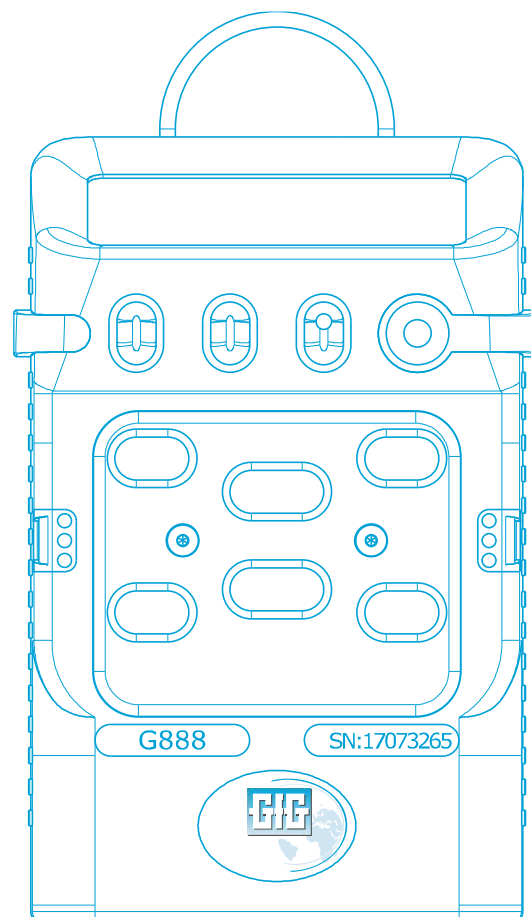


Operation manual

# Microtector III G888

1 to 7 gas detector



Translation of the original operation manual

Measurable safety with GfG instruments

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Congratulations!

You have chosen one of GfG's precise measuring instruments.  
A great choice!

Reliability, safety, ideal performance and efficiency are what distinguishes our devices.

They conform to national and international guidelines.

This operation manual will aid you in learning how to use your new device quickly and safely.

Please observe our operation instructions before turning on the device!

If you have any further questions, please do not hesitate to contact one of our specialists.

**GfG Gesellschaft für Gerätebau mbH**

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# 1 Introduction

## 1.1 For your Safety

This operation manual informs you about the intended use of the product in accordance with §3 of the German Law of technical working equipment. Its purpose is the prevention of dangers. It must be read and adhered to by every person using, maintaining, servicing and controlling the device. This is particularly important for all safety instructions in this operation manual which are labelled with the  symbol. This product can only fulfill its intended purpose if it is used, maintained, serviced and controlled in accordance with GfG - Gesellschaft für Gerätebau's instructions. Using, maintaining, servicing and controlling the product contrary to these instructions will void the warranty given by GfG.

The above does not change the information on warranty and liability stated in GfG's general Terms and Conditions of Purchase and Delivery. Repairs may only be performed by specialists or people that have been trained accordingly. Any modifications and changes to the product must be approved by GfG first. Any unauthorized modifications of the device will void the liability for damages. Only original GfG accessories may be used with the product. Only spare parts that have been authorized and cleared by GfG may be used for repairs.







A function test **must** be performed every day the device is used. A calibration and, if necessary, adjustment has to be carried out at least once every four months.

## 1.2 Application and purpose

The G888 is a hand-held measuring device for personal safety, protecting its user against dangers from toxic or explosive gases and vapors as well as oxygen deficiencies or excesses. The G888 continuously measures in diffusion mode and will warn its user with a visual and acoustic alarm.

The G888 has been approved for use in potentially explosive areas by DEKRA EXAM GmbH and is certified by a corresponding EC Type Examination Certificate according to guideline 2014/34/EU as well as an IECEx certificate.

Certificates: **BVS 15 ATEX E 064 X**  
**IECEX BVS 15.0056 X**


Designation: **G888C**  I M2 Ex ia db I Mb  II 2G Ex ia db IIC T4 Gb -20°C≤Ta≤+50°C  
**G888M**  I M2 Ex ia db I Mb  II 2G Ex ia db IIC T4 Gb -20°C≤Ta≤+50°C  
 I M1 Ex ia da I Ma  II 1G Ex ia da IIC T4 Ga -20°C≤Ta≤+40°C

## 1.3 Special requirements for safe use



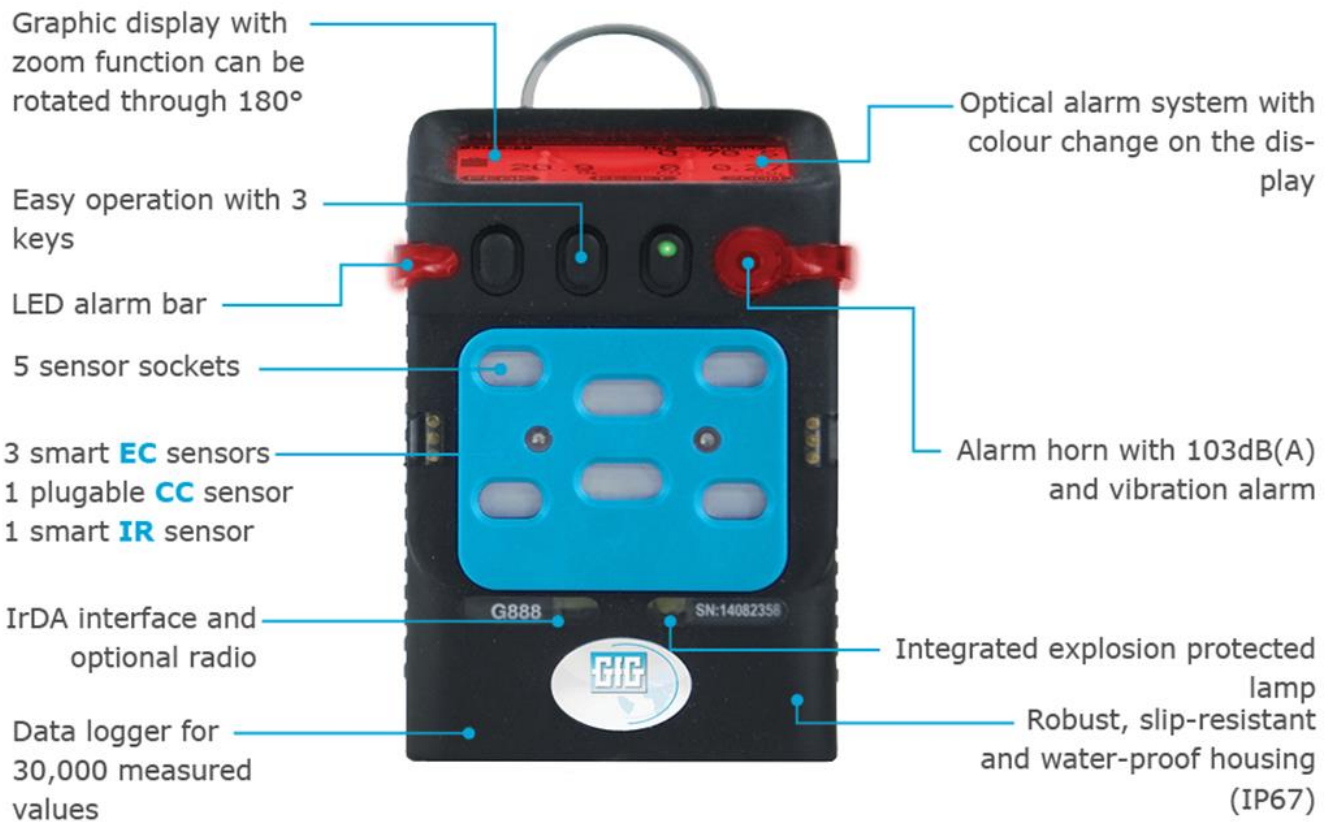
**Caution:** The G888 has to be employed strictly as intended when used in a potentially explosive areas or in group I (mining) applications. This means the device must be carried on your person and may not be left unattended, to avoid mechanical damages due to impacts. It is intended for lower degree mechanical dangers according to EN 60079-0. The gas monitoring device must immediately be removed from potentially explosive areas and cleaned, if it has been polluted by oils and greases or hydraulic fluids.

The displayed gas value of combustible gases and vapors must be checked with zero and test gas before every use. If the displayed gas values permanently deviate from the zero point in fresh air (devoid of measured gases), the zero point needs to be adjusted.

Especially for higher impact conditions, the sensors' zero points must be checked and, if necessary, readjusted. If heavy impacts have caused the catalytic combustion sensor to trigger an alarm stating the measuring range has been exceeded , this alarm has to be acknowledged in fresh air and the zero point might have to be readjusted.

If the G888 is used continuously for more than a day, it should be turned off and on again at least every 24 hours.

## 1.4 Device design




## 2 Operating instructions

### 2.1 Commissioning

#### 2.1.1 Turning the device on and off



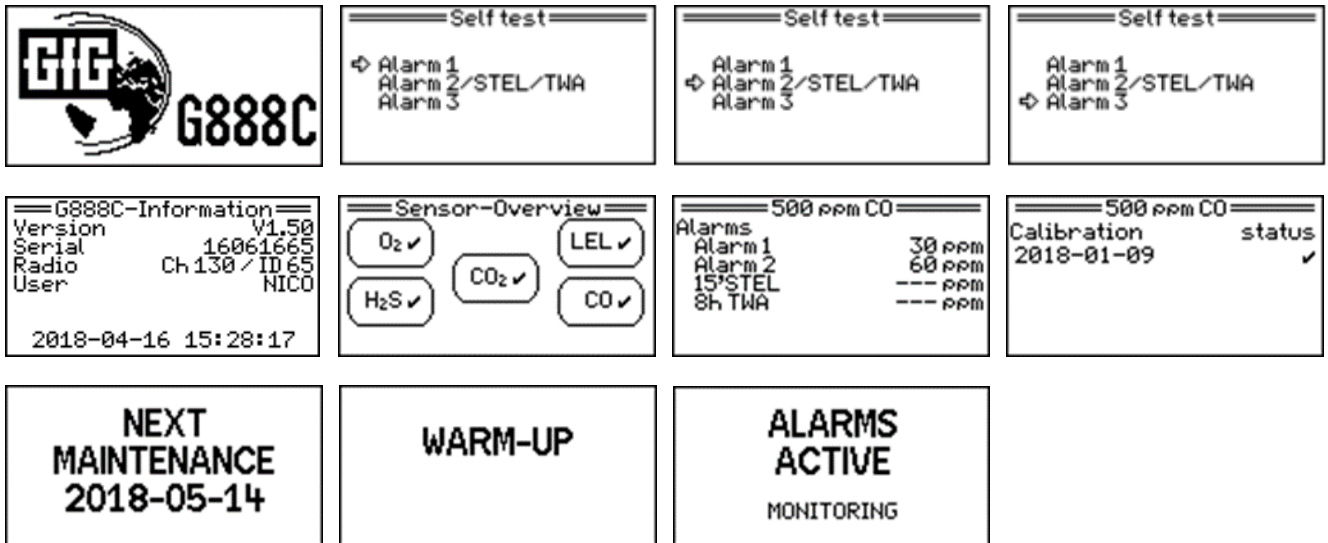
Briefly press the right button  to turn on the device.

Holding the right button  down for approximately five seconds will turn off the device.

Release the button when "Switch off / 0" is displayed.

The regular measuring mode is automatically switched off during charging. Instead, the display will indicate the elapsed charging time.

When it is turned on, the device will perform a self-test and give you information on the firmware version, the integrated sensors and their measuring ranges and alarm thresholds, as well as the date of the next scheduled maintenance. During the self-test, the visual and acoustic signal will be triggered in a way that may be perceived as a gas alarm.

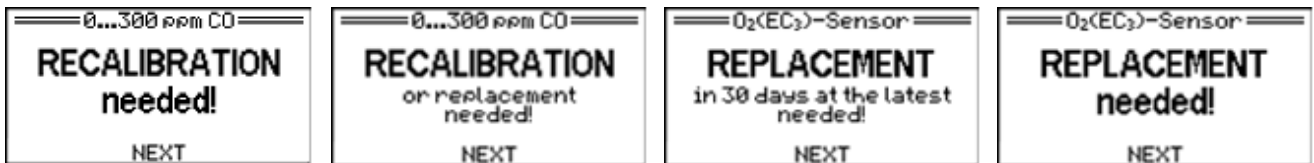


Alarm thresholds and calibration data will be displayed for all available sensors. As an example, only H<sub>2</sub>S is shown here. Depending on the sensors' conditions other notifications might be displayed as well. You may have to acknowledge them. For more information, please refer to section "Other notifications when starting the device"

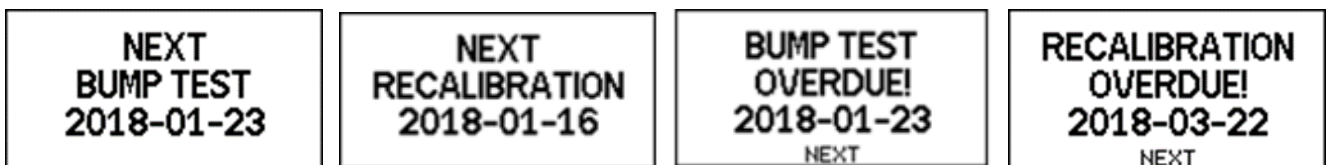
The device will be ready to use approximately a minute after the notifications have been displayed. The notifications can be acknowledged with the center button.

## 2.1.2 Other notifications when starting the device

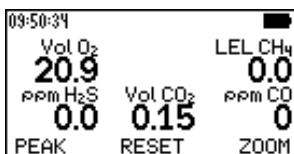
Upon start-up, the G888 will test the sensors and monitor their calibration data. For sensors that have not been calibrated yet, or those whose last calibration was more than a year ago, the notification "Recalibration needed!" will be displayed. Since relatively used sensors have shorter calibration intervals, you may also see the message "Recalibration or replacement needed!" If a sensor is completely used up, the display will show the notification "Replacement needed!" These notifications have to be acknowledged by pressing the button.



If you are using a docking station to check the device, the G888 might have set intervals for the function test and sensor adjustment. The date of the next function test or next sensor adjustment are set automatically, using the dates of the last checks. Depending on which is due next, the device will notify you of the next function test or sensor adjustment upon starting. If this date has already been exceeded, the G888 will display "Overdue!". These notifications have to be acknowledged by pressing the button.



## 2.2 Measuring mode

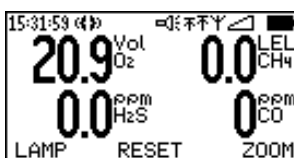







The G888 is ready for operation when the display is showing the time, the battery symbol and the measured values of all measured gases and their units.

The measured gas concentrations are now being monitored. You will be alerted if a measured value exceeds or, for oxygen, falls below the set limit values.

### 2.2.1 Display of measured values, icons and button functions

Depending on the selected functions or activated device options, you can have additional icons be displayed in the topmost row of the display.

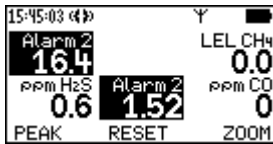
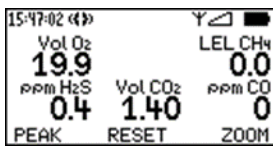


-  Motion detection (see section 2.2.5)
-  Flashlight (see section 2.2.10)
-  Peak display (see section 2.2.8)
-  Radio and field strength (see section 2.2.15)
-  Battery capacity (see section 2.2.4)

The lower row of the display will always show the current function of the three buttons. In this case, briefly pressing the left button will activate (and deactivate) **PEAK** mode. Gas alarms can be acknowledged by briefly pressing the center button (**RESET**). Briefly pressing the right button will let you switch to **ZOOM** or detailed view.

## 2.2.2 Monitoring and gas alarms

If a measured value exceeds (or, in case of O<sub>2</sub>, falls below) the set threshold value, you will immediately be notified by a visual and acoustic signal. The gas that triggered the alarm will be displayed. The measured value that triggered the alarm is indicated with an inverted color scheme flashing every second.



The image on the left shows an alarm being triggered by a high CO<sub>2</sub> reading. In addition to the inverted display, the notifications "Vol CO<sub>2</sub>" and "Alarm 2" are shown alternately.

An extremely loud (103dB(A) @30cm) acoustic alarm and a bright visual alarm all around the device ensure safe warnings when gas hazards occur. In case of a gas alarm the entire display will be backlit either red or orange, depending on the alarm condition. The device has up to three different alarm levels. The pre-alarm 1 is not latching, while the main alarms 2 and 3 are (factory settings). The G888 offers three current value alarms for oxygen and combustible gases (e.g. CH<sub>4</sub>) and two for toxic gases (e.g. CO or H<sub>2</sub>S).



An additional exposition value alarm, which is triggered if the long-term and the short-term exposure limits (TWA and STEL) are exceeded, can be set for toxic gases. For more information, see "Alarm limit values - General settings" and "Alarms - Alarm settings". The alarm can also be signaled by vibrations.

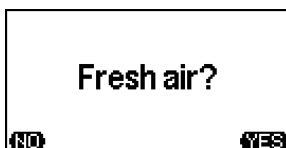
Type of alarm	Sensors	Number of alarms	Description
<b>Current value (AL)</b>	Oxygen combustible gases, toxic gases	3 3 2	A current value alarm is triggered when the gas concentration exceeds or falls short of (O <sub>2</sub> ) a set value. The current value alarms are adjustable.
<b>Short-term exposure limit (STEL)</b>	toxic gases	1	The short-term value (STEL) indicates the average value of the last 15 minutes. The STEL alarm is not latching. It turns off automatically as soon as the measured values fall below the short-term limit values again.
<b>Long-term value (TWA)</b>	toxic gases	1	The long-term value (TWA) indicates the average measured value of the last 8 hours (approximately one working day). The TWA alarm cannot be reset. It will only turn off when the device is turned off.

The alarms are prioritized as follows: Power error, measured values exceeding measuring range, AL3, TWA > AL2, STEL > AL1, measured values falling below measuring range > temperature error.

## 2.2.3 Acknowledging gas alarms

The current value alarms 2 and 3 are latching (factory setting) and can only be reset by pressing the **RESET** button when the measured values exceed (or, for oxygen, fall below) the set threshold values again. Current value alarm 1 is not latching and is reset automatically as soon as the alarm conditions are no longer present.

If the measuring range is exceeded on a catalytic combustion sensor (e.g. CH<sub>4</sub>), the display will show arrows pointing up  instead of the gas for gas concentrations above 110 % LEL or above 5.5 vol % CH<sub>4</sub>. The sensor will be deactivated to protect it from damages. The alarm and the displayed arrows  remain, however. This alarm can only be reset by pressing the **RESET** button. The following question will be displayed:



Only if you are absolutely certain that no combustible gas remains on the sensor, but it is instead surrounded by fresh air, confirm the question with **YES**. The sensor is then reactivated and will - after a short stabilization time - display measured values again!

For more information on this, refer to section "Particularities when monitoring within LEL ranges".

## 2.2.4 Battery capacity and battery alarm



In measuring mode, the battery capacity is indicated by the battery icon in the top right corner of the screen. The degree to which it is filled indicates how much capacity remains. The remaining capacity can also be displayed in numerical values by pressing the right button (**ZOOM**). You might have to press it several times. (\*1)

A fully charged battery normally has enough capacity to function for more than seven hours (8 to 65 hours

depending on the sensor combination - see technical specifications). Alarms may impact the operating time negatively. If the charging status falls to a level that is so low the battery icon appears to be empty, the device will switch to "energy saving mode". This means the green display backlight will no longer be active. In case of a gas alarm, the red display backlight will not be activated either. The alarm will then only be signaled by the red alarm LEDs and at a maximum buzzer volume of 90dB(A). If the charging falls even further, the battery alarm is triggered. It is indicated by an acoustic signal. In this condition, the battery icon will flash. The maximum remaining operating time will be displayed in one-minute intervals. The device will shut down after 15 minutes, emitting a distinct acoustic signal. The display will show "OFF" for five minutes after the device has shut down. If the "Anti-Lazy-Battery" function has been activated in the options menu, the device will not shut off after 15 minutes, but instead only after the minimum voltage cannot be reached anymore.

## 2.2.5 Motion detection and man-down-alarm

The G888 gives you the option of monitoring the movement of its user. This option is helpful for applications during which no other person is in the immediate facility.



If the device user cannot act anymore by themselves, help can be called quickly through the acoustic alarm or via radio signal.

If motion detection is enabled, this will be indicated by the motion icon in the upper row of the display.

If no motion is detected by the internal motion detector for a defined period of time, an acoustic MAN-DOWN-ALARM is triggered after a 30 second warning period. This alarm can only be reset by pressing a button. During the warning period, the timer can be reset by moving the device or pressing a button.

If the device contains a radio module, the motionless time and, if applicable, a triggered MAN-DOWN-ALARM will be transmitted alongside the measured values.

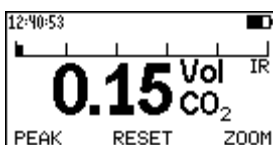
The motion detection settings can be adjusted in the service menu: System / System options / Man-Down-Alarm (see section 2.3.2.1.5).

## 2.2.6 Short-term, long-term, maximum and minimum values

The device will continuously measure in diffusion mode after it has been switched on. In this operation mode, all concentrations are displayed. For toxic gases, the short-term and long-term values (STEL and TWA) are generated and the maximum (MAX) and minimal (MIN) value are stored.

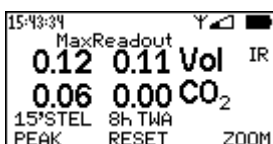
These stored values can be displayed, if the display is switched to the appropriate display mode with the right button **ZOOM**.

## 2.2.7 Zoom display and detailed view



To display the measured values in Zoom mode, press the right button (**ZOOM**). Press the button briefly to zoom in on a selected value. You can also have the measured values of the individual sensors displayed in succession by briefly pressing the right button several times.

While zooming in on a value, press the **ZOOM** button to switch to the following detailed view:

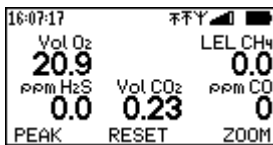


Example: Detailed view for CO<sub>2</sub>

- Upper left: Maximum value (since turning on or last RESET)
- Upper right: Current gas concentration
- Bottom left: Short-term value (15 minutes)
- Bottom right: Long-term value (8 hours)

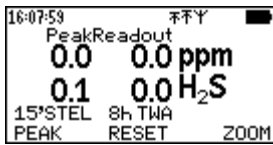
You can switch between the different Zoom modes within one session by holding down the **ZOOM** button. The display mode will switch back to normal view approximately 10 seconds after activating the zoom display. This time can be adjusted in the system settings. If you press the **RESET** button while in zoom display mode, the maximum / minimum value memory will be reset to the current gas concentration.

## 2.2.8 Peak display: Indication of peak values



In Peak mode, which can be accessed by pressing the left button **PEAK**, the peak values are displayed permanently. The Peak icon  $\leftarrow\rightarrow$  (two arrows)  $\leftarrow\rightarrow$  will be displayed in the top row of the display.

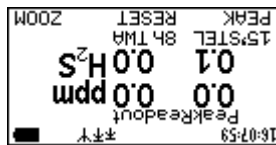
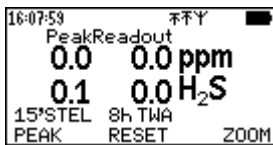
Pressing **PEAK** again will deactivate Peak mode.



In the detailed view of the zoom display, the max. or min. peak value is indicated in the upper left corner instead of the max. or min. gas concentration value.

If you press the **RESET** button while in zoom display mode, the peak memory is reset to the current gas concentration.

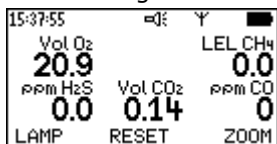
## 2.2.9 Rotating the display



The G888's display can be rotated by 180°. Simply press and release the left and right button simultaneously. The display can then be read more easily, if the device is carried on a belt.

## 2.2.10 Using the flashlight

Using the integrated flashlight can be helpful if the device is, for example, lowered into a shaft or is needed as a safe light source in dark, potentially explosive areas.



The flashlight can be activated by holding down (approximately 3 sec.) the left button and deactivated by briefly pressing the same button again.

The fact that the flashlight is active will be indicated by the flashlight icon  $\text{☞}$ .

## 2.2.11 Display backlight

The display backlight can be activated by holding down any key for approximately ten seconds. It will turn off automatically. You will not be able to activate the display backlight if the battery is already severely depleted.

## 2.2.12 Particularities when monitoring within LEL ranges

The G888 can use a catalytic combustion (CC) sensor for monitoring LEL ranges. Due to the nature of this measuring method, the G888 is not able to differentiate between measured values in the LEL range and values in increased vol % ranges (e.g. 20 vol % CH<sub>4</sub>). The sensor would also be harmed by concentrations above 110 % LEL. To avoid this, the sensor is turned off immediately when a gas concentration above 110 % LEL is detected. It can only be turned on again by pressing the **RESET** button and confirming the question "Fresh air?" with the **YES** button.

At oxygen concentrations of less than 10 vol %, no accurate measurements of combustible gases and vapors can be given via the catalytic combustion process. For more information, refer to "Influences of oxygen and interfering gases"

## 2.2.13 Influences of oxygen and interfering gases

Please consider that no accurate measurements of gas and / or vapor concentrations in the measuring range below 100 % LEL can be made on G888s with a catalytic combustion sensor, if the oxygen concentration is less than 10 vol %. In this case, the CC sensor would be missing the oxygen required for catalytic combustion. If the oxygen sensor detects a concentration this low, question marks "???" will be displayed instead of the % LEL measured value. As soon as the oxygen concentration stabilizes above 10 vol % again, the measured value will be displayed as before. The Ex certification does not apply to use of the device in oxygen-enriched atmospheres. Certain substances (called "sensor and catalyst poisons" in technical terminology) can impair the catalytic combustion (CC) sensor and its signaling behavior. Its "sensitivity", the ability to emit signals, is reduced. Substances in this category include compounds of sulfur, lead and silicone.

## 2.2.14 Recording measured data with the data logger

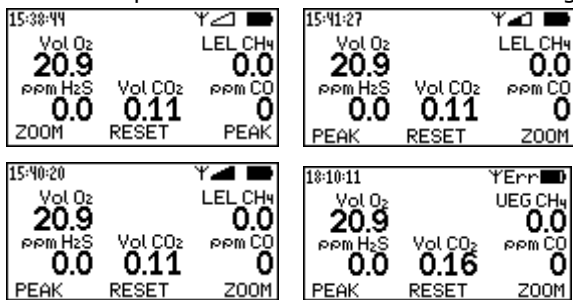
The G888 has an integrated data logger which can be used to record the measured data. You do not have to specifically activate the data logging feature.




The internal data logger is able to store 30,000 measuring points each for up to 12 different measured values as well as additional information. This includes the date, time, location of the measurement, triggered alarms and special events.

The menu item "Data logger" in the service menu can be used to set different data storage options. You can select the storage of averages, peak values or current values as well as set the recording interval between 1 second and 60 minutes. The memory type is set to ring memory by default, which means the oldest measured values are overwritten if the data logger is full.

## 2.2.15 Transmission of measured values via radio signal

If the G888 has an integrated radio module and this module is turned on, the current measured values can also be requested and transmitted via radio signal.



The icons  for radio transmission and field strength will be displayed in the topmost row of the display when the radio module is activated. The field strength is indicated by the amount of black in the field strength icon . The icon  will flash to signal that no measured values can be transmitted at the moment or the radio connection has been interrupted. If the **YErr** icon is displayed, the radio module is either defective or switched on but not present at all.

Generally, the range of the radio connection depends extremely on the structural circumstances between sender and receiver. The 868MHz radio module will reach up to 700 m in unobstructed areas. In buildings, the range can drop to significantly less than 100 m, depending on the material, number and width of the walls and other construction components.

You can set the device-specific radio signal address and, if necessary, the radio channel in the service menu: System / System options / Radio (see section 2.3.2.1.5).

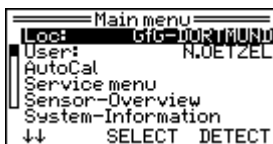
## 2.3 Service mode


Hold down the center button **RESET** for approximately 3 seconds to enter service mode. While in service mode, the G888 can be configured by adjusting program parameters. Some menu items are only accessible after entering the access code "0011". This access code ensures that important functions cannot be changed accidentally or by an unauthorized person. No alarms are triggered while in service mode.

The first menu item in the service menu is the main menu.

### 2.3.1 Main menu

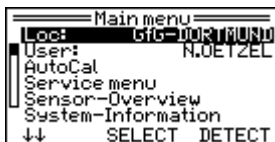
**Navigating the menu:** The individual functions of the buttons are always indicated by the text displayed above each button.



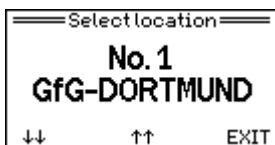
- Left button**  = Scroll down one menu item
- Center button** **SELECT** = Select the highlighted menu item
- Right button** **DETECT** = Back to measuring mode

The individual menu items of the main menu are:

### 2.3.1.1 Location – Selecting a measuring location



Choose one of up to 100 possible locations from a table stored on the device. All entries in this table can only be edited on a PC. One entry in the table can consist of up to 15 letters or numbers, which are saved as "job sites" on the G888.

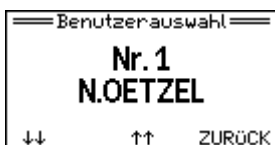


Use the left and center buttons to select one of the stored locations. The process is completed automatically, if the selected value is confirmed with the right button "Back".

### 2.3.1.2 Name - Selecting a user



Choose one of up to 20 possible users from a table stored on the device. All entries in this table can only be edited on a PC. One entry in the table can consist of up to 15 letters or numbers, which are saved as "identification" on the G888.



Use the left and center buttons to select one of the stored users. The process is completed automatically, if the selected value is confirmed with the right button "Back".

### 2.3.1.3 AutoCal - Menu for AutoCal adjustment

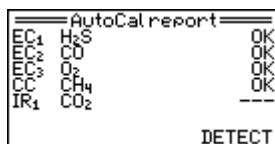
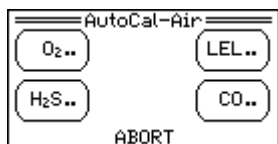
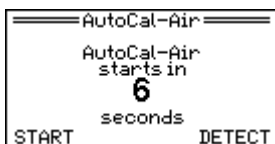
In the AutoCal menu, several different sensors can simultaneously be calibrated with fresh air (AIR) or test gas (GAS). All sensors except CO<sub>2</sub> sensors can by default be calibrated with fresh air without adjusting any further settings. When using test gas (GAS), the sensor must be unlocked depending on the test gas (-mixture). For more information, refer to sections "AutoCal - air..." and "AutoCal - gas...".

The menu item AutoCal can be selected from the main menu or, alternatively, directly from measuring mode by simultaneously pressing the center and right buttons.

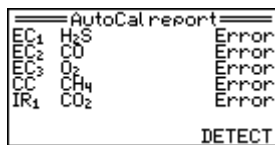
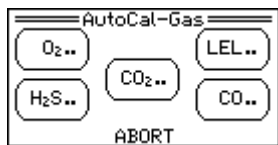
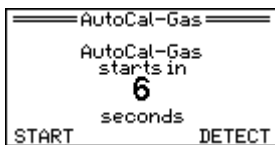


You can then select one of the following functions:

- AIR** = AutoCal adjustment with fresh air
- GAS** = AutoCal adjustment with test gas
- BACK** = Back to the main menu



AutoCal adjustment with fresh air has been successful

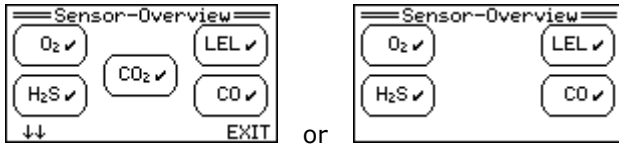


AutoCal adjustment with test gas has not been successful. (due to e.g. a wrong test gas concentration)

An AutoCal adjustment with fresh air can only be carried out if the sensor measurement of the set point 0.0 (except for O<sub>2</sub>) do not deviate from the measuring range by more than ±10 %, or in case of a set value of 20.9 vol % O<sub>2</sub>, not more than ±5.2 vol %. An AutoCal adjustment with test gas can only be carried out if the sensor measurement does not deviate from the "Cal. gas" set value (sensor menu: "Calibration") by more than 25 %. If any deviations higher than are detected, the corresponding sensor will be marked as "error" in the subsequent AutoCal report. If this is the case, adjust the sensor in the sensor menu items "zero" or "calibrate" or on the docking station.

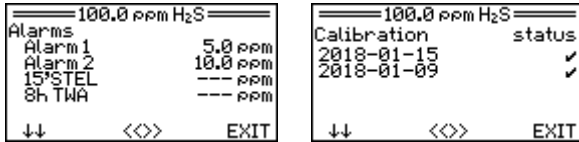
Adjustments with fresh air free of the measured gas can be done while in diffusion mode. You should not be using ambient air to adjust the zero point of a CO<sub>2</sub> sensor however, since ambient air always contains a small amount of carbon dioxide (CO<sub>2</sub>) which would falsify the subsequently measured CO<sub>2</sub> values. This is why the zero point of the CO<sub>2</sub> sensor may only be adjusted in the "zero" sensor menu or with the docking station using zero gas free of CO<sub>2</sub>. This could be synthetic air, 100 vol % N<sub>2</sub> or specifically cleaned air (CO<sub>2</sub> free). Zero gas (air free of measured gas) and test gas can be inserted via the calibration cap "SMART CAP" with a volume flow of 0.5 to 0.6slpm (l/min).

### 2.3.1.4 Sensor overview



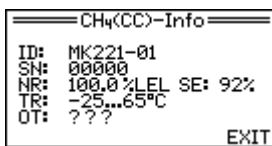
The sensors displayed in the overview are located in the corresponding slots in the device.

### Display and alarm settings as well as date and status of last calibration



The "calibration data" menu can be used to display data of the three most recent sensitivity adjustments. The status display indicates if they have been successful (✓) or unsuccessful (Err).

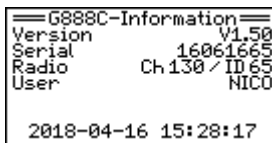
### Sensor information



This menu displays specific information for each sensor.

- ID = Number of the measuring chamber
- SN = Serial number
- MR = Measuring range
- TR = Temperature range
- OT = Operating time of the sensor, e.g. 125 of 791 days

### 2.3.1.5 System information



The **Information** menu will give you information on the device type, the firmware version and the device's serial number.

## 2.3.2 Service-Menu

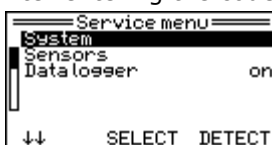
Selecting the main menu item **Service** will give you access to the service menu. You can use the service menu to make adjustments to the G888 by changing program parameters.

Some menu items are only accessible after entering the access code "0011". This access code ensures that important functions cannot be changed accidentally or by an unauthorized person. No alarms are triggered while in service mode.



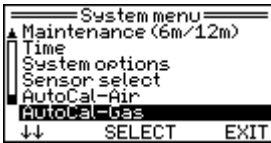
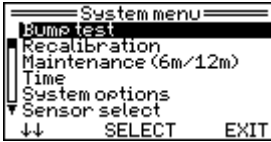
- ABC** = Go to the next letter of the alphabet
- <<>>** = Confirm letter (Cursor will jump to the next position automatically) Holding down the button will delete the last entry. The cursor will jump back one position.
- 012↑↑** = Go to previous letter of the alphabet

After entering the code 0011 the display will show:



The **System** menu can be used to adjust general settings (see section "System menu"). The **Sensor** menu can be used to adjust sensor specific functions (zero and sensitivity adjustments). It will also let you view information or set alarm thresholds. You can exit the service menu and go back to measuring mode by pressing the **DETECT** button.

### 2.3.2.1 System – Menu for system settings

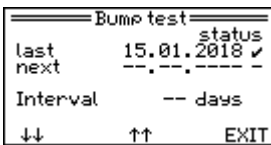


These menu items are explained in the following sections:

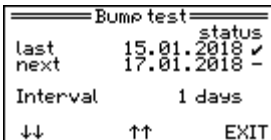
- Bump test (see section 2.3.2.1.1)
- Sensor adjustment (zero point & sensitivity) (see section 2.3.2.1.2)
- Maintenance, setting the next scheduled date (see section 2.3.2.1.3)
- Time, setting of date and time (see section 2.3.2.1.4)
- System options for various settings (see section 2.3.2.1.5)
- Sensor selection, activate / deactivate (see section 2.3.2.1.6)
- AutoCal air, authorizing sensors for AutoCal adjust. (see section 2.3.2.1.7)
- AutoCal gas, authorizing sensors for AutoCal adjust (see section 2.3.2.1.8)

#### 2.3.2.1.1 Bump test

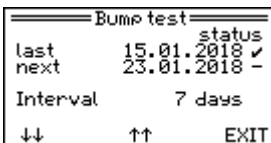
The bump test (checking sensor values and alarms) can be done quickly and easily with the DS400 docking station. The bump test is performed automatically. The intervals for the bump test are stored on the G888. The bump test interval will be activated after the first function test in the docking station.



Bump test interval is not activated.



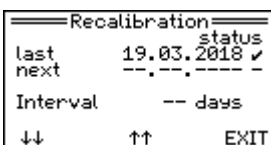
Setting the bump test intervals will immediately set the next due date as well.



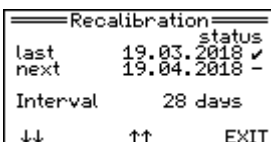
Bump test on January 15, 2018 has been successful. Next bump test is due 7 days later.

#### 2.3.2.1.2 Sensor adjustment (zero point and sensitivity)

The sensor adjustment (zero adjustment and sensitivity adjustment) can be done quickly and easily by having the DS400 docking station perform it fully automatically. The intervals for sensor adjustments are saved on the G888 and activated after the first sensor adjustment with the docking station.



Sensor adjustment on March 19, 2018 has been successful. Sensor adjustment interval is not activated.



Sensor adjustment on March 19, 2018 has been successful. Next sensor adjustment is due on April 19, 2018.

#### 2.3.2.1.3 Maintenance

You can set the G888 to remind you of the date for the next scheduled maintenance (system check according to T021/T023). The device will alarm you if this date is exceeded. If the date has been exceeded, the G888 will notify you that maintenance is due every time it is turned on. To activate this function, go to the service menu and select **Maintenance**.



There, choose which parameter you want to change (year, month and day):

- EXIT** = Back to the main menu
- SELECT** = Selecting the highlighted parameter
- >>** = Go to next parameter



There are several options to change a parameter:

- = Decrease value
- = Confirm value
- = Increase value

### 2.3.2.1.4 Time

The device comes with a clock indicating the date and time. This clock is buffered by a lithium cell, which is designed for an operating life of 20 years. An automatic switch to daylight saving time can be turned on or off. Since there are regional differences regarding daylight saving time, you can also choose between Europe, North America or no adjustment.



To navigate the time menu, use the following:

- = Select the highlighted position.
- = Go to next parameter.
- = Go back to system menu.

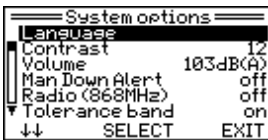


There are several options to change a parameter:

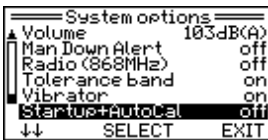
- = Decrease value
- = Confirm value
- = Increase value

### 2.3.2.1.5 System options

Selecting the **Service options** menu will let you do the following:

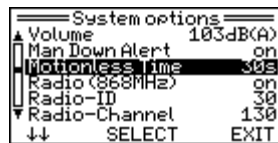
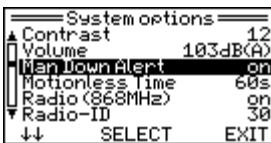


- **Language** (Set the device language, e.g. to German or English)
- **Contrast** (Individually adjust the display's contrast)
- **Volume** (Set the volume of the buzzer to 103dB(A), 90dB(A) or 0dB(A))
- **Man-Down-Alarm** (see below)
- **Radio** (see below)
- **Tolerance range** (see below)
- **Vibrator** (on/off)
- **Start-up + AutoCal** (on/off)



#### Man-Down-Alarm

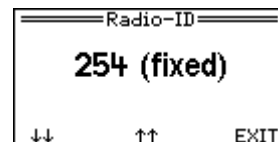
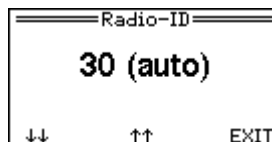
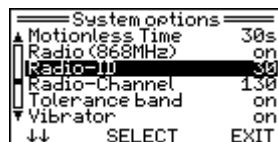
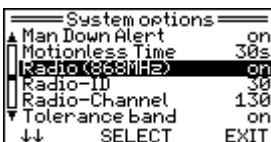
Use the menu item "Man-Down-Alarm" to turn the motion detection feature on (or off).



The option "motionless time" can be set to a period of time between 20 and 300 seconds. If no movement is detected for longer than this period, the device will issue a 30 second warning to the user. Only after this has run out too, will the "Man-Down-Alarm" be triggered.

#### Radio signal settings

If your G888 is equipped with a radio module, you can use the "Radio" menu item to turn the radio signal on or off. Depending on which radio module is integrated into the G888, it will be displayed as (868MHz) or (915MHz). If the radio module is turned on, the radio address and radio channel can be set individually. By default, the last two digits of the radio address use the device's serial number. This corresponds to the setting (auto). Alternatively, you can set the radio address to anything between 0 and 254 (fixed). With the 868MHz radio module, you will also be able to change the radio channel that is by default set to 130, within the ranges of 101 to 111 or 129 to 132. On the 915MHz radio module, no radio channel is set, since this radio module utilizes frequency hopping.



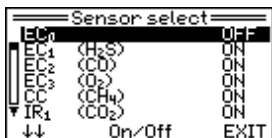
### Turning the tolerance range on or off

In measuring mode, the G888 suppresses minor deviations close to the zero point, when equipped with sensors for toxic or combustible gases. For oxygen measurement, deviations close to the 20.9 vol % O<sub>2</sub> (fresh air range) mark are suppressed. To avoid fluctuations, the displayed value up to double the value of this zero point range, is adjusted to the actual measured value. For more detailed information on the size of the tolerance range, refer to section "Sensor types and measuring ranges".

This tolerance range is activated by the manufacturer, but can generally be turned off in the system options menu. Alternatively, this option can be deactivated or activated by using the abbreviated commands <REAL> or <BAND> respectively instead of the access code, when entering the service menu.

#### 2.3.2.1.6 Sensor selection – Activation / Deactivation of the sensors

Each sensor can be individually turned on or off for measuring. This function is used when you stop monitoring a certain gas or if you are removing a sensor from the device without replacing it.



On = sensor active

Off = sensor inactive

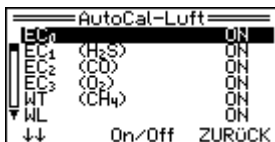
If there is no (gas) indication next to a sensor, this sensor is either not available or cannot be detected.

**↓** = Scroll down to the next sensor

**On/Off** = Activation / Deactivation of individual sensors

**EXIT** = Back to the Service menu

#### 2.3.2.1.7 AutoCal – Air - Authorizing sensors for AutoCal adjustment



Use this menu to set which sensors you want to be supplied with fresh air during automatic adjustments.

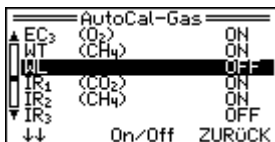
All sensors, except the IR sensor for CO<sub>2</sub> are by default set to "ON" and are therefore authorized for automatic adjustments.

**↓** = Scroll down to the next sensor

**On/Off** = Adjustment / Non-adjustment of the sensors in the AutoCal program

**EXIT** = Back to the Service menu

#### 2.3.2.1.8 AutoCal – Gas - Authorizing sensors for AutoCal adjustment



Use this menu to set which sensors you want to be supplied with test gas during automatic adjustments. All sensors are by default set to "OFF". If you want to simultaneously adjust several sensors with test gas, this is where you choose which sensors are involved.

**↓** = Scroll down to next sensor

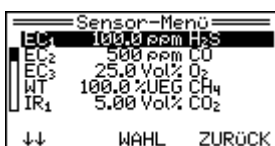
**On/Off** = Adjustment / Non-adjustment of the sensors in the AutoCal program

**EXIT** = Back to the Service menu

### 2.3.2.2 Sensors – Menu for sensor settings

The following functions refers to the individual sensors of the G888. Each sensor can be selected individually from the sensor menu. The settings you make are then only applied to the selected sensor.

In the following section, a CH<sub>4</sub> sensor and an O<sub>2</sub> sensor will act as examples to demonstrate the different functions. However, the setting options can be applied to all sensors equally.



Input options:

**↓** = Scroll down to next sensor

**SELECT** = Selecting the sensor

**EXIT** = Back to the Service menu



The following settings are available for each sensor:

**Zero** = Adjusting the zero point

**Calibrate** = Adjusting the sensitivity

**Alarms** = Setting the alarm thresholds

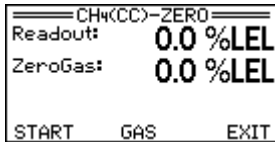
**Calibration data** = Date and status of the last calibration and zero adjustment

**Information** = Sensor information: MK number, serial number, measuring range, temperature range

- Unit and Type of gas** = Selecting the displayed CH<sub>4</sub> unit (% LEL / vol %)  
or selecting the displayed tape of gas
- ↓** = Scroll down to next menu item
- SELECT** = Selecting the menu item
- EXIT** = Back to the Service menu

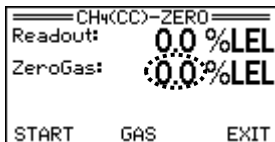
### 2.3.2.2.1 Zero - adjusting the zero point

When adjusting the zero point, the sensors need to be supplied with air containing no traces of the measured gas. Carbon dioxide and oxygen sensors must be adjusted with 100 vol % nitrogen. In this case, the zero gas can be supplied via the "SMART CAP" calibration cap with a flow rate of 0.5...0.6slpm (l/min). To adjust the zero point, first select the sensor menu item "Zero". The following options will be displayed:



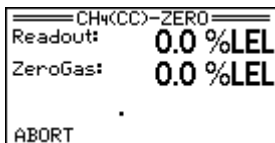
- START** = Start the zero point adjustment
- GAS** = Enter the zero gas concentration
- EXIT** = Back to the "CH<sub>4</sub> menu"

Zero gas is generally 0.0, so you will not have to adjust the concentration. In special cases however, the zero gas concentration could be raised slightly by pressing the GAS button. After entering **GAS**, the following screen will be displayed:



- ↓** = Reduce the zero gas concentration by one unit
- BACK** = Confirm the value and go back to the "zero" menu
- ↑** = Increase the zero gas concentration by one unit

After entering **Start** the zero point adjustment will start.



- Abort** = Cancel the adjustment and go back to the "CH<sub>4</sub>" menu.

The adjustment will be carried out when the device has detected a stable measured value after a stabilization time of ten seconds. Confirm the adjustment by pressing "OK". The stabilization time might take longer for CC, IR and O<sub>2</sub> sensors, but is generally limited to three minutes.

(\*1): The zero point adjustment of the oxygen sensor is performed with 100 vol % nitrogen in its factory calibration. You will therefore not have to readjust anything to monitor the usual alarm threshold of ≥17 vol % O<sub>2</sub>. In this case, an adjustment of the sensitivity will suffice.

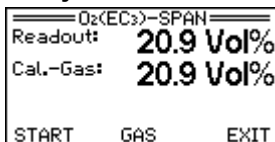
### 2.3.2.2.2 Calibration - sensitivity adjustment

During this calibration, the sensor's sensitivity to gas will be adjusted. You should always perform a zero point adjustment before a sensitivity adjustment. You will need an appropriate test gas to perform the sensitivity adjustment. The following gases can be used (among others)

Measuring range	Test gas
<b>TX</b>	Carbon Monoxide (CO), Hydrogen sulfide (H <sub>2</sub> S) or other gases
<b>OX</b>	Fresh air or test gas with 20.9 vol % oxygen (O <sub>2</sub> ) in nitrogen (N <sub>2</sub> )
<b>EX</b>	Methane (CH <sub>4</sub> ), Propane (C <sub>3</sub> H <sub>8</sub> ) or other combustible gases (*2)

A list of all test gases can be found in the test report. For sensitivity adjustments, the test gas concentration should be between 30% and 70% of the measuring range. For IR sensors with measuring ranges >5 vol % CO<sub>2</sub>, the test gas concentration must be between 25 % and 75 % of the measuring range limit value. The test gas can be applied via the "SMART CAP" calibration cap with a flow rate of 0.5...0.6slpm (l/min).

To adjust the sensitivity, first select the sensor menu item "calibrate".



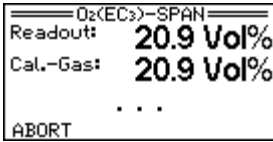
- START** = Start the sensitivity adjustment
- GAS** = Enter the test gas concentration
- EXIT** = Go back to the "O<sub>2</sub>" menu

Entering **GAS** will let you set the test gas concentration within a range of 10 to 105 % of the measuring range limit value:



- = Reduce the test gas concentration by one unit
- = Increase the test gas concentration by one unit
- = Confirm the value and go back to the "O<sub>2</sub>" menu

The sensitivity adjustment will begin when you press **Start**.



- = Cancel the adjustment and go back to the "O<sub>2</sub>" menu.

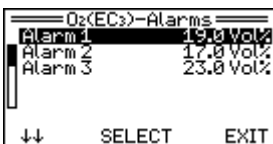
The adjustment will be carried out when the device has detected a stable measured value after a stabilization time of 25 seconds. Confirm the adjustment by pressing "OK". The stabilization time is generally limited to three minutes.

(\*2): The sensitivity adjustment of sensors that measure certain combustible gases in the % LEL range, such as n-hexane, n-nonane, or other similarly "heavy" vapors, is problematic. Not only is the availability of appropriate test gases a problem, but the stabilization time might also take several minutes. Alternatively, the sensitivity adjustment can be performed with a suitable reference gas (e.g. propane). The IR sensor MK249-8, for example, can be adjusted to 67 % LEL n-hexane or 80 % LEL n-nonane, using a reference gas of 0.85 vol % C<sub>3</sub>H<sub>8</sub> (propane). The cross-sensitivities for these sensors are indicated in section "sensor specifications".

### 2.3.2.2.3 Alarms - alarm settings

The G888 comes with three current value alarms for each of the non-toxic gases (O<sub>2</sub>, CH<sub>4</sub>) and two current value alarms per toxic gas (e.g. H<sub>2</sub>S, CO, CO<sub>2</sub>). These alarms are triggered when the gas concentration exceeds or falls below the threshold value. An additional alarm can be set for toxic gases exceeding the long-term and short-term values (TWA and STEL).

After selecting the sensor menu item **Alarms**, the following screen will be displayed (shown here: Selection of O<sub>2</sub>):



- = Scrolling down
- = Selection of menu items
- = Back to the sensor menu

After selecting the alarm threshold (in this example: Alarm 1), the value can be entered:

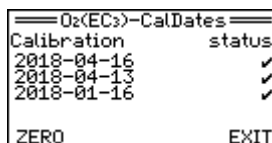
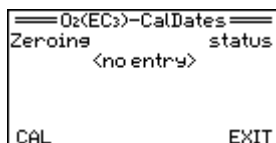
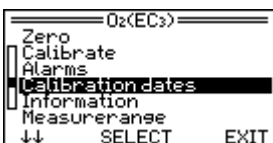


The selected alarm threshold values will flash and can now be changed:

- = Reduce alarm value by one unit
- = Go back to the sensor menu
- = Increase alarm value by one unit

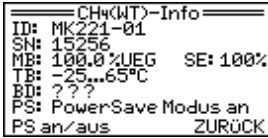
With the exception of % LEL measuring ranges, all threshold values can be adjusted freely within the entire measuring range or deactivated completely (0 or "---"). For % LEL measuring ranges, you can set limit values up to 60 % LEL.

### 2.3.2.2.4 Calibration data for sensor sensitivity



This menu item will display the data of the last calibration. This is purely for information.

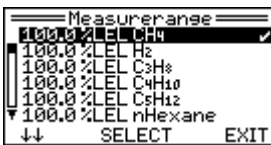
### 2.3.2.2.5 Information on the sensor



This will display the individual data of the integrated sensors.  
 ID: The MK number corresponds to the sensor type  
 SN: Serial number of the sensors  
 MR: Measuring range of the sensor SE: Gas sensitivity of the sensor (100 % = nominally)  
 TR: Temperature range in which the sensor can be operated  
 OT: Operating time of the sensor (remaining service life)  
 PS: The **Power Save** mode of a catalytic combustion sensor can be turned **on** or **off** with the left button. This mode cannot be activated when the sensor sensitivity is too low or when measuring "heavy" gases, such as hexane, nonane etc., because of the low sensor signal.

### 2.3.2.2.6 Measuring range

When using a GfG smart sensor, the menu item **Measuring range** will list all pre-defined measuring ranges. These can be selected.



You can use this menu (shown here: CC sensor) to change the displayed type of gas or switch between units (% LEL or vol %) for CH<sub>4</sub>. The volume concentrations in brackets correspond to the limit values of the measuring range. This can be used to adjust the measuring range to a country specific LEL value.

If you change the unit or type of gas, you will have to restart the device after exiting the service menu, before performing a function test or an AutoCal adjustment via the docking station.

### 2.3.2.3 Data logger - settings

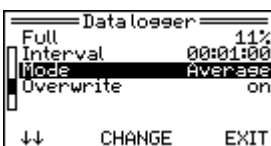
The following adjustments can be made in the **Data logger** menu:

- FULL** - Delete the data in the data logger (display of memory storage)
- Mode** - Choose between current value, average or peak value
- Interval** - Interval the data is logged at (can be set for values between 1 second and 60 minutes)

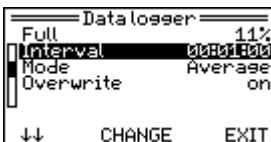


The parameter FULL will give you information on the used memory capacity.

- ↓** = Scroll down to next parameter
- ERASE** = Delete the data. The security prompt "Delete data?" will be displayed. Confirm with **YES** (right button), or decline with **NO** (left button)
- EXIT** = Go back to the main menu



If you select the parameter **mode** by pressing the **CHANGE** button, you will be able to choose between the current value, an average or the peak value. Pressing the **EXIT** button will bring you back to the data logger menu. The selected mode has been adopted.



**Interval:** The interval between the loggings can be set to any value between 1 second and 60 minutes, using the left and right buttons.

The information stored on the data logger can be transferred to a PC and read via the charging tray or an optional USB adapter cable.

## 2.4 Power supply

The G888 is equipped with a NiMH battery module. The battery is an integral part of the power supply unit's housing back side. The G888's battery is not susceptible at all to the dangerous dendrite growths that are common with other (e.g. lithium-ion) batteries.

### 2.4.1 Charging the battery



**Caution:**

The device may not be charged in potentially explosive atmospheres!  
The charging contact may not be dirty (see also: section "Care" in the annex).

The G888's battery can be charged in the **charging tray**. We can only guarantee perfect function if the charging tray is lying down or is secured horizontally and the retaining clamp is latched down correctly. Caution: Do not mount vertically!



Charging tray with retaining clamp

The charging tray can be power with a plug-in power supply made by GfG or via a vehicle charging cable made by GfG. The charging tray will limit the supply voltage of the G888 to max. 6V.

The charging process is split in two: Normal charging and trickle charging. A permanently lit green LED indicates that the charging tray is ready for use. A permanently lit yellow LED indicates normal charging mode, while a flashing yellow LED indicates trickle charging mode. If the red and yellow LED flash alternately, the battery is being discharged first. The charging process will begin automatically after this. If only the red LED is flashing, the charging tray is defective.

After inserting the G888 into the charging tray and latching the retaining clamp, make sure the correct charging process is indicated by the yellow LED and the display, If this is not the case, there might a problem with the contacts. The charging process will take approximately 6 to 7 hours for completely discharging devices. After this process, the charging tray will automatically enter trickle charging mode to avoid overcharging the battery. Both charging conditions are indicated on the G888's display. The battery will be charged to at least 95 % of its capacity when switching to trickle charging mode. To reach 100 % capacity, you will have to trickle charge the battery unit for another two hours.

The charging tray can also be used to transfer the data stored in the G888's data logger to a PC. This is also possible with an optional USB adapter cable.

Alternatively, the battery can also be charged via the "SMART CAP". The SMART CAP must be attached to the sides of the G888 with both clip connections.

The SMART CAP is powered by a GfG plug-in power supply. The SMART CAP will limit the G888's supply voltage to max. 6V. The charging process and LED signaling is identical to the one of the charging tray (described above). Please make sure to check if the charging process is indicated correctly by the yellow LED and the display. If it is not, there might be a problem with the contacts.



SMART CAP

The data stored on the G888's data logger can be read and transferred to a PC via the SMART CAP and a USB cable.

The SMART CAP also allows you to calibrate the device. However, this cannot be done while the device is charging.

To maintain the full capacity of the NiMH battery permanently, make sure the charging station is only used for charging the device (with the frequency depending on its operating time and frequency) and is not used for storing the device for weeks on end. The following table lists recommendations for charging times in correlation with the average usage of your device.

	<b>Usage of device</b>	<b>Recommendation for charging</b>
<b>1.</b>	More than 3 hours every day	Charge after use
<b>2.</b>	Less than 3 hours every day	Charge every 2 / 3 days
<b>3.</b>	Once per week	Charge 1 day before next use
<b>4.</b>	Once per month; more than three hours	Charge after use and 1 day before next use
<b>5.</b>	Once per month; less than three hours	Charge 1 day before next use
<b>6.</b>	Once per quarter or less	Charge after use and 1 day before next use

**Regarding 4, 5, 6:** If the device is used very rarely, the battery should be charged after every use, since parts of the sensor electronics must be supplied with energy even if the device is turned off. If the device has not been used in a long time and the battery is therefore completely discharged, the device should be charged approximately a day before its next use. A regular discharged battery will take approximately six hours to reach 95 % of its nominal capacity. After another two hours using the trickle charge, the battery will be charged to 100 % of its nominal capacity. If the regular device operation time is not attained even with a fully charged battery, this might be a sign of the "Lazy battery effect" (battery inertia). This will impact its charging behavior, making the battery icon indicate very low values rather quickly, even if the battery is fully loaded and will be able to operate for a long time.

## 2.4.2 Removing the lazy battery effect

Long times without usage, wrong charging behavior, wrong use of the device, or temperature influences (above 50 °C) can lead to the NiMH power supply units developing what is known as the lazy battery effect, which can result in shortened operation times. This may happen if the battery has never been fully discharged or has been charged too often or too long. You should avoid starting the charging process several times a day. You should also not leave the device in the charging tray for days or even weeks. The "lazy battery effect" can usually be removed by fully discharging the NiMH battery. If you want the battery to be discharged completely, you should not turn off the device manually.

## 2.4.3 Replacing the device's battery (NiMH power supply)



**Caution:** The device may not be opened in potentially explosive areas. Therefore, the NiMH supply unit (battery) may not be replaced in these areas either! Since the battery is an integral part of the device's housing back side, it may only be replaced (outside of Ex zones) with a NiMH supply unit of the **same type**.

The device has to be turned off before the NiMH supply unit can be replaced. To remove the back side of the housing, loosen the six screws on the back side and pull off the entire NiMH supply unit.

## **3 Annex**

### **3.1 Care**

External contaminations and stains on the device's housing can be removed with a damp cloth. Do not use solvents or cleaning agents! Pay special attention to ensuring the G888's external charging contact surfaces and the charging adapter's charging contact pins are always clean. If the charging station's contacts are inhibited in any way, the NiMH battery will not charge correctly - or at all.

### **3.2 Checks, maintenance and repairs**

The different checks of the gas detection device include a regular visual inspection, the display or function test, calibration checks, sensor adjustments in addition to the regular maintenance and repair work. The process and results of these have to be recorded. The measures are explained by DIN EN 60079-29-2, sections 9.2 and 11, as well as DIN EN 45544-4, sections 7.2 and 8. National regulations have to be adhered to as well. In Germany, these regulations include the "DGUV Information 213-056 (Explanatory leaflet T 021 / previously BGI 836, section 11)" and "DGUV Information 213-057 (Explanatory leaflet T 023 / previously BGI 518, section 11)".

#### **3.2.1 Visual inspection and display or function test**

The visual inspections and display or function tests ensure that the device is in operational status. It is highly recommended to perform them.

They include the following:

- Visually inspecting of the device and its accessories for mechanical damages
- Visual inspection the gas inlets (for e.g. contaminations by dust or dirt)
- Testing the display elements and alarm function
- Checking the charging status of the battery
- Checking the display with zero gas and triggering the alarm with test gas

Most sensor's response behavior and the alarm triggers can be tested appropriate test gas and a docking station or a test station (see also: sections 3.4 and 3.6). For certain sensors for very reactive gases, a SMART CAP calibration cap has to be used for testing.

#### **3.2.2 Function check and sensor adjustment**

Function checks and sensor adjustments ensure that the device is in operational status. These have to be carried out before first use and at least every four months, according to T 021 and T 023. They include the following:

- Visual inspection and test as described in 3.2.1
- Supplying zero and test gas to check the display of measured values (calibration) and adjustments
- Checking and evaluating the response behavior or response times
- Triggering the alarms with e.g. alarm test gas

The accessories necessary for the activities are listed in section 3.2.1.

#### **3.2.3 Maintenance (system check) und repairs**

Maintenance and repair work ensures that the device will work as intended until the next scheduled maintenance and adheres to its specified operating behavior. According to T 021 and T 023, maintenance should be carried out at least once a year.

It includes the following:

- Function check and sensor adjustment according to section 3.2.2
- Evaluation of the battery condition and, if necessary, replacement of very old batteries
- If necessary, replacing used up sensors or sensor seals
- If necessary, replacing dirty or damaged sensor membranes

Maintenance includes all repair and replacement work. Repairs may only be performed by the manufacturer or by people who have been authorized by the manufacturer (GfG Gesellschaft für Gerätebau mbH). Only original spare parts and components that have been approved and cleared by the manufacturer may be used.

### 3.3 Calibration device

The device has to be supplied with test gas to check its display sensitivity. The "SMART CAP" can be used to cover the diffusion openings, so the sensors can be supplied with test gas at a flow rate of 0.5...0.6slpm (l/min). Alternatively, this check can also be carried out on the DS400 docking station for certain test gases.

**Caution: Test gases, especially toxic ones, can be dangerous. Make sure that nobody inhales test gases. Any working spaces where test gas is used for calibrations must be sufficiently ventilated for the type of gas, gas concentration and amount of gas. In special cases, a gas drainage or gas extraction system is appropriate. In any case, the safety labels on the test gas bottles and the safety data sheets of the test gases must be adhered to.**

### 3.4 Checks using the DS400 docking station

The DS400 docking station can be used to quickly and easily perform the function test required by the DGUV Information 213-057 (T 023) and 213-056 (T 021).

The function test is started and performed completely automatically. The effective time of a function test is approximately 20 seconds. Adjustments (sensor adjustments) are started by pressing a single button and completed within a few minutes. A green or red LED will signal the result of the test. The detailed values are indicated on the device's display (function test report, AutoCal - air report, AutoCal - gas report). No PC is required to perform the function test and adjustment - all relevant data is automatically saved to an SD card inside the docking station.

The interval for the function test and adjustments can be activated automatically after the first function test of the G888.

Before using the docking station, you must read its operation manual and adhere to it.



### 3.5 Fault, cause, remedy

	Fault / Notification	Cause	Remedy
1.	Alarm LEDs flashing simultaneously and display is turned off	Insufficient voltage supply	Charge battery
		Hardware or program flow error	Contact the GfG service team
2.	"Bootloader" is displayed permanently, display is lit red	Program memory is defective	Firmware has been transmitted to the device If necessary, contact the GfG service team
3.	"FAULT! RAM"	RAM defective	Restart device
4.	"FAULT! EEP"	Device parameter memory is defective	If necessary, contact the GfG service team
5.	"FAULT! BAT"	Battery voltage metering is defective	
6.	"FAULT! ALG"	Program execution error / algorithm	
7.	"Clock chip does not work!" "Time reset to ..."	Hardware defect	Acknowledge notification If necessary, contact the GfG service team
8.	"Time reset to ..."	Clock is not set or buffer battery is empty	Acknowledge notification, set time If necessary, contact the GfG service team
9.	"Sensor defective!"	Sensor is defective or not available	Restart device If necessary, contact the GfG service team
10.	"Data incorrect!"	Sensor data is incorrect	Restart device If necessary, contact the GfG service team
11.	"Measurement not possible! Reconnect sensor to EC1!"	EC sensor is connected to the wrong slot	Open device, reconnect sensor, then turn device back on
12.	"Measurement not possible! reconnect sensor to EC2 or EC3!"		
13.	Sensor not available. Deactivate sensor	Sensor is not available	Acknowledge notification and switch off sensor in service program

	in the system menu!"		If necessary, contact the GfG service team
14.	"CHECK ALARMS"	Sensor was replaced by different type	Check alarm settings in the service program and, if necessary, adjust them
15.	"Type of gas is not supported"	Type of gas is not supported by the device or old firmware version	Remove sensor If applicable, update firmware
16.	"No sensors"	No sensor is activated in the service program	Activate available sensors in the service program
17.	Gas display "START" ("STRT")	Sensor is still in activation phase	wait a few seconds
18.	Gas display "????"	Measurement with CC sensor not possible, since oxygen display is <10 vol %	If this happens in fresh air, the oxygen sensor must be replaced or adjusted
19.	Gas display "----" / Error	No gas display, because sensor or sensor data are faulty	Deactivate sensor in the service program and contact the GfG service team
20.	Gas display "↓↓↓↓"	Measured values falling below the measuring range Measured values falling significantly short of measuring range	Adjust zero point
21.	Gas display "↑↑↑↑"	Exceeding the measuring range Gas concentration is too high or high cross sensitivities (on EC sensors) or protective circuit is active (on CC sensors)	Leave area with high gas concentration and , if applicable, acknowledge notification for CC sensor in area with fresh air
22.	Gas display "FAULT" ("FLT")	IR sensor signal is faulty	If error occurs repeatedly, contact GfG service team
23.	Gas display "TEMP" or "TEMP ERROR"	Sensor is being operated outside of the specified temperature range or hardware defect at 0°C<Ta<30°C	Seek out environment with more normal ambient temperatures If necessary, contact the GfG service team
24.	Gas display "POWER" or "POWER ERROR"	Sensor's power supply is disrupted	If error occurs repeatedly, contact the GfG service team
25.	Gas display "P+T"	see gas display "TEMP" and "POWER"	see above
26.	"Gas concentration too high!"	Gas concentration is still above 5 vol % after changing from HI % range to % LEL range	Wait until the gas concentration has fallen below 5 vol % and repeat switch.
27.	"No sensors released for AutoCal - air (gas)"	No sensors have been cleared for the automatic fresh air or test gas adjustment	Clear sensor(s) for automatic adjustment in the service program
28.	"Zeroing failed Measured value too high (/ too low)"	Measuring gas available or too positive (negative) zero point deviation	Adjust zero point in air free of measured gas If necessary, contact GfG service
29.	"Calibration failed Measured value too high (/ too low)"	Wrong test gas concentration or Sensor sensitivity too low (too high)	Check test gas and set value If necessary, contact the GfG service team
30.	"Zeroing (calibration) failed Signal cannot be detected"	Extreme sensor deviation or hardware defect	Repeat process and if necessary, contact the GfG service team
31.	"Saving failed"	Parameters could not be saved when exiting the service program	Restart device, then repeat settings in the service program if necessary, contact the GfG service team

## 3.6 Accessories and spare parts

	Designation	Item No.
1.	G888/G999 SMART CAP (Calibration cap)	1990210
2.	G888/G999 SMART CAP with USB cable (calibration cap and data transfer)	1990211
3.	G888/G999 SMART CAP with USB cable and EU plug-in power supply (5.0VDC/1.0A)	1990212
4.	DIC888/999-B Charging tray with brackets and EU plug-in power supply (12VDC/700mA)	1990221
5.	DIC888/999-B Charging tray with brackets and vehicle charging cable	1990222
6.	DIC888/999 USB interface cable	1990229
7.	DS400 docking station for G888/G999-D with EU plug-in power supply	1990231

	(12VDC/1300mA)	
8.	DS404 docking station for G888/G999-D with EU plug-in power supply (12VDC/1300mA)	1990236
9.	TS888/999 test station without fitting without plug-in power supply	1990240
10.	TS888/999 test station with fitting without plug-in power supply	1990241
11.	TS888/999-DIC test station with charging function without fitting without plug-in power supply	1990245
12.	TS888/999-DIC test station with charging function with fitting without plug-in power supply	1990246
13.	G888C NiMH battery pack A21	1990401
14.	G888M NiMH battery pack A21	1990402
15.	G888 replacement sensors → see section "Types of sensors and measuring ranges"	

Spare parts and accessories should be stored at an ambient temperature of 0° to 30°C. They should not be stored for more than five years. A shorter storage time of one year applies to the NiMH battery packs. The battery should be fully loaded before storing devices. If you plan to store something for more than ½ year, you must first disassemble it.

### 3.7 Information on the environmentally safe disposal of used parts



According to GfG's general terms and conditions, the customer assumes responsibility for the environmentally safe disposal of the device or any device components (such as replaced sensors). In Germany, this is regulated by §§11, 12 ElektroG. On request, GfG in Dortmund can also handle the proper disposal.

### 3.8 Types of sensors and measuring ranges

Spare sensors should be stored at an ambient temperature of 0° to 30°C. They should not be stored for more than one year. A shorter storage time of ½ year applies to electrochemical sensors. The expected service life of oxygen sensor is reduced when they are stored. When storing replacement sensors, make sure that the surrounding atmosphere is not aggressive and free of sensor poisons.

Slot	Type of sensor	Display range	Measured gas and additional information	Item No.
EC1	MK380-8	0 to 500 ppm 0 to 100 ppm	CO Carbon monoxide and H <sub>2</sub> S Hydrogen sulfide	1990710
	MK390-8	0 to 10 ppm (*1)	Cl <sub>2</sub> Chlorine	1990725
EC1 EC2 EC3	MK474-8	0 to 10 ppm	Cl <sub>2</sub> Chlorine	1990725
	MK391-8	0 to 2 ppm	ClO <sub>2</sub> Chlorine dioxide	1990730
	MK450-8	0 to 20 ppm (*1)	C <sub>4</sub> H <sub>10</sub> S tert-butyl mercaptan (TBM)	on request
	MK349-8	0 to 2 ppm	COCl <sub>2</sub> Phosgene	1990800
	MK443-8	0 to 500 ppm (*1)	CO Carbon monoxide	1990705
	MK445-8	0 to 100 ppm (*1)	H <sub>2</sub> S Hydrogen sulfide	1990700
	MK396-8	0 to 2000 ppm	H <sub>2</sub> Hydrogen	1990785
	MK402-8	0 to 1 vol %	H <sub>2</sub> Hydrogen	discontinued
	MK403-8	0 to 4 vol %	H <sub>2</sub> Hydrogen	1990795
	MK407-8	0 to 1 vol %	H <sub>2</sub> Hydrogen	1990790
	MK409-8	0 to 50 ppm (*1)	HCN Hydrogen cyanide	1990760
	MK412-3	0 to 10 ppm	HF Hydrogen fluoride (EU-Version)	1990765
	MK412-9	0 to 10 ppm	HF Hydrogen fluoride (resolution 0.5 ppm)	1990766
	MK393-8	0 to 200 ppm (*1)	NH <sub>3</sub> Ammonia	1990736
	MK453-8	0 to 300 ppm (*1)	NH <sub>3</sub> Ammonia	1990735
	MK454-8	0 to 1000 ppm (*1)	NH <sub>3</sub> Ammonia	1990740
	MK399-8	0 to 1000 ppm (*1)	NH <sub>3</sub> Ammonia	1990741
	MK458-8	0 to 30 ppm (*1)	NO <sub>2</sub> Nitrogen dioxide	1990750
	MK464-8	0 to 25 vol %	O <sub>2</sub> Oxygen (2 years)	1990715
	MK465-8	0 to 25 vol %	O <sub>2</sub> Oxygen (3 years)	1990716
MK353-8	0 to 10 ppm (*1)	PH <sub>3</sub> Phosphine	1990770	
MK477-8	0 to 20 ppm (*1)	SiH <sub>4</sub> Silane	1990780	
MK440-8	0 to 10 ppm (*1)	SO <sub>2</sub> Sulfur dioxide	1990720	
EC2 EC3	MK379-8	0 to 20 ppm (*1)	C <sub>2</sub> H <sub>4</sub> O Ethylene oxide	1990775
	MK405-8	0 to 20 ppm (*1)	C <sub>4</sub> H <sub>8</sub> S Tetrahydrothiophene (THT)	1990805
	MK392-8	0 to 30 ppm (*1)	HCl Hydrogen chloride	1990755

	MK457-8	0 to 100 ppm(*1)	NO Nitric oxide	1990745
	MK466-8	0 to 25 vol %	O <sub>2</sub> Oxygen (5 years)	1990718
<b>CC</b>	MK221-0	0 to 100 % LEL	combustible gases and vapors (*2)	1990850
		0 to 5 vol %	CH <sub>4</sub> Methane	
	MK221-1	0 to 100 % LEL	combustible gases (*2)(increased contamination resistance)	1990851
		0 to 5 vol %	CH <sub>4</sub> Methane (increased contamination resistance)	
<b>IR (Infrared)</b>	MK245-8	0 to 5 vol %	CO <sub>2</sub> Carbon dioxide	1990920
		0 to 100 % LEL	combustible gases and vapors (*2)	
	MK248-8	0 to 5 vol %	CO <sub>2</sub> Carbon dioxide	1990900
	MK249-8	0 to 100 % LEL	combustible gases and vapors (*2)	1990905

(\*1): Sensor can also be set to other measuring ranges (see sensor specification)

(\*2): CH<sub>4</sub> Methane or one the combustible gases and vapors listed below

Type of sensor	Combustible gases and vapors
MK221-0	CH <sub>4</sub> (methane), C <sub>3</sub> H <sub>8</sub> (propane), C <sub>4</sub> H <sub>10</sub> (butane), C <sub>5</sub> H <sub>12</sub> (pentane), C <sub>6</sub> H <sub>14</sub> (n-hexane), H <sub>2</sub> (hydrogen), C <sub>2</sub> H <sub>2</sub> (acetylene), C <sub>2</sub> H <sub>4</sub> (ethylene), CH <sub>4</sub> O (methanol), C <sub>2</sub> H <sub>6</sub> O (ethanol), C <sub>3</sub> H <sub>8</sub> O (isopropanol), C <sub>4</sub> H <sub>10</sub> O (n-butanol), C <sub>3</sub> H <sub>6</sub> O (acetone), C <sub>3</sub> H <sub>6</sub> O <sub>2</sub> (methyl acetate), C <sub>4</sub> H <sub>8</sub> O <sub>2</sub> (ethyl acetate), C <sub>4</sub> H <sub>8</sub> O (methyl ethyl ketone MEK), C <sub>7</sub> H <sub>8</sub> (toluol), C <sub>6</sub> H <sub>12</sub> O (methyl isobutyl ketone MIBK), C <sub>7</sub> H <sub>16</sub> (heptane), C <sub>9</sub> H <sub>20</sub> (n-nonane)
MK221-1	CH <sub>4</sub> (methane), C <sub>3</sub> H <sub>8</sub> (propane), C <sub>4</sub> H <sub>10</sub> (butane), C <sub>5</sub> H <sub>12</sub> (pentane), C <sub>6</sub> H <sub>14</sub> (n-hexane), H <sub>2</sub> (hydrogen), C <sub>2</sub> H <sub>2</sub> (acetylene), C <sub>2</sub> H <sub>4</sub> (ethylene)
MK245-8 MK249-8	CH <sub>4</sub> (methane), C <sub>3</sub> H <sub>8</sub> (propane), C <sub>6</sub> H <sub>14</sub> (n-hexane), C <sub>9</sub> H <sub>20</sub> (n-nonane), ETF (ethyl formate)

## 3.9 Sensor specifications

MK221-0 Catalytic combustion sensor for combustible gases and vapors			
Measuring ranges:	0.0 to 100 % LEL	0.00 to 5.00 vol % CH <sub>4</sub>	
Resolution / tolerance range:	0.5 / ±2.5 % LEL	0.02 / ±0.14 vol % CH <sub>4</sub>	
Stabilization time:	t <sub>50</sub> ≤ 10 sec	t <sub>90</sub> < 20 sec	for CH <sub>4</sub> (Methane)
	t <sub>50</sub> ≤ 12 sec	t <sub>90</sub> < 30 sec	for C <sub>3</sub> H <sub>8</sub> (Propane)
	t <sub>50</sub> ≤ 25 sec	t <sub>90</sub> < 65 sec	for C <sub>6</sub> H <sub>14</sub> (n-Hexane)
Pressure (70)80 to 120(130) kPa:	max. ±5(7) % LEL or ±10 % of the displayed value (ref.: 100kPa)		
Humidity 0% to 95% RH:	max. ±3 % LEL or ±10 % of the C <sub>3</sub> H <sub>8</sub> display (ref.: 0 % RH at 40°C)		
	or ±30 % of the CH <sub>4</sub> display (ref.: 0 % RH at 40°C)		
Temperature (-20)-10 to +40(55) °C:	max. ±3 % LEL or ±10(15) % of the displayed value (ref.: 20 °C)		
Flow rate 0 to 6m/s:	max. ±1 % LEL or +15 % of the displayed value at flow rates ≥1,5m/s		
Cross sensitivities at 50 % LEL:	<u>Gas supply</u>	<u>CH<sub>4</sub> display</u>	<u>C<sub>3</sub>H<sub>8</sub> display</u> <u>n-hexane display</u>
	2.00 vol % H <sub>2</sub>	approx. 65 % LEL	approx. 100 % LEL approx. 135 % LEL (theor.)
	2.20 vol % CH <sub>4</sub>	<u>≈ 50 % LEL</u>	approx. 75 % LEL approx. 100 % LEL
	1.15 vol % C <sub>2</sub> H <sub>4</sub>	approx. 48 % LEL	approx. 58 % LEL approx. 77 % LEL
	0.85 vol % C <sub>3</sub> H <sub>8</sub>	approx. 33 % LEL	<u>≈ 50 % LEL</u> approx. 65 % LEL
	0.70 vol % C <sub>4</sub> H <sub>10</sub>	approx. 31 % LEL	approx. 47 % LEL approx. 62 % LEL
	0.55 vol % C <sub>5</sub> H <sub>12</sub>	approx. 28 % LEL	approx. 40 % LEL approx. 52 % LEL
	0.50 col % C <sub>6</sub> H <sub>14</sub>	approx. 27 % LEL	approx. 38 % LEL <u>≈ 50 % LEL</u>
	0.45 vol % C <sub>7</sub> H <sub>16</sub>	approx. 19 % LEL	approx. 28 % LEL approx. 35 % LEL
	0.40 vol % C <sub>8</sub> H <sub>18</sub>	approx. 15 % LEL	approx. 23 % LEL approx. 29 % LEL
	These may vary from one sensor to another and depending on the gas concentration and age of the sensor.		
Expected operating life:	3 years in clean air		

<b>MK221-1 Catalytic combustion sensor for combustible gases (with increased contamination resistance)</b>				
Measuring ranges:	0.0 to 100 % LEL	0.00 to 5.00 vol % CH <sub>4</sub>		
Resolution / tolerance range:	0.5 / ±2.5 % LEL	0.02 / ±0.14 vol % CH <sub>4</sub>		
Stabilization time:	t <sub>50</sub> ≤ 10 sec	t <sub>90</sub> < 20 sec	for CH <sub>4</sub> (methane)	
	t <sub>50</sub> ≤ 12 sec	t <sub>90</sub> < 30 sec	for C <sub>3</sub> H <sub>8</sub> (propane)	
	t <sub>50</sub> ≤ 40 sec	t <sub>90</sub> < 105sec	for C <sub>6</sub> H <sub>14</sub> (n-hexane)	
Pressure (70)80 to 120 (130) kPa:	max. ±5(7) % LEL or ±10 % of the displayed value			(ref.: 100kPa)
Humidity 0% to 95% RH:	max. ±3 % LEL or ±10 % of the C <sub>3</sub> H <sub>8</sub> display			(ref.: 0 % RH at 40°C)
	or ±20 % of the CH <sub>4</sub> display			(ref.: 0 % RH at 40°C)
Temperature (-20)-10 to +40(55) °C:	max. ±3 % LEL or ±10(15) % of the displayed value			(ref.: 20°C)
Flow rate 0 to 6m/s:	max. ±1 % LEL or +20 % of the displayed value at flow rates ≥1.5m/s			
Cross sensitivities at 50 % LEL:	<u>Gas supply</u>	<u>CH<sub>4</sub> display</u>	<u>C<sub>3</sub>H<sub>8</sub> display</u>	<u>n-hexane display</u>
	2.00 vol % H <sub>2</sub>	approx. 65 % LEL	approx. 100 % LEL	approx. 135 % LEL (theor.)
	2.20 vol % CH <sub>4</sub>	<u>≈ 50 % LEL</u>	approx. 75 % LEL	approx. 100 % LEL
	1.15 vol % C <sub>2</sub> H <sub>4</sub>	approx. 48 % LEL	approx. 58 % LEL	approx. 77 % LEL
	0.85 vol % C <sub>3</sub> H <sub>8</sub>	approx. 33 % LEL	<u>≈ 50 % LEL</u>	approx. 65 % LEL
	0.70 vol % C <sub>4</sub> H <sub>10</sub>	approx. 30 % LEL	approx. 47 % LEL	approx. 62 % LEL
	0.55 vol % C <sub>5</sub> H <sub>12</sub>	approx. 26 % LEL	approx. 40 % LEL	approx. 52 % LEL
	0.50 vol % C <sub>6</sub> H <sub>14</sub>	approx. 25 % LEL	approx. 38 % LEL	<u>≈ 50 % LEL</u>
	These may vary from one sensor to another and depending on the gas concentration and age of the sensor.			
Expected operating life:	3 years in clean air			
<b>MK248-8/MK245-8 Infrared sensors for carbon dioxide CO<sub>2</sub></b>				
Measuring range:	0.02 to 5.00 vol %	or	0.00 to 25 vol %	
Resolution:	0.01 to 0.05 vol %	or	0.01 to 0.5 vol %	
Stabilization time:	t <sub>50</sub> ≤ 20sec	t <sub>90</sub> ≤ 50sec	t <sub>10</sub> ≤ 50sec for CO <sub>2</sub>	
Pressure 70 to 130kPa:	<1.6 % of the displayed value per 1 % change in pressure (ref.: 100kPa)			
Humidity 0% to 95% RH:	max. ±0.01 vol % or ±2 % of the displayed value			(ref.: 50 % RH at 20°C)
Temperature -20 to +55°C:	max. ±0.02 vol % or ±10 % of the displayed value			(ref.: 20°C)
Long term stability per month:	max. ±0.01 vol % or ±2% of the displayed value			(in laboratory conditions)
Expected operating life:	6 years			
<b>MK249-8/MK245-8 Infrared sensors for combustible gases and vapors</b>				
Measuring range:	0.0 to 100 % LEL	0.00 to 100 vol % CH <sub>4</sub>		
Resolution:	0.2 to 1.0 % LEL	0.01 to 0.5 vol % CH <sub>4</sub>		
Tolerance range:	±1.2 % LEL	±0.05 vol % CH <sub>4</sub>		
Stabilization time:	t <sub>50</sub> ≤ 20sec	t <sub>90</sub> ≤ 45 sec	at CH <sub>4</sub> (methane)	
	t <sub>50</sub> ≤ 25sec	t <sub>90</sub> ≤ 66 sec	at C <sub>3</sub> H <sub>8</sub> (propane)	
	t <sub>50</sub> ≤ 30sec	t <sub>90</sub> ≤ 99 sec	at C <sub>6</sub> H <sub>14</sub> (n-hexane)	
	t <sub>50</sub> ≤ 55sec	t <sub>90</sub> ≤ 371sec	at C <sub>9</sub> H <sub>20</sub> (n-nonane)	
Pressure 70 to 130kPa:	<1.5 % of the CH <sub>4</sub> display per 1 % change in pressure			(ref.: 100kPa)
	<1.2 % of the C <sub>3</sub> H <sub>8</sub> display per 1 % change in pressure			(ref.: 100kPa)
Humidity 0% to 95% RH:	max. ±2.0 % LEL or ±15% of the displayed value			(ref.: 0 % RH at 40°C)
Temperature -20 to +50°C:	max. ±2.0 % LEL or ±10 % of the C <sub>3</sub> H <sub>8</sub> display			(ref. to 20°C)
Cross sensitivities at 50 % LEL:	<u>Gas supply</u>	<u>CH<sub>4</sub> display</u>	<u>C<sub>3</sub>H<sub>8</sub> display</u>	<u>n-hexane display</u>
	0.85 vol % C <sub>3</sub> H <sub>8</sub>	approx. 145 % LEL	<u>≈ 50 % LEL</u>	approx. 67 % LEL
	1.20 vol % C <sub>2</sub> H <sub>6</sub>	approx. 138 % LEL	approx. 48 % LEL	approx. 65 % LEL
	0.70 vol % C <sub>4</sub> H <sub>10</sub>	approx. 110 % LEL	approx. 42 % LEL	approx. 57 % LEL
	1.00 vol % C <sub>3</sub> H <sub>8</sub> O	approx. 97 % LEL	approx. 39 % LEL	approx. 53 % LEL
	0.50 vol % C <sub>6</sub> H <sub>14</sub>	approx. 88 % LEL	approx. 37 % LEL	<u>≈ 50 % LEL</u>
	0.55 vol % C <sub>5</sub> H <sub>12</sub>	approx. 87 % LEL	approx. 36 % LEL	approx. 49 % LEL
	0.45 vol % C <sub>7</sub> H <sub>16</sub>	approx. 82 % LEL	approx. 34 % LEL	approx. 47 % LEL
	1.00 vol % C <sub>4</sub> H <sub>8</sub> O <sub>2</sub>	approx. 69 % LEL	approx. 31 % LEL	approx. 41 % LEL
	0.35 vol % C <sub>9</sub> H <sub>20</sub>	approx. 65 % LEL	approx. 31 % LEL	approx. 41 % LEL
	2.20 vol % CH <sub>4</sub>	<u>≈ 50 % LEL</u>	approx. 26 % LEL	approx. 35 % LEL
	0.75 vol % C <sub>4</sub> H <sub>8</sub> O	approx. 41 % LEL	approx. 22 % LEL	approx. 28 % LEL
	1.25 vol % C <sub>3</sub> H <sub>6</sub> O	approx. 26 % LEL	approx. 16 % LEL	approx. 22 % LEL
	0.50 vol % C <sub>7</sub> H <sub>8</sub>	approx. 26 % LEL	approx. 16 % LEL	approx. 22 % LEL
	These may vary from one sensor to another and depending on the gas concentration and age of the sensor.			
Expected operating life:	6 years			
<b>MK349-8 Electrochemical sensor for phosgene COCl<sub>2</sub> (PGN)</b>				
Measuring range:	0 to 2 ppm			
Resolution / tolerance range:	0.01 ppm / ±0.02 ppm			
Stabilization time:	t <sub>90</sub> < 150sec			(at 20°C)
Pressure 80 to 120kPa:	max. ±0.02ppm or ±10 % of the displayed value			(ref.: 100kPa)
Humidity 10% to 95% RH:	max. ±0.02 ppm or ±10 % of the displayed value			(ref.: 50 % RH at 20°C)
Temperature -20 to +40°C:	max. ±0.02 ppm or ±10 % of the displayed value			(ref.; 20°C)
Cross sensitivities:	ClO <sub>2</sub> : -300%; HCl: 250%; AsH <sub>3</sub> : 90%; Cl <sub>2</sub> : 40%; NO <sub>2</sub> : -10%; O <sub>3</sub> : 10%; (*1)			
Expected operating life:	1 to 1.5 years in air			

<b>MK353-8 Electrochemical sensor for phosphine PH<sub>3</sub></b>			
Measuring ranges:	0 to 10 ppm	0 to 20 ppm	0 to 50 ppm
Resolution / tolerance range:	0.05 ppm / ±0.05 ppm	0.05 ppm / ±0.05 ppm	0.05 ppm / ±0.05 ppm
Stabilization time:	t <sub>50</sub> < 20sec	t <sub>90</sub> < 60sec	(at 20°C)
Pressure 80 to 120kPa:	max. ±0.05 ppm or ±10 % of the displayed value		(ref.: 100kPa)
Humidity 15% to 90% RH:	max. ±0.05 ppm or ±10 % of the displayed value		(ref.: 50 % RH at 20°C)
Temperature -20 to +50°C:	max. ±0.05 ppm or ±10 % of the displayed value		(ref.: 20°C)
Cross sensitivities:	SiH <sub>4</sub> :90%; GeH <sub>4</sub> :90%; AsH <sub>3</sub> :65%; B <sub>2</sub> H <sub>6</sub> :35%; SO <sub>2</sub> :20%; CO:0,5%; H <sub>2</sub> :0,1%; (*1)		
Expected operating life:	2 to 3 years in air		
<b>MK379-8 Electrochemical sensor for ethylene oxide C<sub>2</sub>H<sub>4</sub>O (ETO)</b>			
Measuring ranges:	0 to 20 ppm	0 to 50 ppm	0 to 100 ppm
Resolution / tolerance range:	0.1 ppm / ±0.3 ppm	0.1 ppm / ±0.3 ppm	0.1 ppm / ±0.3 ppm
Stabilization time:	t <sub>50</sub> < 30sec	t <sub>90</sub> < 120sec	(at 20°C)
Pressure 80 to 120kPa:	max. ±1ppm or ±15 % of the displayed value		(ref.: 100kPa)
Humidity 15% to 90% RH:	max. ±2ppm or ±15 % of the displayed value		(ref.: 50 % RH at 20°C)
Temperature(-20)0 to +40[50] °C:	max. ±1[2] ppm or ±15(20) % of the displayed value		(ref.: 20°C)
Cross sensitivities:	CO≈40%; CH <sub>4</sub> O≈150%; C <sub>2</sub> H <sub>2</sub> ≈125%; CH <sub>2</sub> O≈120%; CH <sub>4</sub> S≈100%; C <sub>2</sub> H <sub>4</sub> ≈80%; C <sub>2</sub> H <sub>6</sub> O≈55%; C <sub>4</sub> H <sub>10</sub> O≈40%; C <sub>7</sub> H <sub>8</sub> ≈20%; MEK≈10% and others		
Expected operating life:	2 to 3 years in air		
Stabilization time:	Four minutes to seven days - depending on the switch-off time		
<b>MK380-8 Electrochemical sensor for carbon monoxide CO and hydrogen sulfide H<sub>2</sub>S (COSH)</b>			
Measuring ranges:	0 to 500 ppm CO (at EC0)	0 to 100 ppm H <sub>2</sub> S (at EC1)	
Resolution / tolerance range:	1 ppm / ±3 ppm CO	0.2 ppm / ±0.6 ppm H <sub>2</sub> S	
Stabilization time:	t <sub>50</sub> < 20sec	t <sub>90</sub> < 50sec	(at 20°C)
Pressure 80 to 120kPa:	max. ±3(1) ppm or ±7(10) % of the CO (H <sub>2</sub> S) display		(ref.: 100kPa)
Humidity 15% to 90% RH:	max. ±3(1) ppm or ±7(10) % of the CO (H <sub>2</sub> S) display		(ref.: 50 % RH at 20°C)
Temperature -20 to +50°C:	max. ±3(1) ppm or ±15(10) % of the CO (H <sub>2</sub> S) display		(ref.: 20°C)
Cross sensitivities CO disp.:	H <sub>2</sub> S:0 to 40%; H <sub>2</sub> ≈20%; SO <sub>2</sub> <20%; NO <sub>2</sub> <2%; NO<0.3%; Cl <sub>2</sub> :0%; (*1)		
Cross sensitivities H <sub>2</sub> S disp.:	CO<2%; NO <sub>2</sub> ≈-20%; SO <sub>2</sub> :8 to 20%; NO<3%; H <sub>2</sub> :0.03%; Cl <sub>2</sub> :0%; (*1)		
Expected operating life:	3 years in air		
<b>MK390-8 Electrochemical sensor for chlorine Cl<sub>2</sub></b>			
Measuring ranges:	0 to 10 ppm	0 to 20 ppm	0 to 40 ppm
Resolution / tolerance range:	0.05 ppm / ±0.10 ppm	0.05 ppm / ±0.10 ppm	0.1 ppm / ±0.1 ppm
Stabilization time:	t <sub>50</sub> < 10sec	t <sub>90</sub> < 30sec	(at 20°C)
Pressure 80 to 120kPa:	max. ±0.2 ppm or ±10% of the displayed value		(ref.: 100kPa)
Humidity 10% to 95% RH:	max. ±0.2 ppm or ±10% of the displayed value		(ref.: 50 % RH at 20°C)
Temperature -20 to +50°C:	max. ±0.2ppm or ±10% of the displayed value		(ref.: 20°C)
Cross sensitivities:	ClO <sub>2</sub> :50%; F <sub>2</sub> :40%; NO <sub>2</sub> :20%; O <sub>3</sub> :20%; SO <sub>2</sub> :18%; CO <sub>2</sub> :0%; CO:0%; H <sub>2</sub> S:0%; H <sub>2</sub> :0% (*1)		
Expected operating life:	2 to 3 years in air		
<b>MK391-8 Electrochemical sensor for chlorine dioxide ClO<sub>2</sub> (ClO)</b>			
Measuring range:	0 to 2 ppm		
Resolution / tolerance range:	0.01 ppm / ±0.03 ppm		
Stabilization time:	t <sub>90</sub> < 120sec		(at 20°C)
Pressure 80 to 120kPa:	max. ±0.05ppm or ±10% of the displayed value		(ref.: 100kPa)
Humidity 10% to 95% RH:	max. ±0.05ppm or ±10% the displayed value		(ref.: 50%r.F. at 20°C)
Temperature -20 to +50°C:	max. ±0.05ppm or ±10% of the displayed value		(ref.: 20°C)
Cross sensitivities:	O <sub>3</sub> ≈280%; Cl <sub>2</sub> ≈60%; H <sub>2</sub> S≈-25%; H <sub>2</sub> =CO=0%; (*1)		
Expected operating life:	1 to 2 years in air		
<b>MK392-8 Electrochemical sensor for Hydrogen chloride HCl</b>			
Measuring ranges:	0 to 30 ppm	0 to 50 ppm	
Resolution / tolerance range:	0.2 ppm / ±0.4 ppm	0.2 ppm / ±0.4 ppm	
Stabilization time:	t <sub>50</sub> < 30sec	t <sub>90</sub> < 90sec	(at 20°C)
Pressure 80 to 120kPa:	max. ±1ppm or ±10% of the displayed value		(ref.: 100kPa)
Humidity 10% to 95% RH:	max. ±1ppm or ±10% of the displayed value		(ref.: 50 % RH at 20°C)
Temperature -20 to +50°C:	max. ±1ppm or ±10% of the displayed value		(ref.: 20°C)
Cross sensitivities:	AsH <sub>3</sub> :350%; PH <sub>3</sub> :300%; H <sub>2</sub> S:65%; NO:45%; SO <sub>2</sub> :40%; HCN:35%; Cl <sub>2</sub> :6%; NO <sub>2</sub> :3%; NH <sub>3</sub> :0,1%; CO:0%; CO <sub>2</sub> :0%; H <sub>2</sub> :0%; (*1)		
Expected operating life:	2 to 3 years in air		
<b>MK393-8 Electrochemical sensor for ammonia NH<sub>3</sub></b>			
Measuring ranges:	0 to 100 ppm	0 to 200 ppm	
Resolution / tolerance range:	0.5 ppm / ±2 ppm	0.5 ppm / ±2 ppm	
Stabilization time:	t <sub>50</sub> < 20sec	t <sub>90</sub> < 60sec	(at 20°C)
Pressure 80 to 120kPa:	max. ±1 ppm or ±10 % of the displayed value		(ref.: 100kPa)
Humidity 10% to 95% RH:	max. ±1 ppm or ±10 % of the displayed value		(ref.: 50 % RH at 20°C)
Temperature (-20)10 to +50°C:	max. ±1(2) ppm or ±10(20) % of the displayed value		(ref.: 20°C)
Cross sensitivities:	H <sub>2</sub> S≈10%, CO=CO <sub>2</sub> =H <sub>2</sub> =C <sub>3</sub> H <sub>8</sub> O=0% (*1)		
Expected operating life:	2 to 3 years in air		

<b>MK396-8 Electrochemical sensor for hydrogen H<sub>2</sub> (*2)</b>			
Measuring range:	0 to 2000 ppm		
Resolution / tolerance range:	2 ppm / ±50 ppm		
Stabilization time:	t <sub>50</sub> < 30sec	t <sub>90</sub> < 90sec	(at 20°C)
Pressure 80 to 120kPa:	max. ±10 ppm or ±10 % of the displayed value		(ref.: 100kPa)
Humidity 15% to 90% RH:	max. ±10 ppm or ±10 % of the displayed value		(ref.: 50 % RH)
Temperature -20 to +50°C:	max. ±20 ppm or ±20 % of the displayed value		(ref.: 20°C)
Cross sensitivities:	C <sub>2</sub> H <sub>4</sub> ≈80%; NO≈35%; HCN≈30%; CO<20%; H <sub>2</sub> S<20%; NO <sub>2</sub> =SO <sub>2</sub> =Cl <sub>2</sub> =HCl=0%; (*1)		
Expected operating life:	2 to 3 years in air		
<b>MK399-8 Electrochemical sensor for ammonia NH<sub>3</sub></b>			
Measuring ranges:	0 to 500 ppm	0 to 1000 ppm	0 to 1500 ppm
Resolution / tolerance range:	2 ppm / ±5 ppm	2 ppm / ±5 ppm	5 ppm / ±10 ppm
Stabilization time:	t <sub>90</sub> < 90sec (at 20°C)		
Pressure 80 to 120kPa:	max. ±5 ppm or ±10 % of the measuring range		(ref.: 100kPa)
Humidity 10% to 95% RH:	max. ±5 ppm or ±10 % of the displayed value		(ref.: 50 % RH @20°C)
Temperature -20 to +50°C:	max. ±5 ppm or ±10 % of the displayed value		(ref.: 20°C)
Cross sensitivities:	NO <sub>2</sub> ≈65%, H <sub>2</sub> S≈60%, Cl <sub>2</sub> ≈20%, SO <sub>2</sub> ≈10%, CO=NO=H <sub>2</sub> =0% (*1)		
Expected operating life:	2 to 3 years in clean air		
<b>MK402-8 Electrochemical sensor for hydrogen H<sub>2</sub> (*2)</b>			
Measuring range:	0 to 1.00 vol %		
Resolution / tolerance range:	0.01 vol % / ±0.02 vol %		
Stabilization time:	t <sub>50</sub> < 40sec	t <sub>90</sub> < 70sec	(at 20°C)
Pressure 80 to 120kPa:	max. ±0.01 vol % or ±10 % of the displayed value		(ref.: 100kPa)
Humidity 15% to 90% RH:	max. ±0.01 vol % or ±10 % of the displayed value		(ref.: 50 % RH)
Temperature -20 to +50°C:	max. ±0.02 vol % or ±20 % of the displayed value		(ref.: 20°C)
Cross sensitivities:	NO <sub>2</sub> :~400%; CO:150%; H <sub>2</sub> S:20%; C <sub>2</sub> H <sub>4</sub> :yes; NH <sub>3</sub> =CO <sub>2</sub> =Cl <sub>2</sub> =SO <sub>2</sub> =HCN=0%; (*1)		
Expected operating life:	2 to 3 years in air		
<b>MK403-8 Electrochemical sensor for hydrogen H<sub>2</sub> (*2)</b>			
Measuring range:	0 to 4.00 vol %		
Resolution / tolerance range:	0.01 vol % / ±0.05 vol %		
Stabilization time:	t <sub>50</sub> < 40sec	t <sub>90</sub> < 60sec	(at 20°C)
Pressure 80 to 120kPa:	max. ±0.01 vol % or ±10 % of the displayed value		(ref.: 100kPa)
Humidity 15% to 90% RH:	max. ±0.01 vol % or ±10 % of the displayed value		(ref.: 50 % RH)
Temperature -20 to +50°C:	max. ±0.02 vol % or ±25 % of the displayed value		(ref.: 20°C)
Cross sensitivities:	H <sub>2</sub> S:220%; C <sub>2</sub> H <sub>4</sub> :ja; NH <sub>3</sub> =CO <sub>2</sub> =CO=Cl <sub>2</sub> =HCN=NO=NO <sub>2</sub> =0%; (*1)		
Expected operating life:	2 to 3 years in air		
<b>MK405-8 Electrochemical sensor for tetrahydrothiophene (THT) C<sub>4</sub>H<sub>8</sub>O</b>			
Measuring ranges:	0 to 10 ppm	0 to 20 ppm	0 to 30 ppm
Resolution / tolerance range:	0.05 ppm / ±0.10 ppm	0.1 ppm / ±0.2 ppm	0.1 ppm / ±0.2 ppm
Stabilization time:	t <sub>50</sub> < 15sec	t <sub>90</sub> < 30sec	(at 20°C)
Pressure 80 to 120kPa:	max. ±0.3 ppm or ±10 % of the displayed value		(ref.: 100kPa)
Humidity 10% to 95% RH:	max. ±0.3 ppm or ±10 % the displayed value		(ref.: 50 % RH at 20°C)
Temperature -10 to +45°C:	max. ±0.5 ppm or ±15 % of the displayed value		(ref.: 20°C)
Cross sensitivities:	C <sub>3</sub> H <sub>8</sub> O≈25%, H <sub>2</sub> ≈0,5%, CO≈0,5%, CO <sub>2</sub> =0% (*1)		
Stabilization time:	Four minutes to three days, depending on the switch-off time		
Expected operating life:	2 years in air		
<b>MK407-8 Electrochemical sensor for hydrogen H<sub>2</sub> (*2)</b>			
Measuring ranges:	0 to 1.00 vol %	0 to 2.00 vol %	0 to 4.00 vol %
Resolution / tolerance range:	0.01 vol % / ±0.01 vol %		
Stabilization time:	t <sub>50</sub> < 20sec	t <sub>90</sub> < 40sec	(at 20°C)
Pressure 80 to 120kPa:	max. ±0.01 vol % or ±10% of the displayed value		(ref.: 100kPa)
Humidity 15% to 90% RH:	max. ±0.01 vol % or ±10% of the displayed value		(ref.: 50%RH)
Temperature -20(-30) to +50°C:	max. ±0.02 vol % or ±10(±20%) of the displayed value		(ref.: 20°C)
Cross sensitivities:	NO:60%; CO:30%; H <sub>2</sub> S:8%; Cl <sub>2</sub> =NO <sub>2</sub> =SO <sub>2</sub> =0% (*1)		
Expected operating life:	2 to 3 years in air		
<b>MK409-8 Electrochemical sensor for Hydrogen cyanide HCN</b>			
Measuring ranges:	0 to 50 ppm	0 to 100 ppm	
Resolution / tolerance range:	0.1 ppm / ±0.5 ppm	0.2 ppm / ±1.0 ppm	
Stabilization time:	t <sub>50</sub> < 25sec	t <sub>90</sub> < 60sec	(at 20°C)
Pressure 80 to 120kPa:	max. ±0.5 ppm or ±10 % of the measuring range		(ref.: 100kPa)
Humidity 10% to 95% RH:	max. ±0.5 ppm or ±10 % of the displayed value		(ref.: 50 % RH at 20°C)
Temperature -20 to +50°C:	max. ±0.5 ppm or ±15 % of the displayed value		(ref.: 20°C)
Cross sensitivities:	NO <sub>2</sub> ≈70%, NO≈5%, H <sub>2</sub> S≈0 to 200% (depending on filter saturation) CO=CO <sub>2</sub> =H <sub>2</sub> =0% (*1)		
Expected operating life:	2 years in air		

<b>MK412-3/MK412-9 Electrochemical sensors for Hydrogen fluoride HF</b>				
Measuring ranges:	0 to 10 ppm	0 to 10 ppm		
Resolution / tolerance range:	0.1 ppm / ±0.3 ppm (MK412-3)	0.5 ppm / ±0.5 ppm (MK412-9)		
Stabilization time:	t <sub>50</sub> < 40sec	t <sub>90</sub> < 90sec	(at 20°C)	
Pressure 80 to 120kPa:	max. ±0.2 ppm or ±10 % of the displayed value		(ref.: 100kPa)	
Humidity 10% to 80% RH:	max. ±0.2 ppm or ±10 % of the displayed value		(ref.: 50 % RH at 20°C)	
Temperature -20 to +40°C:	max. ±0.2 ppm or ±10 % of the displayed value		(ref.: 20°C)	
Cross sensitivities:	Cl <sub>2</sub> ≈140%; HCl≈70%; CO=CO <sub>2</sub> =NO <sub>2</sub> =H <sub>2</sub> S=H <sub>2</sub> =0% (*1)			
Expected operating life:	1 to 2 years in air			
<b>MK440-8 Electrochemical sensor for sulfur dioxide SO<sub>2</sub></b>				
Measuring ranges:	0 to 10 ppm	0 to 20 ppm	0 to 50 ppm	0 to 100 ppm
Resolution:	0.05 ppm	0.05 ppm	0.1 ppm	0.1 ppm
Tolerance range:	±0.15 ppm	±0.20 ppm	±0.3 ppm	±0.4 ppm
Stabilization time:	t <sub>50</sub> < 10sec	t <sub>90</sub> < 30sec	(at 20°C)	
Pressure 80 to 120kPa:	max. ±0.2 ppm or ±5 % of the displayed value		(ref.: 100kPa)	
Humidity 15% to 90% RH:	max. ±0.3 ppm or ±3 % of the displayed value		(ref.: 50 % RH at 20°C)	
Temperature -20 to +50°C:	max. ±0.3 ppm or ±5 % of the displayed value		(ref.: 20°C)	
Cross sensitivities:	C <sub>2</sub> H <sub>2</sub> <300%; NO <sub>2</sub> <-170%; C <sub>2</sub> H <sub>4</sub> <90%; HCN<50%; Cl <sub>2</sub> <-40%; NO<10%; H <sub>2</sub> S<0,4%; CO<0,4%; H <sub>2</sub> <0,3%; NH <sub>3</sub> =0%; (*1)			
Expected operating life:	3 years in air			
<b>MK443-8 Electrochemical sensor for carbon monoxide CO</b>				
Measuring ranges:	3 to 500 ppm	3 to 1000 ppm	3 to 2000 ppm	
Resolution / tolerance range:	1 ppm / ±3 ppm	1 ppm / ±3 ppm	1 ppm / ±3 ppm	
Stabilization time:	t <sub>50</sub> < 10sec	t <sub>90</sub> < 20sec (↑)	t <sub>10</sub> < 20sec (↓)	(at 20°C)
Pressure 80 to 120kPa:	max. ±3 ppm or ±10 % of the displayed value		(ref.: 100kPa)	
Humidity 15% to 95% RH:	max. ±3 ppm or ±5 % of the displayed value		(ref.: 50 % RH at 20°C)	
Temperature -20 to +40(50)°C:	max. ±3 ppm or ±5(10) % of the displayed value		(ref.: 20°C)	
Cross sensitivities:	C <sub>2</sub> H <sub>4</sub> ≈96%, C <sub>2</sub> H <sub>2</sub> ≈90%, H <sub>2</sub> <30%(typ.15%), NO<20%, Cl <sub>2</sub> <7%, C <sub>2</sub> H <sub>6</sub> O□0,5%, SO <sub>2</sub> =NH <sub>3</sub> =H <sub>2</sub> S=0% (*1)			
Expected operating life:	3 years in air			
<b>MK445-8 Electrochemical sensor for Hydrogen sulfide H<sub>2</sub>S</b>				
Measuring ranges:	0.2 to 50 ppm	0.2 to 100 ppm	0.2 to 200 ppm	0.5 to 500 ppm
Resolution:	0.1 ppm	0.1 ppm	0.2 ppm	0.5 ppm
Tolerance range:	±0.5 ppm	±0.5 ppm	±1.0 ppm	±1.5 ppm
Stabilization time:	t <sub>50</sub> < 10sec	t <sub>90</sub> ≤ 20sec (↑)	t <sub>10</sub> ≤ 20sec (↓)	(at 20°C)
Pressure 80 to 120kPa:	max. ±0 ppm or ±5 % of the displayed value		(ref. to 100kPa)	
Humidity 15% to 90% RH:	max. ±0.2 ppm or ±5 % of the displayed value		(ref.: 50 % RH at 20°C)	
Temperature -20 to +40(50) °C:	max. ±0.2 ppm or ±5(10) % of the displayed value		(ref.: 20°C)	
Cross sensitivities:	NO <sub>2</sub> <10%, CO<2%, NO<1%, CO <sub>2</sub> =SO <sub>2</sub> =Cl <sub>2</sub> =NH <sub>3</sub> =C <sub>2</sub> H <sub>4</sub> =0% low methanol cross sensitivity (*1)			
Expected operating life:	3 years in air			
<b>MK450-8 Electrochemical sensor for tert-butyl mercaptan C<sub>4</sub>H<sub>10</sub>S (TBM)</b>				
Measuring ranges:	0 to 10 ppm	0 to 20 ppm		
Resolution / tolerance range:	0.05 ppm / ±0.10 ppm	0.1 ppm / ±0.2 ppm		
Stabilization time:	t <sub>50</sub> < 30sec	t <sub>90</sub> < 90sec	(at 20°C)	
Pressure 80 to 120kPa:	max. ±0.2 ppm or ±10 % of the displayed value		(ref.: 100kPa)	
Humidity 15% to 90% RH:	max. ±0.2 ppm or ±10 % of the displayed value		(ref.: 50 % RH at 20°C)	
Temperature -10...+50°C:	max. ±0.2 ppm or ±15% of the displayed value		(ref.: 20°C)	
Expected operating life:	2 years in air			
<b>MK453-8 Electrochemical sensor for ammonia NH<sub>3</sub></b>				
Measuring ranges:	0 to 300 ppm	0 to 500 ppm		
Resolution / tolerance range:	1 ppm / ±3 ppm	1 ppm / ±3 ppm		
Stabilization time:	t <sub>50</sub> < 20sec	t <sub>90</sub> < 90sec	(at 20°C)	
Pressure 80 to 120kPa:	max. ±1 ppm or ±10 % of the displayed value		(ref.: 100kPa)	
Humidity 15% to 90% RH:	max. ±1 ppm or ±10 % of the displayed value		(ref.: 50 % RH at 20°C)	
Temperature -(20)10 to +50°C:	max. ±1(2) ppm or ±15(20) % of the displayed value		(ref.: 20°C)	
Cross sensitivities:	H <sub>2</sub> S≈120%, NO <sub>2</sub> ≈-100%, SO <sub>2</sub> ≈-30%, CO=NO=CO <sub>2</sub> =H <sub>2</sub> =C <sub>2</sub> H <sub>6</sub> O=0% (*1)			
Expected operating life:	2 to 3 years in clean air			
<b>MK454-8 Electrochemical sensor for ammonia NH<sub>3</sub></b>				
Measuring ranges:	0 to 500 ppm	0 to 1000 ppm	0 to 1500 ppm	
Resolution / tolerance range:	2 ppm / ±5 ppm	5 ppm / ±10 ppm	5 ppm / ±10 ppm	
Stabilization time:	t <sub>50</sub> < 20sec	t <sub>90</sub> < 90sec	(at 20°C)	
Pressure 80 to 120kPa:	max. ±5 ppm or ±10 % if the displayed value		(ref.: to 100kPa)	
Humidity 15% to 90% RH:	max. ±5 ppm or ±10 % of the displayed value		(ref.: to 50 % RH at 20°C)	
Temperature -20 to +55°C:	max. ±10 ppm or ±20% of the displayed value		(ref.: to 20°C)	
Cross sensitivities:	H <sub>2</sub> S≈140%, NO <sub>2</sub> ≈-100%, SO <sub>2</sub> ≈-30%, CO=NO=CO <sub>2</sub> =H <sub>2</sub> =C <sub>2</sub> H <sub>6</sub> O=0% (*1)			
Expected operating life:	2 to 3 years in clean air			

<b>MK457-8 Electrochemical sensor for nitric oxide NO</b>			
Measuring ranges:	0 to 50 ppm	0 to 100 ppm	0 to 200 ppm
Resolution / tolerance range:	0.2 ppm / ±1.5 ppm	0.5 ppm / ±2.0 ppm	0.5 ppm / ±2.0 ppm
Stabilization time:	$t_{50} < 10\text{sec}$	$t_{90} < 30\text{sec}$	(at 20°C)
Pressure 80 to 120kPa:	max. ±1ppm or ±10 % of the displayed value		(ref.: 100kPa)
Humidity 15% to 90% RH:	max. ±1ppm or ±10 % of the displayed value		(ref.: 50 % RH at 20°C)
Temperature -20 to +40(50) °C:	max. ±2 ppm or ±10 % of the displayed value		(ref.: 20°C)
Cross sensitivities:	H <sub>2</sub> S<50%; NO <sub>2</sub> <40%; C <sub>2</sub> H <sub>6</sub> O ±10%; SO <sub>2</sub> <5%; H <sub>2</sub> <1%; NH <sub>3</sub> <1%; CO<-1%; CO <sub>2</sub> =Cl <sub>2</sub> =0 (*1)		
Expected operating life:	3 years in air		
Stabilization time:	Three minutes to one day, depending on the switch-off time		
<b>MK458-8 Electrochemical sensor for nitrogen dioxide NO<sub>2</sub></b>			
Measuring ranges:	0 to 30 ppm	0 to 50 ppm	0 to 100 ppm
Resolution / tolerance range:	0.1 ppm / ±0.3 ppm	0.1 ppm / ±0.5 ppm	0.1 ppm / ±0.5 ppm
Stabilization time:	$t_{50} < 10\text{sec}$	$t_{90} < 30\text{sec}$	(at 20°C)
Pressure 80 to 120kPa:	max. ±0.2 ppm or ±10 % of the displayed value		(ref.: 100kPa)
Humidity 15% to 90% RH:	max. ±0.2 ppm or ±10 % of the displayed value		(ref.: 50 % RH at 20°C)
Temperature -20 to +50°C:	max. ±0.2 ppm or ±10 % of the displayed value		(ref.: 20°C)
Cross sensitivities:	Cl <sub>2</sub> ≈100%; H <sub>2</sub> S<-40%; NO<20%; C <sub>2</sub> H <sub>6</sub> O<1%; CO<-1%; SO <sub>2</sub> <-1%; H <sub>2</sub> <-1%; NH <sub>3</sub> <-1%, CO <sub>2</sub> =0; (*1)		
Expected operating life:	3 years in air		
<b>MK464-8 Electrochemical sensor for oxygen O<sub>2</sub></b>			
Measuring range:	0 to 25 vol %		
Resolution / tolerance range:	0.1 vol % / ±0.3 vol %		
Stabilization time:	$t_{20} \leq 5\text{sec}$	$t_{90} \leq 15\text{sec}$	(at 20°C)
Pressure 80 to 120kPa:	max. ±0.2 vol % or ±2.5 % of the measuring range		(ref.: 100kPa)
Humidity 5% to 95% RH:	max. ±0.2 vol % or ±2.5 % of the measuring range		(ref.: 50 % RH at 40°C)
Temperature -20 to +50°C:	max. ±0.4 vol % or ±3.0 % of the displayed value		(ref.: 20°C)
Expected operating life:	2 years in air		
<b>MK465-8 Electrochemical sensor for oxygen O<sub>2</sub></b>			
Measuring range:	0 to 25 vol %		
Resolution / tolerance range:	0.1 vol % / ±0.3 vol %		
Stabilization time:	$t_{20} \leq 5\text{sec}$	$t_{90} \leq 15\text{sec}$	(at 20°C)
Pressure 80 to 120kPa:	max. ±0.3 vol % or ±2.5 % of the measuring range		(ref.: 100kPa)
Humidity 5% to 95% RH:	max. ±0.3 vol % or ±2.5 % of the measuring range		(ref.: 50 % RH at 40°C)
Temperature -20 to +50°C:	max. ±0.4 vol % or ±3,0 % of the displayed value		(ref.: 20°C)
Expected operating life:	3 years in air		
<b>MK466-8 Electrochemical sensor for oxygen O<sub>2</sub></b>			
Measuring range:	0 to 25 vol %		
Resolution / tolerance range:	0.1 vol % / ±0.3 vol %		
Stabilization time:	$t_{20} \leq 5\text{sec}$	$t_{90} \leq 15\text{sec}$	(at 20°C)
Pressure 80 to 120kPa:	max. ±0.3 vol % or ±2,5 % of the measuring range		(ref.: 100kPa)
Humidity 15% to 90% RH:	max. ±0.3 vol % or ±2.5 % of the measuring range		(ref.: 50 % RH at 40°C)
Temperature -20 to +50°C:	max. ±0.4 vol % or ±3.0 % of the displayed value		(ref.: 20°C)
Expected operating life:	5 years in air		
<b>MK474-8 Electrochemical sensor for chlorine Cl<sub>2</sub></b>			
Measuring range:	0 to 10ppm	0 to 20ppm	0 to 40ppm
Resolution / Tolerance range:	0.05ppm / ±0.10ppm	0.05ppm / ±0.10ppm	0.1ppm / ±0.1ppm
Stabilization time:	$t_{90} < 60\text{sec}$ (at 20°C)		
Pressure 80 to 120kPa:	max. ±0.2ppm or ±10% of the displayed value		(ref.: 100kPa)
Humidity 15% to 90% RH:	max. ±0.2ppm or ±10% of the displayed value		(ref.: 50%RH at 20°C)
Temperature -20 to +40°C:	max. ±0.2ppm or ±10% of the displayed value		(ref.: 20°C)
Cross sensitivities:	Br <sub>2</sub> ≈100%, O <sub>3</sub> ≈80%, ClO <sub>2</sub> ≈50%, F <sub>2</sub> ≈50%, NO <sub>2</sub> ≈10%, H <sub>2</sub> S≈-10%, CO=C <sub>3</sub> H <sub>8</sub> O=H <sub>2</sub> =SO <sub>2</sub> =0% (*1)		
Expected operating life:	2 to 3 years in air		
<b>MK477-8 Electrochemical sensor for silane SiH<sub>4</sub></b>			
Measuring ranges:	0 to 20 ppm	0 to 50 ppm	
Resolution / tolerance range:	0.1 ppm / ±0.2 ppm	0.1 ppm / ±0.2 ppm	
Stabilization time:	$t_{50} < 20\text{sec}$	$t_{90} < 60\text{sec}$	(at 20°C)
Pressure 80 to 120kPa:	max. ±0.1 ppm or ±10 % of the displayed value		(ref.: 100kPa)
Humidity 15% to 90% RH:	max. ±0.2 ppm or ±10 % of the displayed value		(ref.: 50 % RH at 20°C)
Temperature -20 to +50°C:	max. ±0.3 ppm or ±10 % of the displayed value		(ref.: 20°C)
Cross sensitivities:	H <sub>2</sub> S≈160%, PH <sub>3</sub> ≈100%; SO <sub>2</sub> ≈20%; H <sub>2</sub> =CO=0%; (*1)		
Expected operating life:	2 to 3 years in air		

\*1: Displayed gas concentration with reference to the applied concentration in TLV range

\*2: Not permitted for monitoring the lower explosion limit for primary explosion protection applications

## 3.10 Alarm thresholds - general settings

### General settings of the alarm thresholds for toxic gases without exposure alert

Measuring range	Alarm 1	Alarm 2	STEL (15')	TWA (8h)
0 to 20 ppm C <sub>2</sub> H <sub>4</sub> O (ETO)	2.0 ppm	4.0 ppm	-	-
0 to 10 ppm Cl <sub>2</sub>	0.5 ppm	1.0 ppm	-	-
0 to 2 ppm ClO <sub>2</sub> (CLO)	0.2 ppm (*1)	0.4 ppm		
0 to 2 ppm COCl <sub>2</sub> (PGN)	0.1 ppm	0.2 ppm		
0 to 500 ppm CO	30 ppm	60 ppm	-	-
0 to 5.0 vol % CO <sub>2</sub>	0.5 vol %	1.0 vol %	-	-
0 to 100 ppm H <sub>2</sub> S	5.0 ppm	10 ppm	-	-
0 to 30 ppm HCl	5.0 ppm (*1)	10 ppm	-	-
0 to 50 ppm HCN	5.0ppm (*1)	10 ppm	-	-
0 to 10 ppm HF	1.0 ppm	2.0 ppm	-	-
0 to 300 ppm NH <sub>3</sub>	20 ppm	40 ppm	-	-
0 to 100 ppm NO	2.5 ppm (*1)	5.0 ppm	-	-
0 to 30 ppm NO <sub>2</sub>	2.0 ppm (*1)	4.0 ppm	-	-
0 to 10 ppm PH <sub>3</sub>	0.3 ppm (*1)	0.6 ppm	-	-
0 to 20 ppm SiH <sub>4</sub> (SIL)	5.0 ppm	10 ppm	-	-
0 to 10 ppm SO <sub>2</sub>	1.0 ppm	2.0 ppm	-	-

\*1: The TLV value cannot be monitored satisfactorily with the available sensor technology.

### General settings of the alarm thresholds for toxic gases with exposure alert

Measuring range	Alarm 1	Alarm 2	STEL (15')	TWA (8h)
0 to 20 ppm C <sub>2</sub> H <sub>4</sub> O	2 ppm	6 ppm	4 ppm	2 ppm
0 to 10 ppm Cl <sub>2</sub>	1.0 ppm	1.5 ppm	1.0 ppm	0.5 ppm
0 to 2 ppm ClO <sub>2</sub>	0.2 ppm	0.4 ppm	0.2 ppm	0.1 ppm
0 to 2 ppm COCl <sub>2</sub>	0.1 ppm	0.2 ppm	0.2 ppm	0.1 ppm
0 to 500 ppm CO	30 ppm	120 ppm	60 ppm	30 ppm
0 to 5.0 vol % CO <sub>2</sub>	0.5 vol %	2.0 vol %	1.0 vol %	0.5 vol %
0 to 100 ppm H <sub>2</sub> S	5.0 ppm	15 ppm	10 ppm	5.0 ppm
0 to 30 ppm HCl	5.0 ppm	10 ppm	5.0 ppm	2.0 ppm
0 to 50 ppm HCN	5.0 ppm	10 ppm	5.0 ppm	1.9 ppm
0 to 10 ppm HF	1.0 ppm	3.0 ppm	2.0 ppm	1.0 ppm
0 to 300 ppm NH <sub>3</sub>	20 ppm	80 ppm	40 ppm	20 ppm
0 to 100 ppm NO	2.5 ppm	5.0 ppm	2.5 ppm	0.5 ppm
0 to 30 ppm NO <sub>2</sub>	2.0 ppm	4.0 ppm	2.0 ppm	0.5 ppm
0 to 10 ppm PH <sub>3</sub>	0.3 ppm (*1)	0.4 ppm	0.2 ppm	0.1 ppm
0 to 20 ppm SiH <sub>4</sub>	5.0 ppm	15 ppm	10 ppm	5.0 ppm
0 to 10 ppm SO <sub>2</sub>	1.0 ppm	3.0 ppm	2.0 ppm	1.0 ppm

\*1: The TLV value cannot be monitored satisfactorily with the available sensor technology.

### General settings of the alarm thresholds for oxygen and combustible gases and vapors

Measuring range	Alarm 1	Alarm 2	Alarm 3
0 to 25 vol %	19.0 vol % (↓)	17.0 vol (↓)	23.0 vol % (↑)
0 to 2000 ppm H <sub>2</sub> (*2)	1000 ppm	1500 ppm	2000 ppm
0 to 1.0/4.0 vol % H <sub>2</sub> (*2)	0.40 vol %	0.60 vol %	0.80 vol %
0 to 5.0 vol % CH <sub>4</sub>	1.00 vol %	2.00 vol %	3.00 vol %
0 to 100 % LEL CH <sub>4</sub> (*3)	20.0 % LEL	40.0 % LEL	60.0 % LEL

\*2: Not permitted for monitoring the lower explosion limit for primary explosion protection applications.

\*3: of a different gas or vapor (of the ones listed below)

LEL values according to DIN EN 60079-20-1:2010				
4.0 vol %	H <sub>2</sub>	hydrogen	(CAS-Nr.1333-74-0)	6.0 vol % CH <sub>4</sub> O methanol (CAS-Nr.67-56-1)
4.4 vol %	CH <sub>4</sub>	methane	(CAS-Nr.74-82-8)	3.1 vol % C <sub>2</sub> H <sub>6</sub> O ethanol (CAS-Nr.64-17-5)
2.3 vol %	C <sub>2</sub> H <sub>2</sub>	acetylene	(CAS-Nr.74-86-2)	2.5 vol % C <sub>3</sub> H <sub>6</sub> O acetone (CAS-Nr.67-64-1)
2.3 vol %	C <sub>2</sub> H <sub>4</sub>	ethylene	(CAS-Nr.74-85-1)	3.1 vol % C <sub>3</sub> H <sub>6</sub> O <sub>2</sub> methyl acetate (CAS-Nr.79-20-9)
2.4 vol %	C <sub>2</sub> H <sub>6</sub>	ethane	(CAS-Nr.74-84-0)	2.7 vol % C <sub>3</sub> H <sub>6</sub> O <sub>2</sub> ethyl formate ETF (CAS-Nr.109-94-4)
1.7 vol %	C <sub>3</sub> H <sub>8</sub>	propane	(CAS-Nr.74-98-6)	2.0 vol % C <sub>3</sub> H <sub>8</sub> O isopropanol (CAS-Nr.67-63-0)
1.4 vol %	C <sub>4</sub> H <sub>10</sub>	butane	(CAS-Nr.106-97-8)	1.5 vol % C <sub>4</sub> H <sub>8</sub> O methyl ethyl ketone MEK (CAS-Nr.78-93-3)
1.1 vol %	C <sub>5</sub> H <sub>12</sub>	pentane	(CAS-Nr.109-66-0)	2.0 vol % C <sub>4</sub> H <sub>8</sub> O <sub>2</sub> ethyl acetate (CAS-Nr.141-78-6)
1.0 vol %	C <sub>6</sub> H <sub>14</sub>	n-hexane	(CAS-Nr.110-54-3)	1.4 vol % C <sub>4</sub> H <sub>10</sub> O n-butanol (CAS-Nr.71-36-3)
0.85vol %	C <sub>7</sub> H <sub>16</sub>	heptane	(CAS-Nr.142-82-5)	1.2 vol % C <sub>6</sub> H <sub>12</sub> O methyl isobutyl ketone MIBK (CAS-Nr.108-10-1)
0.70 vol %	C <sub>9</sub> H <sub>20</sub> n	n-nonane	(CAS-Nr.111-84-2)	1.0 vol % C <sub>7</sub> H <sub>8</sub> toluol (CAS-Nr.108-88-3)

## 3.11 Technical Specifications

<b>Type designation:</b>	<b>G888C and G888M</b>	
<b>Measuring principle:</b>	Electrochemical (EC):	for toxic gases and oxygen
	Catalytic Combustion (CC):	for combustible gases and vapors (up to 100 % LEL)
	Infrared (IR):	for combustible gases and vapors and carbon dioxide
<b>Measuring ranges:</b>	see sections "Types of sensors and measuring ranges" and "Sensor specifications"	
<b>Stabilization time:</b>	see section "Sensor specifications"	
<b>Sensor service life</b>	see section "Sensor specifications"	
<b>Sample gas feed:</b>	via diffusion inlets	
<b>Display:</b>	Backlit full graphics LCD, automatic size adjustment for easier reading, display of battery capacity, gas concentration shown as current value and peak value	
<b>Alarm:</b>	Two or three current value alarms (depending on the type of gas) and two exposure alarm, battery alarm via visual and acoustic signal as well as display notification, color changing display backlight (depending on alarm condition) in red / orange. Buzzer: 103 dB(A) (can be reduced down to 90 dB(A))	
<b>Zero point and sensitivity adjustment:</b>	manually or automatically with adjustment program and, if necessary, test gas supply via the "SMART CAP" with 0.5 to 0.6slpm	
<b>Radio signal:</b>	optionally 868MHz for EU; Range approximately 700m (free field) optionally 915MHz for USA; Range approximately 300m (free field)	
<b>Power supply</b>	NiMH battery pack; 2.6V 2100mAh; rechargeable	
<b>Operating time (*1)</b>		
	without radio signal:	approx. 13h (EC+CC <sub>PS</sub> +IR) approx. 9h (EC+CC+IR)
		approx. 21h (EC+CC <sub>PS</sub> ) approx. 13h (EC+CC)
		approx. 65h (EC) approx. 23h (EC+IR)
	with radio signal:	approx. 03h (EC+CC <sub>PS</sub> +IR) approx. 7,5h (EC+CC+IR)
		approx. 14h (EC+CC <sub>PS</sub> ) approx. 10h (EC+CC)
		approx. 26h (EC) approx. 15h (EC+IR)
<b>Climatic conditions</b>		
	for operation:	-20 to +50°C   5 to 95% RH   70 to 130kPa
	for storage:	-25 to +55°C   5 to 95% RH   70 to 130kPa (0 to +30°C recommended)
<b>Housing</b>	Material:	rubberized polycarbonate
	Dimensions:	68 x 100 x 39 mm (W x H x D)
	Weight:	up to 275g (depending on equipped sensors)
	Protection class:	IP67

## Approvals / tests

SIL parameters and.  
Ignition protection types:

**G888C** Ⓢ I M2 Ex ia db I Mb Ⓢ II 2G Ex ia db IIC T4 Gb -20°C≤Ta≤+50°C  
**G888M** Ⓢ I M2 Ex ia db I Mb Ⓢ II 2G Ex ia db IIC T4 Gb -20°C≤Ta≤+50°C  
Ⓢ I M1 Ex ia da I Ma Ⓢ II 1G Ex ia da IIC T4 Ga -20°C≤Ta≤+40°C

EC Type Examination Certificate: BVS 15 ATEX E 064 X

IECEX Certificate of Conformity: IECEX BVS 15.0056 X

Electromagnetic compatibility: DIN EN 50270:2015

Interference emission: Type class I

Interference resistance: type class II

\*1: This operating time refers to new battery modules used in operating temperatures of +20°C. It is reduced by pressing buttons (display light & flashlight) and gas alarms. It also decreases the older the battery module is, and with the number of times it has been charged / discharged, long storage times of gas measuring device in the charging tray and through the lazy battery effect.

CC<sub>PS</sub>=Catalytic combustion sensor with active **Power Save** mode, as long as a measured value of 0 % LEL is being detected.

This energy saving mode can only be activated on certain measuring ranges (see section 2.3.2.2.5).

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215-000.30\_BA\_G888.doc



As of: July 12, 2024

Subject to change

**EU Declaration of Conformity GfG Gesellschaft für Gerätebau mbH**

**G888C, G888S, G888M**

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Edited: 31.07.2017 Amended: 19.05.2021

GfG Gesellschaft für Gerätebau mbH develops produces and sells gas sensors and gas warning devices which are subject to a **quality management system** as per DIN EN ISO 9001.

Subject to supervision by means of a **quality system**, surveilled by the notified body, DEKRA Testing and Certification GmbH (0158), is the production of electrical apparatus of instrumentation Group I and II, categories M1, M2, 1G and 2G for gas sensors, gas detectors, gas warning systems in types of protection flameproof enclosures, increased safety, encapsulation and intrinsic safety, as well as their measuring function.

The portable detector **G888C, G888S, G888M** complies with directive **2014/34/EU** (ATEX) for devices and protective systems for proper use in potentially explosive atmospheres, directive **2014/30/EU** for electromagnetic compatibility, directive **2014/53/EU** (RED) relating to the making available on the market of radio equipment and with directive **2011/65/EU** (RoHS) on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

<b>For electrical explosion protection</b>	BVS 15 ATEX E 064 X	
<b>Labelling G888C:</b>	⊕ II <b>2G</b> Ex ia db IIC T4 Gb / ⊕ I <b>M2</b> Ex ia db I Mb	-20≤T <sub>3</sub> ≤+50°C
<b>Labelling G888S:</b>	⊕ II <b>2G</b> Ex ia db IIC T4 Gb / ⊕ I <b>M1</b> Ex ia I Ma	-20≤T <sub>3</sub> ≤+50°C
<b>Labelling G888M:</b>	⊕ II <b>2G</b> Ex ia db IIC T4 Gb / ⊕ I <b>M2</b> Ex ia db I Mb	-20≤T <sub>3</sub> ≤+50°C
	⊕ II <b>1G</b> Ex ia da IIC T4 Ga / ⊕ I <b>M1</b> Ex ia da I Ma	-20≤T <sub>3</sub> ≤+40°C

**The directive 2014/34/EU is complied considering the following standards:**

Explosive atmospheres		
- General requirements	EN 60079-0	: 2018
- Flameproof enclosure "d"	EN 60079-1	: 2014
- Intrinsic safety "i"	EN 60079-11	: 2012

The rating of the danger of ignition was done and documented. The EC-Type Examination Certificate was issued by the notified body with ID number 0158 (DEKRA EKAM, Dinnendahlstraße 9, D-44809 Bochum).

**The directive 2014/30/EU is complied considering the following standard:**

- Electromagnetic compatibility - Electrical apparatus for the detection and measurement of combustible gases, toxic gases or oxygen		
	EN 50270	: 2015
- Emitted interference		
	Type class 1	
- Interference immunity		
	Type class 2	

The EMC test laboratory AMETEK CTS Germany GmbH at Kamen has tested and certified the electromagnetic compatibility.

**The directive 2014/53/EU is complied considering the following standards:**

- Short Range Devices (SRD) operating in the frequency range 25 MHz bis 1000 MHz		
	EN 300220-2 V3.11	: 2017

**Reference to the directive 2014/30/EU:**

- ElectroMagnetic Compatibility (EMC) standard for radio equipment and services		
- Common technical requirements	EN 301489-1 V2.2.0	: 2017

**Reference to the directive 2014/35/EU:**

- Assessment of the compliance of low power and electronic and electrical equipment with the basic restrictions related to human exposure to electromagnetic fields (10 MHz – 300GHz)		
	EN 62479	: 2010
- Audio/video, information and communication technology equipment		
Part1: safety requirements	EN 62368-1	: 2014 + AC :2015

The test laboratory m.dudde hochfrequenz-technik, Bergisch Gladbach has tested and certified the compatibility.

**The directive 2011/65/EU is complied considering the following standard:**

- Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances	EN 50581	: 2012
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Dortmund, 19 May 2021

*[Signature]*  
QMB B. Siebrecht

ATEX EU-Karte 1 0560025



**Translation**

**EU-Type Examination Certificate Supplement 6**

- 1
- 2 **Equipment intended for use in potentially explosive atmospheres**  
Directive 2014/34/EU
- 3 EU-Type Examination Certificate Number: **BVS 15 ATEX E 064 X**
- 4 **Product:** **Gas detector type** **G888C, G888S, G888M**  
**Remote monitoring device type** **G999C, G999S, G999E, G999P, G999M**
- 5 **Manufacturer:** **GfG Gesellschaft für Gerätebau mbH**
- 6 **Address:** **Klönnestr. 99, 44143 Dortmund, Germany**
- 7 This supplementary certificate extends EU-Type Examination Certificate No. BVS 15 ATEX E 064 X to apply to products designed and constructed in accordance with the specification set out in the appendix of the said certificate but having any acceptable variations specified in the appendix to this certificate and the documents referred to therein.
- 8 DEKRA Testing and Certification GmbH, Notified Body number 0158, in accordance with Article 17 of Directive 2014/34/EU of the European Parliament and of the Council, dated 26 February 2014, certifies that this product has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of products intended for use in potentially explosive atmospheres given in Annex II to the Directive.  
The examination and test results are recorded in the confidential Report No. BVS PP 15.2110 EU.
- 9 The Essential Health and Safety Requirements are assured in consideration of:  
**EN IEC 60079-0:2018** **General requirements**  
**EN 60079-1:2014** **Flameproof enclosure "d"**  
**EN 60079-11:2012** **Intrinsic Safety "i"**
- 10 If the sign "X" is placed after the certificate number, it indicates that the product is subject to the Special Conditions for Use specified in the appendix to this certificate.
- 11 This EU-Type Examination Certificate relates only to the design and construction of the specified product. Further requirements of the Directive apply to the manufacturing process and supply of this product. These are not covered by this certificate.
- 12 The marking of the product shall include the following:  
 Details see next page

DEKRA Testing and Certification GmbH  
Bochum, 2021-05-03

Signed: Jörg-Timm Kilisch

Managing Director



Page 1 of 4 of BVS 15 ATEX E-064 X / NG – Jobnumber 342250400  
This certificate may only be reproduced in its entirety and without any change.

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Certification body, Dinnendahlstr. 9, 44809 Bochum, Germany  
Phone +49 234.3698-400, Fax +49 234.3698-401, e-mail DTC-Certification-body@dekra.com

13 **Appendix**

14 **EU-Type Examination Certificate**

**BVS 15 ATEX E 064 X  
Supplement 6**

15 **Description of Product**

15.1 **Subject, type, marking and ambient temperature range**

Gas detector type G888C, G999C, G999S	II 2G Ex ia db IIC T4 Gb I M2 Ex ia db I Mb	-20 °C ≤ T <sub>a</sub> ≤ +50 °C -20 °C ≤ T <sub>a</sub> ≤ +50 °C
Gas detector type G888S	II 2G Ex ia db IIC T4 Gb I M1 Ex ia I Ma	-20 °C ≤ T <sub>a</sub> ≤ +50 °C -20 °C ≤ T <sub>a</sub> ≤ +50 °C
Gas detector type G999E, G999P	II 1G Ex ia IIC T4 Ga I M1 Ex ia I Ma	-20 °C ≤ T <sub>a</sub> ≤ +50 °C -20 °C ≤ T <sub>a</sub> ≤ +50 °C
Gas detector type G888M, G999M	II 2G Ex ia db IIC T4 Gb I M2 Ex ia db I Mb	-20 °C ≤ T <sub>a</sub> ≤ +50 °C -20 °C ≤ T <sub>a</sub> ≤ +50 °C
	II 1G Ex ia da IIC T4 Ga I M1 Ex ia da I Ma	-20 °C ≤ T <sub>a</sub> ≤ +40 °C -20 °C ≤ T <sub>a</sub> ≤ +40 °C
Remote monitoring device type G999L	II 2G Ex ib IIC T4 Gb I M2 Ex ib I Mb	-20 °C ≤ T <sub>a</sub> ≤ +50 °C -20 °C ≤ T <sub>a</sub> ≤ +50 °C

15.2 **Description**

**Reason for the supplement:**

The gas detectors and the remote monitoring device were tested in accordance to the standards listed on page 1.

A bluetooth module can be used optionally in the gas detector type G888C, type G888S, type G888M,

type G999C, type G999S, type G999E, type G999P or type G999M.

A new material combination can be used optionally for the back casing.

**Description of Product:**

The Gas detector type G888C, type G888S, type G888M, type G999C, type G999S, type G999E, type G999P or type G999M is a portable instrument with a built in power-supply battery. It is used for the detection of gases in ambient air under atmospheric conditions.

The measurement values are shown on a built-in display. If the present limits are reached, a visual alarm, an audible alarm and a vibrating alarm are produced.

The remote monitoring device type G999L is a portable device with a built in power-supply battery for Gas detectors of the series G888 and G999. Purpose of the G999L is to receive status messages and measurement data of the Gas detectors by radio. It is able to connect up to ten Gas detectors by radio. At the front of the G999L an LED panel shows the status of all connected respectively addressed gas detectors. Actual measurement data of the connected Gas detectors are shown at the display of the G999L.

The Gas detector type G888C, type G888S, type G888M, type G999C, type G999S or type G999M contains 3 electro-chemical cells, 1 IR-sensor and 1 sensor of flameproof enclosure.

The Gas detector type G999E contains 4 electro-chemical cells and 1 IR-sensor.

The Gas detector type G999P contains 3 electro-chemical cells, 1 IR-sensor and 1 PID-sensor.

A radio or bluetooth module for wireless data transfer can be optionally used inside of the Gas detector type G888C, type G888S, type G888M, type G999C, type G999S, type G999E, type G999P or type G999M.

The gas detector type G888C, type G888S, type G888M, type G999C, type G999S, type G999E, type G999P or type G999M and the remote monitoring device type G999L is powered by a NIMH battery which has to be charged only outside of the hazardous area.

The gas detector type G999C or type G999S or type G999E or type G999P or type G999M contains additionally a built-in pump.

Listing of all components used referring to older standards

Subject and type	Certificate	Standards
Gas Sensor type A (used in type G888C, G999C, G999S)	Sira 07ATEX1088X	EN 60079-0:2006 EN 60079-1:2004
4P Series Gas Sensing Head (used in type G888C, G888M, G999C, G999M, G999S)	Sira 01ATEX1205X	EN 60079-0:2012 EN 60079-1:2014

15.3 **Parameters**

15.3.1 **Power supply battery in type G888C or type G888S or type G888M**

Nominal voltage	2.6 V
Nominal capacity	2100 mAh
Maximum charging voltage	U <sub>m</sub> DC 6 V

15.3.2 **Power supply battery in type G999C or type G999S or type G999E or type G999P or type G999M or type G999L**

Nominal voltage	5.2 V
Nominal capacity	2100 mAh
Maximum charging voltage	U <sub>m</sub> DC 9 V

15.3.3 **Radio or bluetooth module**

Frequency range radio (depend on module type)	865.0 – 868.6 MHz or 865.0 – 870.0 MHz or 902.0 – 92.0 MHz
Frequency range bluetooth	2.402 – 2.480 GHz
Nominal RF output power	< 35 mW
Maximum RF output power	< 250 mW

15.3.4 **Ambient temperature range see section 15.1**

16 **Report Number**

BVS PP 15.2110 EU, as of 2021-05-03

17 **Special Conditions for Use**

The measuring function according to annex II paragraph 1.5.5 of the directive 2014/34/EU is not part of this supplement to the EU-type Examination Certificate.

For Gas detector type G888C, G888M, G999C, G999M, G999S / usage Group I / mining:

The gas detector may only be used in potentially explosive atmospheres as intended. That means, that the device has to be carried on the body or has not be discarded unattended, so that mechanical stress by impact is avoided. It is intended for the low risk of mechanical danger according to EN IEC 60079-0.

The gas detector has to be immediately removed from the hazardous area and has to be cleaned when it is contaminated with oils and greases or hydraulic fluids.

**18 Essential Health and Safety Requirements**

The Essential Health and Safety Requirements are covered by the standards listed under item 9.

**19 Drawings and Documents**

Drawings and documents are listed in the confidential report.

We confirm the correctness of the translation from the German original.  
In the case of arbitration only the German wording shall be valid and binding.

DEKRA Testing and Certification GmbH  
Bochum, 2021-05-03  
BVS-Rip/MGR A20210262

  
\_\_\_\_\_  
Managing Director