	0.0 ... 100.0 % O_2
Oxygen partial pressure	0 ... 1100 hPa
Sensor temperature	-20.0 ... 50.0 °C
Pressure range	500 ... 2000 hPa abs.

Accuracy device: (± 1 digit) (at 1000 hPa abs. and nominal temperature)

Oxygen concentration	± 0.1 % O_2
Oxygen partial pressure	± 1 hPa
Sensor temperature	± 0.2 °C

Nominal temperature:	25 °C
Working temperature:	0 to +50 °C
Relative humidity:	0 to 95 %RH (non-condensing)
Storage temperature:	-20 to +70 °C
Sensor connection:	6-pin Mini-DIN-socket
Display:	2 four digit LCDs (12.4 mm high and 7 mm high) for temperature, and for min./ max values, hold function, etc. as well as additional pointing arrows.
Pushbuttons:	6 membrane keys altogether for on/off switch, selection of thermoelements, min. and max. value memory, hold-function etc.
Interface:	serial interface (3.5 mm jack), serial interface can be directly connected to USB or RS232 interface of a PC via interface adapter USB3100, GRS3100 or GRS3105 (see accessories).
Power supply:	9V-battery, type IEC 6F22 (included) or additional d.c. connector (internal pin Ø 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
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 1and 120 min.; it can be completely deactivated.
Min-/max-value memory:	Both the max. and the min. value will be memorized for each measurement taken.
Hold-function:	Press button to memorize current measuring values.
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
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)
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%

13 Disposal instruction:

Batteries must not be disposed in the regular domestic waste but at the designated collecting points.
The device must not be disposed in the unsorted municipal waste! Send the device directly to us (sufficiently stamped), if it should be disposed. We will dispose the device appropriate and environmentally sound.

Residual oxygen meas. device

for quick and cost-effective measurement of residual oxygen

GMH 3691 GOG

Application:
Essentially there, where delicate products are conserved by low-oxygen atmospheres (protective gas), this instrument is suitable to check the residual oxygen content.

- **packaging industry**
- **food industry**

Specification: (summary)

Meas. range: 0,0 ... 100,0 % O_2 (O_2-concentration)
Accuracy: *(whole system - during carefully calibration and measuring)*
1-point-calibration: ±0.2 %O2 ±1 digit (for concentrations < 10%)
2-point-calibration: ±0.1 %O2 ±1 digit (for concentrations < 10%)
Oxygen probe: Oxygen-partial pressure probe, built in external sensor housing
Response time: T_{90} < 10 sec., depending on temperature
Operation life: warranty for sensor element 12 months (appropriate application and ambient pressure)
Working pressure: 0.5 to 2.0 bar abs.
Over-/under-pressure: max. 0,25 bar
Working temperature: 0 to 50°C (sensor), -20 to 50°C (device)
Relative humidity: 0 to +95%RH (non-condensing)
Storage temperature: -15 to 60°C (sensor), -20 to 70°C (device)
Power supply: 9V battery type IEC 6F22
Dimensions case: approx. 394 x 294 x 106 mm
Weight: approx. 1400g (cpl. set)

for additional technical data refer to GMH3691 and accessory sensors p. 51

Scope of supply:
Instrument GMH3691, hand pump with air tube, GOG oxygen sensor with penetration needle, case GKK3500, spare needle ø0,9mm, rubber foam sticker (40 pieces), operating manual.

Spare elements, accessories:

GOG-SET Set without instrument
Scope of supply: GOG oxygen sensor with penetration needle, hand pump with air tube, case GKK3500, spare needle and 40 rubber foam sticker

GOEL 370 spare sensor element

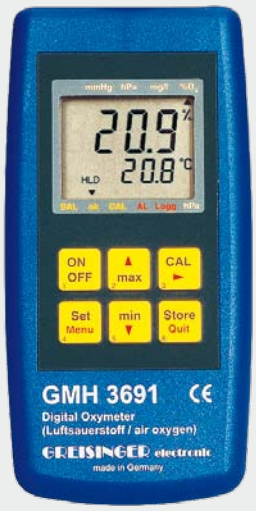
GOG-N needle, Ø 0.9 mm (5 pieces)

GOG-A rubber foam sticker (40 pieces)

ST-R1 device protection bag with cut-out for probe connection

for add. accessories p.r.t. page 56 - 58

Air oxygen measuring device



- Double display for oxygen and temperature
- Measured units: O_2-concentration and O_2-partial pressure
- Alarm detector with integrated horn
- Automatic temperature compensation
- Min./Max. value memory, Hold function
- Serial interface, device can be connected to bus system (up to 5 devices can be connected to one PC interface)
- Battery and d.c. operation
- Wide range of application
- Most simple calibration in atmospheric air

GMH 3691 Sensor not included - please order separately!

Specification:

Measuring ranges:
Oxygen concentration: 0,0 ... 100,0 % O_2 (gaseous)
Partial oxygen pressure: 0 ... 1100 hPa O_2
Temperature: -5,0 ... 50,0 °C
Accuracy: (device) (at nominal temperature = 25°C)
Oxygen concentration: ±0.1% ±1digit
Partial oxygen pressure: ±1 hPa ±1digit
Temperature: ±0.1°C ±1digit
Oxygen electrode: *for suitable sensores p.r.t. page 51*
Sensor connection: 6-pin screened Mini-DIN-socket.
Display: two 4 digit LCDs (12.4mm or 7mm high), as well as additional arrows.
Pushbuttons: 6 membrane keys for ON/OFF-switch, selection of meas. range, min- and max-value memory, hold-function, calibration etc.
Working temperature: 0 to +50°C
Relative humidity: 0 to +95%RH (non-condensing)
Storage temperature: -20 to +70°C
Interface: serial interface, direct connection to RS232 or USB interface of a PC via electrically isolated interface converter GRS3100 or GRS3105 resp. USB3100 (p.r.t. accessories).
Power supply: 9V-battery, type IEC 6F22 (included), as well as additional d.c. connector for external 10.5-12V direct voltage supply. (suitable power supply: GNG10/3000)
Power-Off-function: 1...120min (can also be deaktivated).
Power consumption: approx. 1.5 mA
Low battery warning: ⚠ and ' bAt '
Dimensions: 142 x 71 x 26 mm (H x W x D) Impact-resistant ABS plastic housing, membrane keyboard, transparent panel. Front side IP65, integrated pop-up clip.
Weight: approx. 160 g (cpl. with battery)

Functions:
Min-/Max-value memory: max. and min. values will be memorized.
Hold function: by pressing a button the current meas. value will be memorized.
Alarm: integrated limit detector for min. or max. alarm.
Temperature compensation: automatic via temperature sensor, integrated in probe housing.
Air pressure compensation: The O_2 concentration will be compensated according to the abs. atmospheric pressure set (500...2000hPa).

Calibration: 1-point calibration: extremely simple quick calibration in atmospheric air. (press button to compensate unit to 20.9%).
2-point calibration: first point at atmospheric air (20.9%), second point freely selectable

Application:

Wide range of application for your home, job and hobby! For example:

- Bio chemistry: Oxygen monitoring in breeding chambers for cell cultures. Monitoring of fermenting process of fruits in fermentation plants etc.

- Medicine: Monitoring of oxygen concentration in respirators; checking of breathing, monitoring of oxygen concentration in incubators, oxygen tents etc.

- Food technology: Monitoring of residual oxygen in packages (e.g. coffee, tea, etc.). Monitoring of oxygen content during production processes.

- Air conditioning and ventilation technology: Oxygen measurements, air quality monitoring, measuring of oxygen concentration in enclosed air conditioning systems, etc.

- Sport: Checking of oxygen content in compressed air breathing apparatuses (diving, etc.), oxygen monitoring for gliding.

The device can only be used to check during these applications. -> no substitute for approved monitoring device!

Accessories:

Suitable sensores **p.r.t. page 51**

GKK 3000 case (275 x 229 x 83 mm) with punched lining suitable for GMH3xxx

USB 3100 N interface converter, electrical isolated

GRS 3105 interface converter with 5 connection points, electr. isolated, for the connection of 5 GMH3xxx to one PC (RS232).

ST-R1 device protection bag with cut-out for probe connection

for add. accessories p.r.t. pages 56 - 58