Installation & Maintenance Instructions

Microtector II – G450

1 to 4-Gas Detector

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Congratulations!

You decided for a high technology product of GfG. A good choice!

Our detectors are characterized by reliability, safety, best performance and economic efficiency.

They comply with national and international directives.

This manual will help you to operate the detector quickly and safely.

Please take note of the operational hints before putting into operation!

For any questions please feel free to contact us.

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Content

Introduction

For your safety

According to § 3 of the law about technical working media and consumer products, device and production safety law (GPSG), this manual points out the proper use of the product and serves to prevent dangers. It must be read and adhered to by all persons who use, service, maintain and check this product.
This device can do the job designed to do only, if it is used, serviced, maintained and checked according to the instructions given by GfG Gesellschaft für Gerätebau.
The warranties made by GfG with respect to the product are voided, if the product is not used, serviced, maintained and checked in accordance with GfG's instructions.
The above does not alter statements regarding warranties and liabilities in GfG's general conditions of sale and delivery. Repairs must only be done by skilled personnel resp. by trained persons. Modifications and changes of the product require GfG's permission. Unauthorized modification of the product result in the exclusion of any liability for possible damage. Make sure that only genuine GfG accessories are used with the product. Repairs require the use of spare parts released by GfG.

Application and purpose

The G450 is a handheld detector for personal protection from hazards occurring by toxic or explosive gases and vapours as well as by lack or surplus of oxygen. The G450 measures permanently in diffusion mode and gives a visual and audible alarm, if a gas-induced danger builds up.

The G450 is approved for the use in explosion endangered areas and is subject to an EC-Type Examination Certificate issued by Dekra EXAM GmbH, according to directive 94/9/EG (ATEX100a):

Certificate:	BVS 06 ATEX E 017 X		
Labelling:	⟨Ex⟩ II 2G	Ex ia d IIC T4	-20°C≤Ta≤+55°C (NiMH-II)
		Ex ia d IIC T3	-20°C≤Ta≤+55°C (NiMH)
		Ex ia d IIC T4/T3	-20°C≤Ta≤+45°/+55°C (Alkaline)

The temperature class of the detector depends on the supply module used. When using the „NiMH-II" accumulator, temperature class T4 is valid for ambient temperatures of –20°C to +50°C, while temperature class T3 is valid when using the „NiMH" accumulator. Both supply modules are identified by a black enclosure with an inside label showing the type and temperature class. When using the Alkaline batteries (grey housing), temperature class T4 is valid for ambient temperatures from -20°C to +45°C resp. temperature class T3 for ambient temperatures of -20°C to +55°C.
For the use in explosion endangered areas with a measurement function for the explosion protection there is a supplement for the G450 to the above mentioned EC-Type Examination Certificate of DEKRA EXAM GmbH according to guideline 94/9/EG. Basis of the test were the standards DIN EN 60079-29-1 „Gas detection instruments – requirements to the operational behavior of instruments for the measurement of combustible gases" and DIN EN 50271 "Electronic instruments for the detection and measurement of combustible gases, toxic gases or oxygen – requirements and testing for warning instruments, that use software and/or digital technology".
Furthermore the G450 was examined on its measurement ability by DEKRA EXAM GmbH on the basis of the standards DIN EN 50104 "Electronic instruments for the detection and measurement of oxygen – requirements to the operational behavior and testing method" and DIN EN 45544-1/-2 "Electronic instruments for the direct detection and direct measurement of the concentration of toxic gases and vapours part 1: common requirements and testing methods" and part 2: requirements to the operational behavior of instruments for the measurement of concentration in threshold ranges". This is approved by the relevant Type Examination Certificate with the number PFG 09 G 001.

The tests of the measuring function contain followed sensors and detection ranges:				
EC-Type Examination Certificate BVS 06 ATEX E 017 X (4. supplement)	MK221-0, MK221-1 for 0..100% LEL CH4, C_3H_8, C_6H_{14}			(CC)
Type Examination Certificate PFG 09 G 001	MK369-0	for	5..500 ppm CO	(EC)
	MK427-0	for	0..25 %-Vol. O_2	(EC)
	MK429-0	for	0,2..100 ppm H_2S	(EC)

The functions being marked with [#] were not subject of the test of the measurement function.

Special conditions for safe use

In explosion endangered areas the G450 must be used properly. This means that the detector must be carried at your body and must not be laid down unattended, to prevent an electrostatic charge of the clip. In case readings in gas-free environments show a permanent zero-point deviation, a zero-point adjustment is necessary. Especially after a heavy impact stress the zero-points of the sensors have to be checked and optionally re-adjusted. In case the CC sensor shows "over-range" after a stress impact, the alarm has to be reset in fresh air and the zero-point has also to be re-adjusted. If the G450 is operated continuously for more than one day, the instrument should be turned off and on again every 24 hours latest. Within the system option menu the deactivation of the latching alarm is not allowed for the use as a function tested measurement instrument.

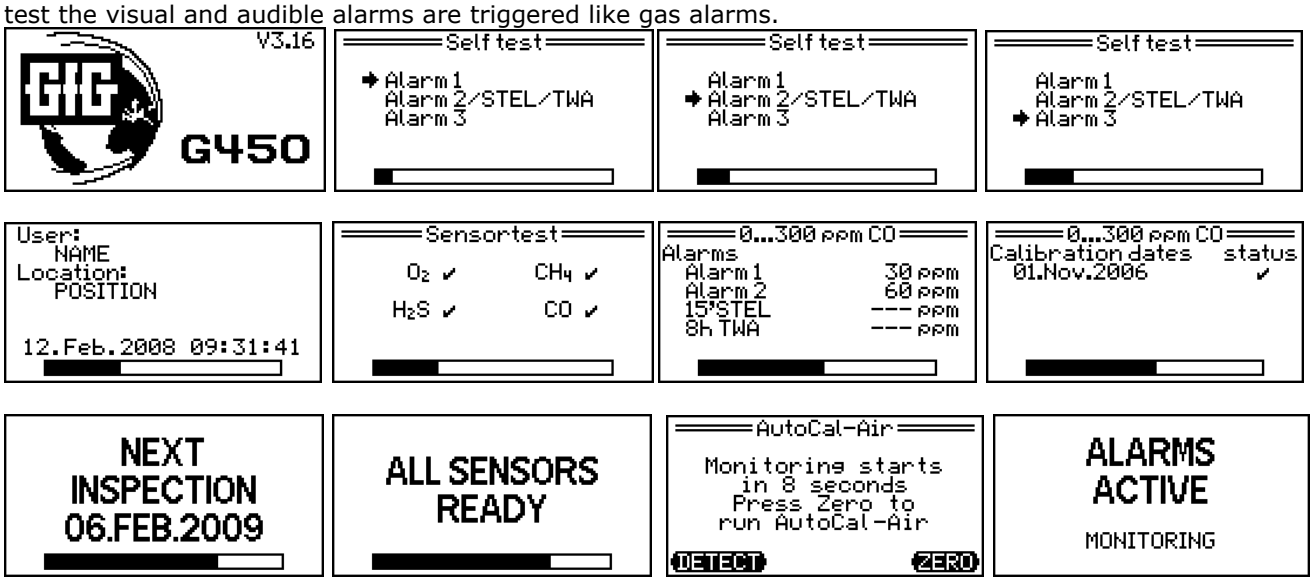
Design

Operational Hints

Switching On and Off

Press the right key shortly to switch the G460 on ◆.
To switch the G460 off, press the right key ◆ for approx. 5 seconds. Release the key when the display reads **SWITCH-OFF 0.**
During charging the standard detection mode is automatically switched off and the charging time is displayed.

After switching on the G450 starts a self-test and displays information about the firmware version, the built-in sensors with detection ranges and alarm thresholds and the date of the next inspection. During the self test the visual and audible alarms are triggered like gas alarms.

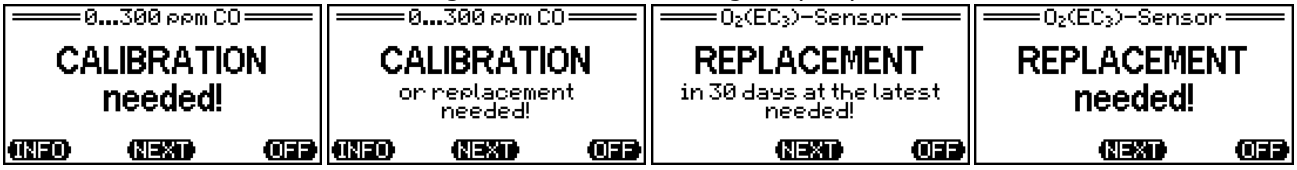


Alarm thresholds and calibration data are displayed for all sensors connected. Only as an example it is only CO which is being described here. Depending on the status of the sensors, the instrument may provide additional messages, which may have to be confirmed. Please refer to "Additional messages during detector start" for further information.

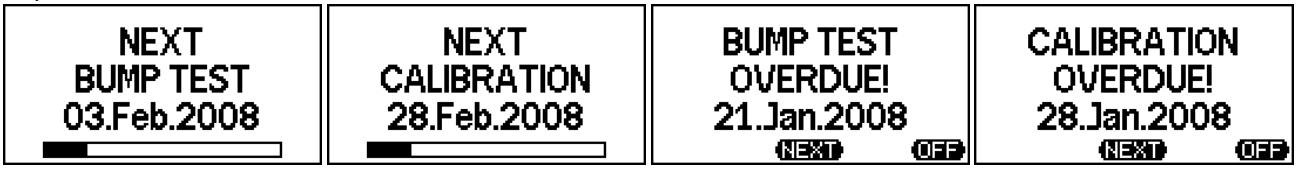
Once the self test is completed, the instrument is ready to use after about one minute. By hitting the middle key readings and messages can be reset.

Additional Messages during Detector Start

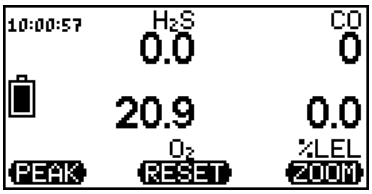
When started, the G450 tests the sensors and supervises their adjustment data. For sensors, which were not adjusted yet or whose adjustment is older than one year, the message "Calibration needed!" is displayed. The reduced adjustment interval of used-up sensors might result in the message "Calibration or replacement is needed!". Exhausted sensors are indicated by the message "Replacement needed!", when the detector is started. These messages must be acknowledged by key.



When a docking station is used for instrument check, the G450 may include intervals for bump test and calibration of sensors. The dates for the next bump test or for the next calibration are calculated automatically on the basis of the last check. Depending on what becomes necessary next, the date for the next bump test or for the next calibration will be indicated, when the detector is started. Should the relevant date be exceeded, the G450 indicates this as „overdue". This message must be acknowledged by key.



Detection mode



The G450 is ready for operation, if all measurement values, the unit, the gas, the battery capacity and the time are displayed.
The detector checks whether the preset thresholds for the individual gases are exceeded or deviated (O_2).

When more than two measurement values are displayed simultaneously, either the gas type or the unit is shown. By hitting the right key (**ZOOM**) measurement values can be displayed individually with gas type and unit.

Battery Capacity and Battery Alarm

The fully charged battery pack or fresh batteries of the G450 have a capacity (depending on sensor combinations) of approx. 14-170 hours of continuous operation (see technical data). The operational time may be reduced by activated alarms. In the top left corner of the display the remaining battery capacity is indicated by a battery symbol. The black area represents the remaining capacity. If the charging status reaches a low level which is shown as a blank battery symbol, the instrument switches to "energy-saving mode". In this mode the green background illumination will not be activated whenever you hit any key. In case of gas alarms also the red display illumination will not be triggered. The alarm will only be shown by the alarm LEDs and with a maximum volume of 90 db(A). If the charging status sinks even further, battery alarm is given acoustically. In this status the battery symbol flashes. The maximum remaining term is displayed every minute. After 15 minutes the instruments automatically shuts off with a clear acoustic signal. The display reads "OFF" for 5 minutes. Selecting the "Anti-Lazy-Battery" within the option menu the instrument does not automatically shut off after 15 minutes but when falling below a minimum voltage.

Alarms

Should the measured gas concentration exceed a pre-set threshold, the detector immediately gives an audible and visual alarm. The display indicates which gas has caused the alarm. An extremely loud acoustic alarm (103 dB(A) at 30 cm) and bright flashing alarm LEDs provide reliable warning for dangerous gas concentrations. In case of a gas alarm the colour of the whole display turns into orange or red depending on the alarm status. The G460 provides up to three alarm modes. The LO-alarm AL1 can be reset, while the HI-alarms AL2 and AL3 are latching (default). There are three alarm levels for oxygen and combustible gases (e.g. CH_4), and two thresholds for toxic gases (CO, H_2S). For toxic gases the G460 provides additional alarms for exceeding of short term exposure level (STEL) and time weighted average (TWA). For further information see "Alarm Thresholds – Standard Setpoints" and "Alarms – Adjusting the Alarm Thresholds". The alarm can also be triggered in combination with a vibration alarm, if the instrument provides a relevant "battery pack with integrated vibrator".

Kind of alarm	Sensors	Number of Alarms	Description
Instantaneous value (AL)	oxygen combust. gases toxic gases	3 3 2	An instantaneous alarm is activated immediately, if the gas concentration exceeds resp. falls below a pre-set threshold. The alarm thresholds are adjustable.
Short term exposure level (STEL)	toxic gases	1	The short term exposure level (STEL) is the average concentration over a period of 15 minutes. The STEL alarm is not latching. It resets automatically as soon as the concentration has fallen below the threshold.
Time weighted average (TWA)	toxic gases	1	The time weighted average (TWA) refers to an 8 hours shift and calculates the average concentration. The TWA alarm cannot be reset. It is only de-activated, if the detector is switched off.

The alarms are prioritized as follows: Power fault, overrange, AL3, TWA > AL2, STEL > AL1, underrange > temperature fault.

Reset of Alarms

The latching (default) alarms 2 and 3 can be reset by pressing the **RESET** key, if the gas concentration has fallen below or exceeded (O_2) the pre-set thresholds. Alarm 1 is not latching and resets automatically, when the alarm condition does not exist any longer. If the detection range of the CC sensor (e.g. CH_4) is exceeded, the display additionally reads „OVER RANGE" instead of the value, for gas concentrations above 110 % LEL. In this case the sensor is deactivated to avoid damage. The alarms and the message "OVER RANGE" remain. This alarm can only be reset by pushing the **RESET** key. Then the display asks:

Only if you made sure **that the sensor is not exposed to combustible gas but to fresh air only, you may answer this question with YES.** In this case the sensor turns on again and indicates gas concentrations after a short warm-up time!

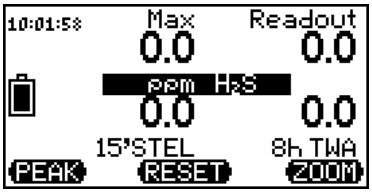
For further details please refer to „Special Notes for LEL Monitoring".

STEL, TWA, Peak, Minimum values

After switching the detector on, measurement is effected continuously in diffusion mode. In this mode, all concentrations are shown in the display. In addition, short term and long-term averages (STEL and TWA) are calculated for toxic gases, and for non-toxic gases peak and minimum values (MAX and MIN) are stored. The stored values can be read from the display, if you turn to the relevant display mode by means of the right key (**ZOOM**, see below).

Flip-Flop Display, Zoom Display

The display can be turned by 180° by pressing the right and the left key simultaneously and then releasing them. This allows easy reading when carrying the detector on the belt.
For activating the zoom display, press the right key (**ZOOM**). Press the key shortly to display one value. Repeated pressing of this key displays the individual measurement values of the individual sensors in zoomed reading one after the other. When a zoomed value is displayed, press **ZOOM** long to change to the following detail reading:

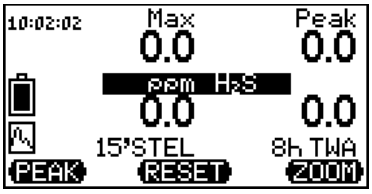


Example of zoom display for H_2S:

Top left: Peak value
Top right: Current gas concentration
Bottom left: STEL value (15 minutes)
Bottom right: TWA value (8 hours)

Pressing **ZOOM** a certain time changes from one to the other zoom modes. After one zoom mode being activated, the display returns back to normal mode after approx. 10 seconds.

Peak – Display peak values



During peak mode (activation by left key **PEAK**) peak values can be monitored and displayed. The display shows an animated symbol in the left bottom corner. Within *zoom display* the peak value will be displayed in the top right corner instead of the actual gas concentration.

Pressing **RESET** during peak mode, the peak memory will be reset to the current gas concentration. Pressing **RESET** during zoom display, the peak memory and the peak value memory will be reset to the current gas concentration. By pressing **PEAK** again, the peak mode is deactivated.

Turn On /Off Lights

The G450 is optionally available with a rechargeable battery pack with lights. The lights can be switched on by keeping the left key pressed for approx. 3 seconds, and turned off by pressing this key shortly. The lights are useful e.g. when the device is linked to a cord and let down into a sewer system. Using the lights can prevent the device from being dipped into water.

Display Illumination

The display illumination is turned on for approx. 10 seconds whenever you hit any key. It turns off automatically after that time. Should the battery or accumulator be almost exhausted, the display illumination cannot be activated any longer.

Storing Measurement Data with the Data Logger

The measurement data can be stored in an integrated data logger within the G450. A special activation of the data storage is not necessary. With the internal data logger about 1800 events for all measurement values and further information can be stored, containing date, time, location, alarms and special events. Within the main menu under "data logger" different functions of the data storage can be set. It provides a selection of the storage of average values, peak values or instantaneous values as well as the storage interval from 1 second to 60 minutes. The default setting of storing is a loop memory. The oldest event will be overwritten when the data loggers is full. The measurement data of the Microtector II can be read on a PC by means of a charging adaptor, a USB-interface and the GfG-Interface software. The configuration of the data logger can be changed with the interface program.

Influence of Oxygen and Interfering Gases

It is to be considered, that the measurement of gas and/or vapour concentrations in the range below 100% LEL cannot be done accurately, if the oxygen concentration at the same time is below 10 %-Vol.. In this case the CC sensor suffers from a lack of oxygen, which is necessary for the "catalytic combustion". If the oxygen sensor detects such a low concentration, the display reads "????" instead of the LEL value. When the oxygen concentration exceeds 10 %-Vol., the LEL value will be displayed correctly again. The EX-approval does not cover the use of the detector in oxygen enriched atmospheres. Certain components, known as „sensor or catalyst poisons", may affect the signal behaviour of the CC sensor. The "sensitivity", i.e. the capability of the sensor to give signals, is reduced. Components of this kind are e.g. sulphuric, lead or silicone compounds.

Special Notes for LEL Monitoring

For LEL monitoring the G450 may use a catalytic combustion (CC) sensor. Due to this principle the G460 cannot distinguish between measurement values in the LEL range and those in the high Vol.-% range (e.g. > 20 Vol.-% CH_4). Concentrations of more than 110 % LEL might also damage this sensor. To prevent such a damage, the sensor is turned off, when gas concentrations of more than 110 % LEL are measured. Only pressing the key **RESET** and confirming the question "Fresh Air?" by means of key **YES** the sensor is turned on again. Oxygen concentrations of less than 10 %-Vol. do not allow the CC sensor to correctly detect combustible gases and vapours. The paragraph „Influence of Oxygen and Interfering Gases" provides additional information.

Service Mode

Press the middle key (**RESET**) for approx. 5 seconds to activate the service mode. In the service mode the G450 can be adjusted by changing of program parameters. Certain menu points require the access code „0011" to prevent accidental change of important functions by unauthorized persons. During the service mode all alarms are deactivated. The main menu is the first menu point in the service mode.

Main Menu

The menu points of the main menu are:

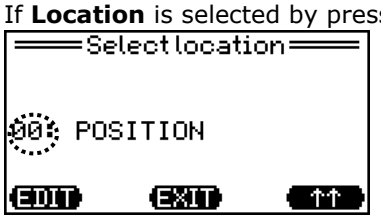
1. **Location** (= Entering a location)
2. **User** (= Entering of identity)
3. **Data logger** (= Adjustment of data logger functions)
4. **Signal** (= Setting of confidence bleep intervals)
5. **Service** (= Starting the service menu)
6. **AutoCal** (= AutoCal adjustment with fresh air or with test gas)
7. **Options** (= Anti-Lazy-Battery, contrast, alarm volume)

Menu control: The functions of the keys are explained in bold letters in the bottom line of the display.

Left key (↓↓) = Scroll down
Middle key (**SELECT**) = Selection of marked menu point
Right key (**DETECT**) = Back to detection mode

Location – Entering a location

From a deposited table one location out of hundred possible locations can be selected. The first two digits stand for the number of the table entry. Except of the table entry "00" all other 99 entries can only be edited by means of a PC. Within the table entry "00" up to 15 letters / figures can be entered, which will be stored as "**Location**" on the G450.
If **Location** is selected by pressing the middle key (**SELECT**), the following reading is displayed:



During location selection a consecutive number is determined first:

EDIT = Confirming of consecutive number
EXIT = Back to main menu
↑↑ = Changing of consecutive number

After confirming the running number by pressing the left key **"EDIT"**, the location entry will follow:

The function of the keys is as follows:

ABC↓↓ = Change of symbol – moving forward in alphabetical order
<<>> = Enters the blinking letter or figure and moves the cursor to the right
012↑↑ = Change of symbol – moving back in alphabetical order

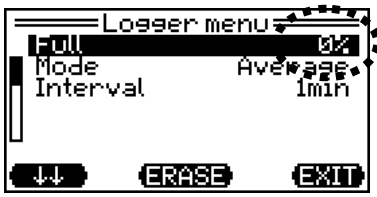
User - Entering user name

From a deposited table one out of ten possible entries can be selected. The first two digits stand for the number of the table entry. Except of the table entry "00" all other 9 entries can only be edited by means of a PC. Within the table entry "00" up to 15 letters / figures can be entered, which will be stored as "**IDENTIFICATION**" on the G460. Entry is completed automatically, when the cursor reaches the end mark "**>**". Entering the user name (ID) is done in the same way as entering the location.

Data logger settings

Within the menu point **"Data logger"** different settings can be effected:

Full - Deleting data from data logger
Mode - Selection of instantaneous, average or peak value
Interval - Interval of data recording (adjustable from 1 second to 60 minutes)

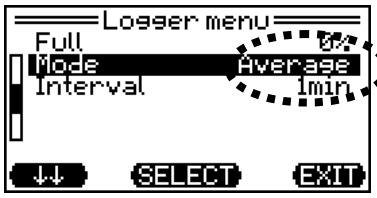


Parameter **Full** shows the occupancy of the data logger.

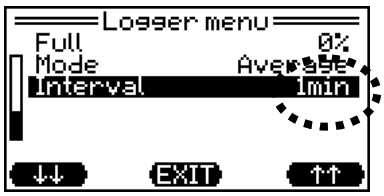
↓↓ = Scroll down to next parameter

ERASE = Deletes data. A security check is effected
"Delete data?" Confirm with the right key **YES**,
resp. deny with the left key **NO**.

EXIT = Back to main menu



If parameter **Mode** was selected with **SELECT**, instantaneous value, average value or peak value (PEAK) can be chosen.
Press **EXIT** to return to the recorder menu. The selected mode will be kept.

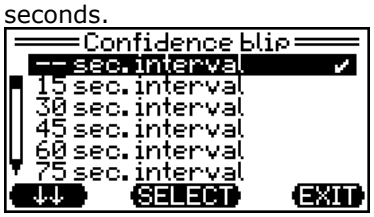


Interval:
The data recording interval can be selected by ↓↓ and ↑↑ between 1 second and 60 minutes.

The recorded data can be read and transmitted to a PC by means of the drop-in charger or the smart charger cap and an optional USB adapter cable.

Signal – Entering confidence bleep

Within the menu point **"Signal"** the interval for releasing the confidence bleep can be chosen in which the G450 triggers a confidence bleep during activated alarm monitoring. Default setting of the interval is 60 seconds.



The confidence bleep can be set in intervals of 15 to 90 seconds or be deactivated (enter "--").

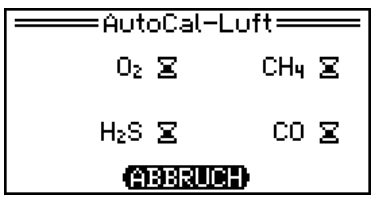
SELECT↑ = Selection
EXIT = Confirm interval and back to main menu
↓↓ = Scroll down

AutoCal – AutoCal-Adjustment

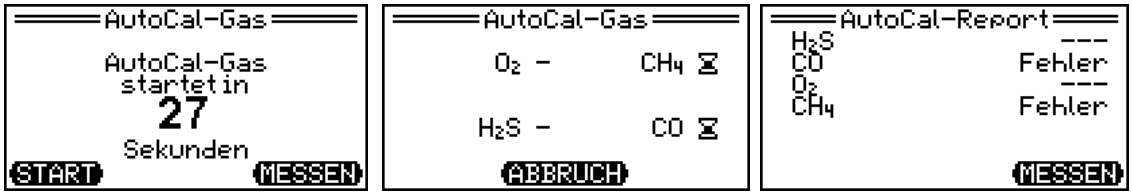
Within the menu point AutoCal, several sensors can be calibrated simultaneously with fresh air (ZERO) or test gas (CAL). Normally all sensors except of the CO_2 sensor can be set with fresh air without any further adjustment. For adjustments with test gas the sensors have to be activated according to the test gas / mixture being used (s. chapter "AutoCal Air …" and "AutoCal Gas …". The menu point AutoCal can be selected within the main menu, but s also activated automatically, when the "Smart Cap" or the "Smart Charger Cap" is mounted.

The following functions can be chosen:

ZERO = AutoCal with fresh air
CAL = AutoCal with test gas
EXIT = Back to main menu



AutoCal adjustment with fresh air successful



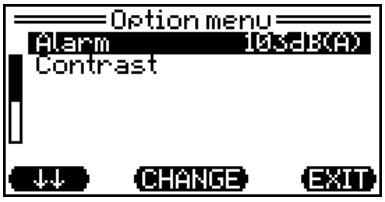
AutoCal adjustment with test gas mixture not successful (e.g. due to wrong test gas concentration)

An AutoCal adjustment with fresh air is only successful, if the measured value does not differ by more than ±10% full scale from the nominal value 0.0 resp. not more than ±5.2 %-Vol. O_2 from the nominal value 20.9 %-Vol. O_2. A successful AutoCal adjustment with test gas is only completed, if the measured value does not differ by more than 25% from the nominal "CalGas" value (see sensor menu "Calibration"). In case of higher deviations the related sensor is marked with "Fault" in the subsequent AutoCal-report. In this case an adjustment with "ZERO" resp. "CAL" or in the docking station is necessary. The adjustment with gas-free fresh air can be done in diffusion mode. Zero gas (gas-free air) and test gas can be supplied with a volume flow of 0.5 to 0.6 l/min by means of the "Smart Cap" or the "Smart Charger Cap".

Options – Anti-Lazy-Battery, alarm volume, contrast

Menu point "Options" allows the following settings:

- When "**Anti-Lazy-Battery**" is activated the level for the automatic shut down due to a nearly discharged battery pack is reduced, i.e. the discharging time of the battery pack is extended. This setting is only active until the instrument is turned off.
- The buzzer volume can be changed to: 103dB(A), 90dB(A) or 0dB(A). For safety reasons, adjustment to 0dB(A) is only possible after entering a service code. During operation a 0dB-symbol is shown in the top left corner of the display. In this case all acoustic signals (gas alarm, fault, battery alarm and confidence bleep) are deactivated, so the user has to check the display permanently for possible hazards.
- The display contrast can be changed from 1 = very low up to 15 = very high).



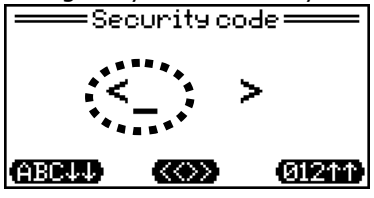
↓↓ = scroll down
CHANGE = Change selected parameter
EXIT = Back to main menu

Tolerance band on/off

In standard detection mode the G450 suppresses small fluctuations around the zeropoints of sensors for toxic and combustible gases. For the oxygen measurement small fluctuations around 20.9 %-Vol. O_2 (fresh air) will be suppressed. The displayed value is kept at 0 until the gas concentration will have reached 200 % of the tolerance band value. This tolerance band is a default setting but can be deactivated: When going to service mode, enter <**REAL**> for deactivation or <**BAND**> for activation of the tolerance band instead of the normal access code. For more details about the tolerance band values see chapter "Sensor Types and Detection Ranges".

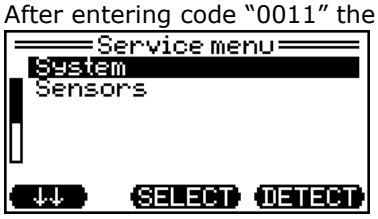
Service menu

Enter the service menu by selecting **"Service"**. Within the service menu the G450 can be adjusted by changing program parameters.
The menu points are only accessible with the code „0011". The code prevents important functions being changed by mistake or by unauthorised persons. In service mode no alarms can be released.



ABC↓↓ = one letter ahead
<<>> = confirms letter *(cursor moves automatically to the next digit)*. By holding the key the last entry will be deleted, the cursor moves one position backwards.
012↓↓ = one letter back

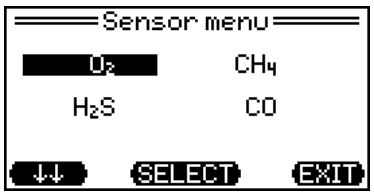
After entering code "0011" the display reads:



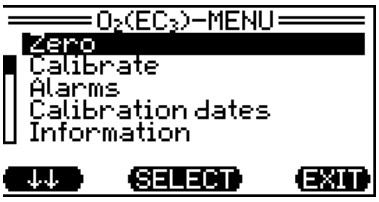
From here you reach the system menu (see section „system menu"), to perform general adjustments. Within the menu point **System** the individual sensors can be zeroed or calibrated. Information can be called up or alarm thresholds can be adjusted.
Select **Sensors** for adjustment of sensor specific functions. With **DETECT** you leave the service menu and return to detection mode

Sensor menu – sensor specific functions

Following functions refer to individual sensors of the G450. In service menu every sensor can be selected individually. The adjustments are only valid for the selected sensor.
For function description of the sensor specific adjustments the CH_4 sensor resp. the O_2 sensor is being mentioned as an example. The adjustment possibilities, however, are valid for all sensors.



↓↓ = move to next sensor
SELECT = Select sensor
EXIT = Back to service menu



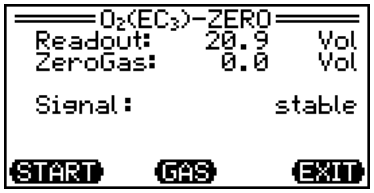
For each sensor following adjustments can be done:

Zero = Zero point adjustment
Calibrate = Sensitivity adjustment
Alarms = Adjustment of alarm thresholds
Calibration dates = Date & status of last calibration and zeroing
Information = Sensor information: MK type, serial number, detection range, temperature range
Gas type and unit = Selection of displayed CH_4-unit (%LEL/%Vol) resp. displayed gas type

↓↓ = move to next menu point
SELECT = Select menu point
EXIT = Back to service menu

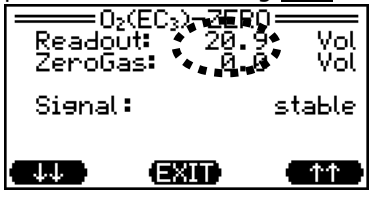
Zeroing – Zero point adjustment

For the adjustment of the zero point the sensors have to be provided with gas within measurement gas free air resp. the oxygen sensor (*1) with 100 %Vol nitrogen. In this case the zero gas can be provided with a flow of 0,5 to 0,6 l/min by using the "Smart Cap" or the "Smart Charger Cap". To adjust the zero point the sensor menu point „ZeroGas" can be selected. The display reads:



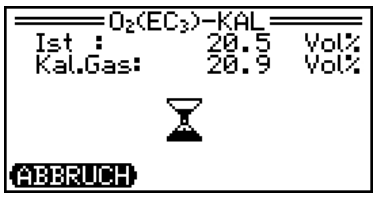
START = Start zero point adjustment
GAS = Enter zero gas concentration
EXIT = Back to „O_2 menu"

Normally zero gas is 0.0, so that this concentration does not need to be changed. In special cases, however, you may push the key GAS to slightly increase the zero gas concentration; please refer to the following picture. After entering GAS the display shows



↓↓ = Decrease zero gas value by one unit
EXIT = Confirm value and back to the „O_2 menu"
↑↑ = Increase zero gas value by one unit

By entering START the zero point adjustment starts:



ABORT = Aborting the adjustment and switching to the CH_4-menu

A constant measurement value being captured after a stabilization time of 10 seconds the adjustment will be executed and acknowledged with "OK". Using CC- and O_2-sensors the stabilization time is longer but restricted to a maximum of 3 minutes.
(*1): The zero point adjustment of the oxygen sensor has factory-made settings of 100%Vol nitrogen. For the detection of usual alarm thresholds of ≥17%Vol O_2 a readjustment done by the operator is not necessary. In this case an adjustment of the sensitivity is sufficient.

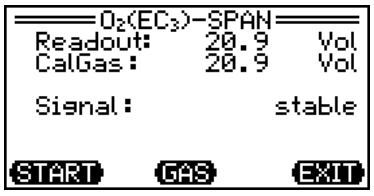
Calibration – Sensitivity calibration

During calibration the gas sensitivity of the sensor is adjusted. Before starting sensitivity calibration, a zero point adjustment has to be effected.
For sensitivity calibration you need a suitable test gas, e.g.:

Detection range	Test gas
TOX	Carbon monoxide (CO), Hydrogen sulphide (H_2S)
OX	Fresh air or test gas with 20.9 Vol% oxygen (O_2) in nitrogen (N_2)
EX	Methane (CH_4), Propane (C_3H_8) or other combustible gases (*2)

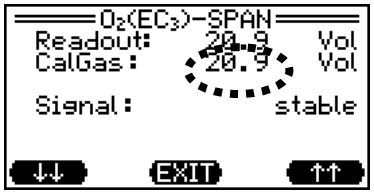
You can see the recommended test gas from the test report of your G450. For sensitivity calibration the test gas concentration should be between 30% and 70% of full scale. The test gas can be supplied with a flow of 0,5 to 0,6 l/min by using the "Smart Cap" or the "Smart Charger Cap".

For adjusting the sensitivity the sensor menu point „Calibration" has to be selected.



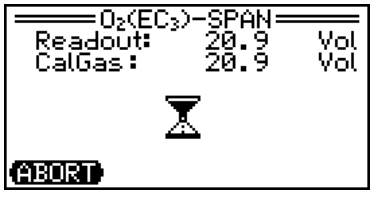
START = Start sensitivity calibration
GAS = Enter test gas concentration
EXIT = Back to „O_2 menu"

After entering "GAS" you can define the test gas concentration in a range of 10 to 105% of the measurement end value:



↓↓ = Decreases calibration gas value by one unit
↑↑ = Increases calibration gas value by one unit
EXIT = Confirms value and goes back to „O_2 menu"

After entering **Start** the sensitivity calibration procedure is started:



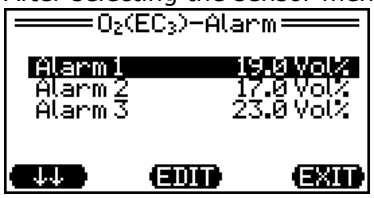
ABORT = Stop calibration and back to "O_2" menu

A constant measurement value being captured after a stabilization time of 25 seconds the adjustment will be executed and acknowledged with "OK". The stabilization time is restricted to a maximum of 3 minutes.
(*2): The sensitivity adjustment of sensors that measure certain combustible gases within LEL-range, e.g. n-Hexane, n-Nonane or other si,milar "heavy" vapours, is not uncomplicated. Apart from the availability of such a test gas it is necessary to notice that the gas supply accompanies with a long stabilization time of

several minutes. Alternatively the sensitivity adjustment can be performed with a comparable gas (e.g. Propane). The CC-sensor MK221-0 can be e.g. with a comparable gas of 0,85%Vol C_3H_8 (Propane) adjusted to 65%LEL n-Hexane. The cross sensitivities for those sensors are described in chapter "Sensor specifications".

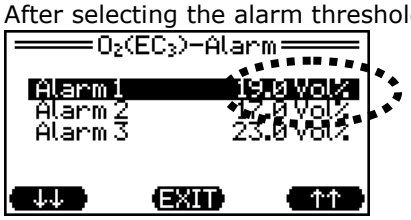
Alarms – Adjusting the alarm thresholds

The G450 provides 3 alarm thresholds for each non-toxic gas (O_2, CH_4). For the toxic gases (H_2S, CO) the G450 provides 2 alarm thresholds. The alarms will be released when the gas concentration exceeds or falls below the threshold. For toxic gases an additional alarm for exceeded long-term (TWA) and short-term (STEL) averages can be released.
After selecting the sensor menu point "**Alarms**" the following reading is displayed (here: selection of O_2):



↓↓ = Scroll down
SELECT = Select menu point
EXIT = Back to sensor menu

After selecting the alarm thresholds (e.g.: Alarm 1) the value can be entered:

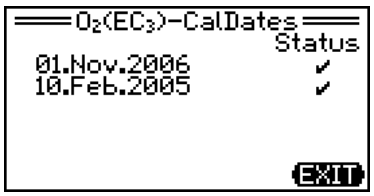


The selected alarm threshold is flashing, the value can be changed now:

↓↓ = decreases alarm value by one unit
EXIT = Back to sensor menu
↑↑ = increases alarm value by one unit

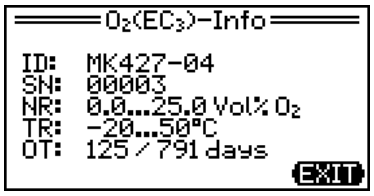
Except of %LEL detection ranges all thresholds can be freely adjusted within the entire detection range or complete deactivated (0 resp. "----"). For %LEL detection ranges thresholds are limited to a maximum of 60%LEL.

Calibration data - Date & status of the last calibration and zeroing



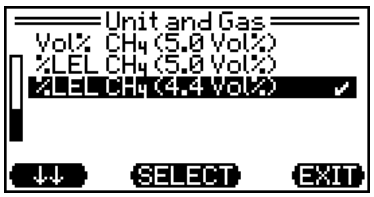
Within the sensor menu point „CalDates" the date of the last sensitivity calibration and if calibration was successful (√)
or not (✗) can be displayed.

Information – Sensor information



In this sensor menu point specific information for the sensor are displayed:
ID = Type of sensor
SN = Serial number
MB = Nominal detection range
TR = Temperature range
OT = Operating time, days running / maximum lifetime ,
e.g. 125 of 791 days

Unit and Gas – Selection of detection range (catalytic combustion only)

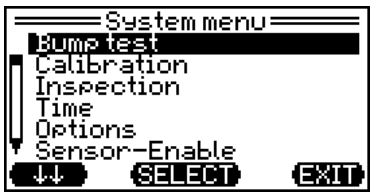


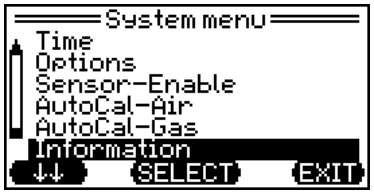
In this menu point you can set the unit for CH_4 to %LEL or %Vol.
The volume concentrations in brackets correspond to full scale deflection.
This allows to set the detection range to the country-specific LEL value.

When unit and gas type being changed the instrument has to be restarted after exiting the service menu. This has to be done before running a bump test or AutoCal adjustment with a docking station.

System menu – General settings

Selecting „System" in the system menu, following reading is displayed:

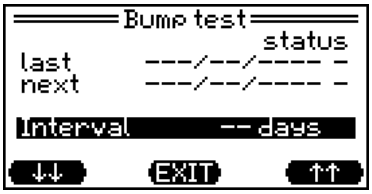




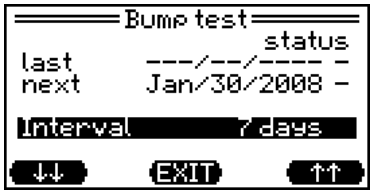
- **Bump test** (status, date of last and next bump test, interval)
- **Calibration** (status, date of last and next calibration, interval)
- **Inspection** (date of next inspection)
- **Time** (date + time)
- **System options** (selection of menu language, vibration alarm on/off, latching alarm on/off, autostore on/off)
- **Sensor selection** (activation resp. de-activation of individual sensors)
- **AutoCal** – air (Adjustment with fresh air)
- **AutoCal** – gas (Adjustment with test gas)
- **Information** (info about detector type, software version, serial number and battery type)

Bump test – Date and Interval

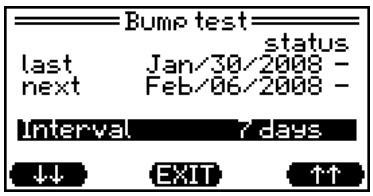
The bump test (check of sensor values and alarms) can be done quick and easy by means of the docking station DS400. The bump test is effected automatically; the intervals can be stored in the Microtector II. The bump test interval is activated by the first bump test in the docking station.



Bump test interval not activated



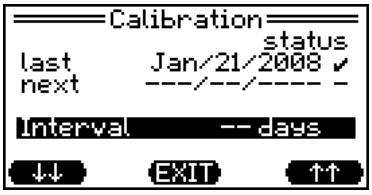
Bump test interval activated
next bump test required immediately



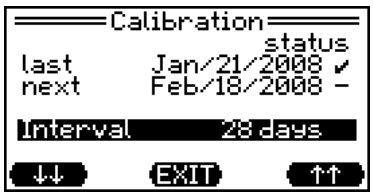
Bump test on January 30 2008 was alright
next bump test required in 7 days

Calibration (ZERO+CAL) – Date and Interval

The fully automatic calibration (zero point and sensitivity adjustment) can be done quick and easy by means of the docking station DS400. The intervals for the calibration are stored in the G450 and activated by the first calibration in the docking station.



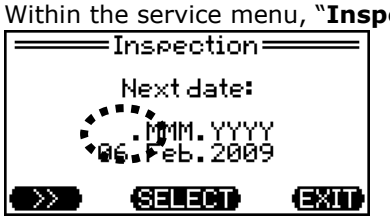
Calibration on January 21 2008 was alright Calibration interval not activated



Calibration on January 21 2008 was alright
Next calibration required in 28 days

Inspection - Date of next inspection

To remind you of the date for the next maintenance resp. inspection, you can enter a date. When it expires, the G450 automatically triggers an alarm. When the entered date is expired, the G450 reports a reminder every time it is switched on.
Within the service menu, "**Inspection**" has to be selected.



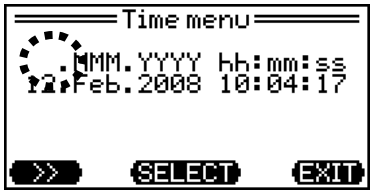
Here the parameter to be changed can be selected (day, month and year).

EXIT = Back to system menu
SELECT = Selects the blinking parameter
>> = moves to next parameter

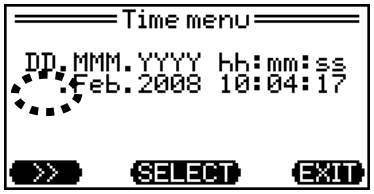
To change a parameter, following options are available:
□□□ = decreases value
EXIT = confirms value
↑↑ = increases value

Time – Date and Time of the Instrument

The instrument provides a clock function for indicating date and time. There is no automatic change from summer- and wintertime. The clock is buffered by a lithium cell providing a lifetime of 20 years.



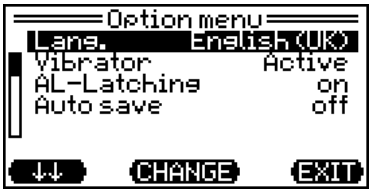
In the time menu the blinking parameter by pressing
SELECT = you select
With **>>** = you move to the next parameter.
With **EXIT** = you go back to system menu.



To change a parameter, following options are available:
↓↓ = Decrease value
EXIT = Confirm value
↑↑ = Increase value

Options – Language, Vibration Alarm, Latching Alarm, Autostore

The system menu point "**System Options**" provides information about the selected language, the status of the vibration alarm, the latching alarm function and the autostore function.



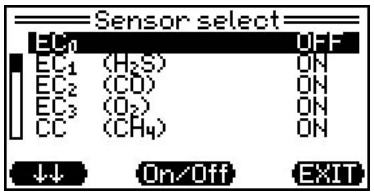
↓↓ = Scroll down
CHANGE = Change language resp. vibration alarm
BACK = Back to service menu

All options can be changed. „**Language**" allows to chose German, English (UK), English (US) and French. Under „**Vibrator**" (only if battery pack with vibrator is available) you can turn the vibration alarm on or off. „**AL-Latching**" determines whether gas alarms 2 and 3 can only be reset by pressing the RESET key or whether these alarms reset automatically when the gas concentration has fallen below the thresholds. The deactivation of self-latching alarms is not allowed for the use of a function tested instrument „**Autostore**" selects whether leaving the service mode saves all changes automatically or whether saving the changes must be confirmed by keystroke.

Sensor selection – Activation /Deactivation

Every sensor can individually be de-activated / activated for each measurement. This function is necessary for applications, in which a gas does not need to be measured or if the G450 is to be upgraded by further sensors or if a sensor is to be taken out and not being replaced.

Indicator being cramped – (ON) or (OFF) – sensor not available. Simulates how possible sensors would react. The display - - - discontinues. Prevails even for menus AutoCal-Air and AutoCal-Gas.

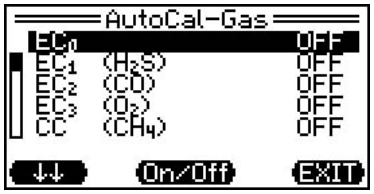


On = Sensor active
Off = Sensor inactive
If the indicator is in brackets, this means that the sensor is not available; it is indicated, however, how an additional sensor would react.
↓↓ = Scroll down to next sensor
On/Off = Activation / Deactivation of sensor
EXIT = Back to service menu

AutoCal-Air – Sensor activation for AutoCal adjustments

Adjustment of which sensors are to be adjusted with fresh air. Generally all sensors will be adjusted and show "ON".
↓↓ = Scroll down to next sensor
On/Off = Calibration / non-calibration of sensor in program
EXIT = Back to service menu

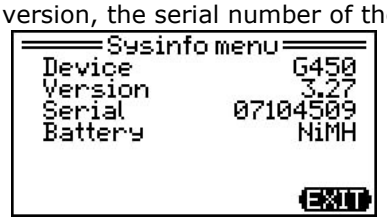
AutoCal-Gas – Sensor activation for AutoCal adjustments



Adjustment of which sensors are to be adjusted with test gas. Generally no sensors will be adjusted with test gas and show "Off".
↓↓ = Scroll down to next sensor
On/Off = Sensitivity calibration / non-calibration of sensor in program
EXIT = Back to service menu

Information – Detector, Software version, Serial Number, Supply Module

Within the system menu point "**Information**" you gain information about the detector type, the software version, the serial number of the detector, and the kind of supply module.



EXIT = Back to service menu

Charging of battery pack

Caution: The detector must not be charged in hazardous locations.
The detector must not be charged when turned on (detection mode).
The charge contacts must be kept clean. (s. chapter "Cleaning")

The rechargeable battery pack in the G450 can be recharged by means of the **drop-in charger (charger tray)**. There are two versions available, one with and one without fixing straps. The version with fixing straps can also be mounted to the wall.

Drop-in charger

The charger tray is being supplied either by a plug-in mains adapter or by a car charging cable. The charger tray limits the charging voltage for the G450 to max. 6V. The charging process is divided into quick and trickle charge mode. The green LED indicates that the charger tray is ready for operation. The yellow LED indicates the charging mode (off: no detector in charger tray, lit permanently: quick charge, flashing: trickle charge).

When the rechargeable battery pack is completely exhausted, it takes approx. 4 – 4,5 hours in quick charge mode. Then the charger tray automatically turns to trickle charge, so it is not possible to overcharge the battery pack. Both charging modes are indicated in the display of the G450. When the charger turns to trickle charge, the battery pack has reached at least 90% of its capacity. To reach 100% capacity, you should allow another 7 hours in trickle charge mode.


Drop-in charger
c/w fixing strap - Charge

With an optional USB adapter cable, the charger tray allows to download the data from the G450 data logger and to transfer them to a PC.

Alternatively the rechargeable battery pack module in the G450 can be charged with the **Smart Charger Cap**. The Smart Charger Cap is to be fixed to the G450 by means of two knurled screws.

The Smart Charger Cap is also supplied by a plug-in mains adapter or by a car charging cable. The Smart Charger Cap limits the charging voltage for the G450 to max. 6V. The charging process and the signals from the green and yellow LEDs are identical to what was described for the charger tray.

The Smart Charger Cap and an optional USB adapter cable also allow to download data from the G450 data logger and to transfer them to a PC.

The Smart Charger Cap also allows to recalibrate the detector (see picture at right). This should not be done, however, during charging.


Smart Charger

To maintain the complete capacity of the battery pack for a long time it is important to notice to charge the battery pack depending on the operational time and frequency. Do not use the drop-in charger as a repository for the instrument lasting for several weeks. The following table shows recommendations for charging the battery packs depending on the frequency:

	Operational frequency	**Charging recommendation**
1.	More than 3h a day	Charge after use
2.	Less than3h a day	Charge every 2. or 3. day
3.	1x a week	Charge 1 day before next use
4.	1x a month; more than 3h	Charge after use as well as 1 day before next use
5.	1x a month; less than 3h	Charge 1 day before next use
6.	1x a quarter or less	Charge after use as well as 2 days before next use

4., 5., 6.: The instrument being used occasionally the battery pack should be charged after each use, due to parts of the sensor electronics have to be provided with energy also in power off mode. In case of instrument not being used for a long time and battery pack completely discharged the instrument has to be charged about 2 days before the next use. Possibly the battery pack will be charged for a short time (e.g. 11min) in the quick charge mode switching to the trickle charge mode afterwards. A normally discharged battery pack will be charged in about 4 to 4,5 hours during quick charge mode to 90% of its normal capacity. After further 8 hours trickle charge the battery pack reaches 100% of its normal capacity. In case of not reaching the normal operational time with a fully charged battery pack a reason for that might be the "Lazy-Battery-Effect". That effect has an impact on the discharging behavior that despite of fully charged battery pack the battery symbol quite early shows an empty status in which the instrument can be operated for a long time.

Lazy-Battery-Effect of the battery pack and its clearance

The NiMH battery pack can reveal problems in the decreased duration of the operational time caused by temperature effects beyond 50°C, by a wrong use of the instrument or by a wrong charging behavior, also called "Lazy-Battery-Effect". That can occur in case of battery pack never discharged completely or battery pack being charged too long. Therefore it should be prevented that charging periods do not start several times a day or being stored in the drop-in charger for several weeks.
The "Lazy-Battery-Effect" can mostly be avoided by discharging the NiMH battery pack completely. For that reason in software version 3.23 the menu item "Anti-Lazy-Battery" was added within the "Main Menu/Options". This function being activated the instrument works as usual. For discharging the battery pack completely do not switch off the instrument manually. By that option the threshold for the automatic switch off will be leveled down once. So the instrument will be kept activated after a 15min battery alarm until the minimum voltage is reached. The battery alarm will be triggered every minute and shows additional operational time with negative minutes in the display. In case of "Lazy-Battery-Effect" is strongly qualified this option should be activated again after charging the battery pack.

Replacement of batteries and rechargeable battery pack module

Caution: The detector must not be opened in hazardous locations and the battery resp. rechargeable module must not be changed.

Turn the detector off before you replace the battery or the rechargeable battery pack module. For replacing the supply module unscrew the two screws at the front of the detector and pull the complete module backwards, or push it through one of the screw holes.

When the alkaline batteries have to be replaced in a battery module, use a thin subject to push the two battery cells out through the PCB holes. Take care of the correct polarity when fitting the new 1.5V AA Alkaline batteries (see battery holder). These batteries have to be purchased from GfG as the manufacturer. Internal controls ensure the use of batteries prescribed by the EC-Type Examination Certificate. The correct battery type is: **DURACELL PROCELL MN1500 LR6 AA**.

The battery module or a new rechargeable battery pack module can now be fit. Fix the new supply module by means of the two screws.

Annex

Cleaning

Polluted enclosures can be cleaned with a damp cloth. Do not use solvents and detergents! It is important to notice that outer charge contacts of the G460 and charge contact pins of the charging adapter will be kept clean. In case of bad contacts of the charging adapter the NiMH battery pack will be charged incompletely or not at all.

Maintenance and inspection

Maintenance and inspection include a regular check and adjustment of sensitivity and zero point. A bump test or adjustment of the device is necessary as well. Gas monitoring devices can react differently on environmental conditions. It is important, independent from maintenance duties, to test the device before putting into operation (s. DIN EN 60079-29-2 chapter 9.2 as well as in Germany see BG-Chemistry, Guideline T 021 and T 023). This test comprises following checks:

- Visual control regarding physical damages
- Visual control regarding gas supply entry holes
- Charging status of battery / rechargeable battery pack
- Display with zero gas and with test gas as well as alarms being triggered

The response behaviour of oxygen sensors can be checked with appropriate test gas (<18 %Vol O_2) in combination with the docking station, calibration cap "Smart Cap" or the charger cap "Smart Charger Cap". The simplest way of checking the response behaviour is by exhaled air.

Service - Repair

The DIN EN 60079-29-2 "… Gasmessgeräte – Auswahl, Installation, Einsatz und Wartung von Geräten für die Messung von brennbaren Gasen und Sauerstoff", the DIN EN 45544-4 „... Elektrische Geräte für die direkte Detektion und direkte Konzentrationsmessung toxischer Gase und Dämpfe, Teil 4: Leitfaden für Auswahl, Installation, Einsatz und Instandhaltung" as well as relevant national guidelines have to be noticed. Service comprises in Germany the "Explosionsschutz-Richtlinien", the „BGR 500, chapter 2.33" (formerly: UVV Gase), the maintenance, inspection and repair of gas monitoring devices. Guidelines T 021 and T 023 of the BG Chemistry describe the proper measures. The bump test has to be executed before first operation and at least once a year and comprises:

- Status of the zero point
- Charging status of the battery
- Pump and diffusion inlet
- Display with zero gas and standard test gas and adjustment, if necessary
- Alarm signal release, e.g. with alarm test gas
- Constantly amplified signal with standard test gas
- Response time

The check must be done by an expert, and the result must be confirmed in writing. Any repair of the G450 must generally be done according to the manufacturer's instructions and with genuine spare parts.

Calibration Accessories

For controlling of the response sensitivity the instrument has to be provides with test gas. By using the "Smart Cap" or the "Smart Charger Cap" the diffusion inlets can be covered, with the result that sensors will be provided with test gas with a flow of 0,5 – 0,6 l/min. Alternatively the check for relevant test gases can take place by using the docking station DS400.

Attention:

Test gases, especially toxic gases, can be hazardous. It is necessary not to inhale test gases. Work places where calibrations with test gas are performed should be ventilated sufficiently depending on the gas type, concentration and amount. In special cases an exhaust resp. a gas drain is functional. The safety lecture written on the gas bottles as well as the safety data sheets of the test gases have to be noticed.

Test with Docking Station DS400

The bump test required by T021 and T023 as well as the adjustment of the Microtector II can be done easily and quickly by means of the docking station DS400.
The bump test is started and effected automatically. The effective time amounts to approx. 20 seconds. Adjustment is started by just pushing one button, and is completed within a few minutes. The test result is indicated by means of a green resp. red LED. Detailed values are shown in the display of the detector (bump test report, AutoCal-Air report, AutoCal-Gas report). You do not need a PC; all relevant data are automatically stored on a SD card in the docking station.
The first bump test of a Microtector II G450 in the docking station can activate the interval for bump test and adjustment automatically. For additional information about the functions of the docking station please refer to the operation manual for the docking station DS400. Before using the docking station DS400 the operation manual has to be read and followed.

Faults, Causes and Remedy

	Fault / Message	**Cause**	**Remedy**
1.	Simultaneous blinking Alarm-LED´s and display	Supply voltage insufficient	Charge resp. replace battery pack
		Hardware- or program sequence fault	Call in GfG-Service
2.	Continuous "Bootloader" with red display illumination	Program memory faulty	Transfer software to the device or call in GfG-Service
3.	"FAULT! RAM"	RAM faulty	Switch device off and on or call in GfG-Service
4.	"FAULT! EEP"	Device parameter memory faulty	
5.	"FAULT! BAT"	Battery voltage measurement faulty	
6.	"FAULT! ALG"	Program sequence fault / Algorithm	
7.	"Clock chip does not work!" "Time set back to …"	Hardware defect	Quit message, set clock or call in GfG-Service
8.	"Time set back to …"	Clock not set or buffer battery empty	Quit message, set clock or call in GfG-Service
9.	"Sensor defect!"	Sensor defect or not available	Switch device off and on or call in GfG-Service
10.	"Data faulty!"	Sensor data faulty	Switch device off and on or call in GfG-Service
11.	"No sensors!"	No sensor activated in service program	Activate available sensor within the service menu
12.	Gas indication "START" ("STRT")	Sensor still in start up phase	Wait some seconds
13.	Gas indication "????"	Measurement wit CC sensor not possible due to oxygen indication <10%Vol	If occurring with fresh air the oxygen sensor has to be adjusted or replaced
14.	Gas indication "----" / "ERROR"	No gas indication due to faulty sensor or sensor data	Deactivate sensor within the service program or call in GfG-Service
15.	Gas indication "UNDER" or "UNDER RANGE"	Massive falling down below detection range	Perform zero point adjustment

16.	Gas indication "OVER" or "OVER RANGE"	Gas concentration too high or high cross sensitivity (EC sensors) or protect switch activated (CC sensors)	Leave the range of high gas concentrations and acknowledge message quitting CC-sensor and switch to fresh air range
17.	Gas indication "TEMP" or "TEMP ERROR"	Sensor operated out of specific temperature range or hardware defect at 0°C<Ta<30°C	Find area of normal temperature or call in GfG-Service
18.	Gas indication "POWER" or "POWER ERROR"	Power supply of sensor is corrupted	Call in GfG-Service if repeated
19.	Gas indication "P+T"	s. gas indication "TEMP" and "POWER"	see above
20.	"Remove charger!"	Alkaline batteries not rechargeable	Demount charger from the instrument
21.	"Remove battery pack!"	Instrument can not be shut down due to hardware defect	Demount battery pack from the instrument or call in GfG-Service
22.	"No sensors for AutoCal-Air (Gas) enabled!"	No sensors for automatic fresh air resp. test gas adjustment enabled	Enable sensors for the automatic adjustment within the service menu
23.	"Zero failure – measurement value too high!" (too low)	Measurement gas possible available but zero point drift too positive (negative)	Perform zero point adjustment within measurement gas free environment or call in GfG-Service
24.	"Calibration failure – measurement value too low!" (too high)	Wrong test gas concentration or sensor sensitivity too low (high)	Check test gas and reference value or call in GfG-Service
25.	"Zero (calibration) failure – signal not discoverable!"	Extreme sensor signal deviation or hardware defect	Repeat process or call in GfG-Service
26.	"Storing failure!"	Parameter can not be saved when leaving service program	Switch instrument on / off, then repeat settings within the service menu or call in GfG-Service

Accessories and spare parts

	Description	Part No.
1.	Alkaline battery pack (without batteries)	1450200
2.	Alkaline battery pack with vibrator (without batteries)	1450202
3.	Alkaline battery (pack of 10)	1450204
4.	Rechargeable NiMH battery pack	1450206
5.	Rechargeable NiMH battery pack with vibrator	1450207
6.	Rechargeable NiMH battery pack with lights	1450208
7.	Rechargeable NiMH battery pack with vibrator and lights	1450209
8.	Smart Charger Cap (charge, calibrate, data transfer)	1450215
9.	Plug-in charger 100-240VAC	1450216
10.	Charging cable for cars	1450218
11.	Drop-in charger G400-DIC1 / Drop-in charger G400-DIC2 [#]	1450219 / 23
12.	Drop-in charger G400-DIC1S / Drop-in charger G400-DIC2S (with strap) [#]	1450220 / 24
13.	Calibration cap "Smart Cap" (calibration)	1450225
14.	Transportation and storing case (plastic) [#]	1450229
15.	USB Interface cable for PC	1450232
16.	Data logger set 1 with GfG-Interface software for Microtector II	1450233
17.	Docking station DS400 with DIC1D / with DIC2D [#]	1450401 /02
18.	MK221-0 Sensor for 100% LEL combustible gases and vapours	1450703
19.	MK221-1 Sensor for 100% LEL combustible gases (with increased intoxication resistance)	1450704
20.	MK369-0 Carbon monoxide sensor CO	1450701
21.	MK380-0 Dual sensor for carbon monoxide CO and hydrogen sulphide H_2S [#]	1450706
22.	MK380-0 Oxygen sensor O_2, (2 years)	1450708
23.	MK427-0 Oxygen sensor O_2, (3 years)	1450707
24.	MK429-0 Hydrogen sulfide H_2S	1450705

The spare parts and the accessories should be stored at ambient temperatures of 0...30°C. Storage time should not be longer than 5 years. Electrochemical sensors should not be stored for more than ½ year. When you store oxygen sensors be aware of the fact that storage reduces the expected lifetime of the sensor. When storing spare sensors, make sure that the ambient atmosphere is free from corrosive media and sensor poisons. For NiMH battery packs a storing time of only one year is valid. Before storing the battery pack has to be charged completely. In case of storing lasts more than ½ year the battery pack has to be demounted.

Hints for a non-polluting disposal of old parts

According to §11 of the general conditions the customer of the instrument is committed for a non-polluting disposal of the instrument and its components according to §§11, 12 of the ElektroG. On request the parts can be adequately disposed by the GfG in Dortmund.

Sensor type and detection range

Slot	Sensor type (ID)	Detection range	Gas	Resolution	T-Band *
EC1	MK 429-0	0 .. 100 (200) ppm	H_2S Hydrogen sulfide	0.2 ppm	±1.0 ppm
EC1	MK 380-0	0 .. 500 ppm 0 .. 100(200) ppm	CO Carbon monoxide H_2S Hydrogen sulfide	1 ppm 0.5 ppm	±3.0 ppm ±1.5 ppm
EC2	MK 369-0	0 .. 500(1000) ppm	CO Carbon monoxide	1 ppm	±3 ppm
EC3	MK 383-0 MK 427-0	0 .. 25 %Vol 0 .. 25 %Vol	O_2 Oxygen O_2 Oxygen	0.1 %Vol 0.1 %Vol	±0.3 %Vol ±0.3 %Vol
PL	MK 221-0	0 .. 100% LEL	CH_4 Methane	0.02 %LEL	±0.14 %LEL
PL	MK 221-1	0 .. 100% LEL	CH_4 Methane	0.5 %LEL	±2.5 %LEL

at (*1): T-Band = Tolerance bandat (*2): or one of the following combustible gases and vapours

MK221-0	CH_4 (Methane), C_3H_8 (Propane), C_4H_{10} (Butane), C_5H_{12} (Pentane), C_6H_{14} (n-Hexane), H_2 (Hydrogen), CH_4O (Methanol), C_2H_2 (Acetylene), C_2H_6O (Ethanol), C_3H_8O (Isopropanol), $C_4H_{10}O$ (n-Butanol), C_3H_6O (Acetone), $C_3H_6O_2$ (Methylacetate), $C_4H_8O_2$ (Ethylacetate), C_4H_8O (Methylethylketone MEK), C_7H_8(Toluene), $C_6H_{12}O$ (Methylisobutylketone MIBK), C_7H_{16}(Heptane), C_9H_{20}(n-Nonane)
MK221-1	CH_4 (Methane), C_3H_8 (Propane), C_4H_{10} (Butane), C_5H_{12} (Pentane), C_6H_{14} (n-Hexane), H_2 (Hydrogen), C_2H_2 (Acetylene), C_2H_4 (Ethylene)

Sensor specification

MK221-0 Catalytic combustion sensor for combustible gases and vapours

Detection range:	0,0 .. 100 %LEL			
Response time:	t_{50}: ≤10 s	t_{90}: <20 s for CH_4	t_{50}: ≤12 s	t_{90}: <30 s
	t_{50}: ≤25 s	t_{90}: <65 s for C_6H_{14}		
Pressure (70)80...110 kPa:	max. ±5(7)% LEL or ±10% of display (referred to 100 kPa)			
Humidity 0%...95% r.h.:	max. ±3% LEL	or ±10% of C_3H_8 display	(referred to 0% r.h. @ 40°C)	
		or ±30% of CH_4 display	(referred to 0% r.h. @ 40°C)	
Temperature -20(-10)...+40(55)°C:	max. ±5% LEL or ±10(15)% of display (referred to 20°C)			
Flow velocity 0 .. 6 m/s:	max. ±1% LEL or ±15% of display @ flow velocity ≥ 1.5 m/s			

Cross sensitivities [#] at 50%LEL:

Gas supply	CH_4 display	C_3H_8 display	n-Hexane display
2,00%Vol H_2	ca.65%LEL	ca.100% LEL	ca.135% LEL (theor.)
2,20%Vol CH_4	= 50% LEL	ca.75% LEL	ca.100% LEL
0,85%Vol C_3H_8	ca.33% LEL	= 50% LEL	ca.65% LEL
0,70%Vol C_5H_{12}	ca.32% LEL	ca.48% LEL	ca.63% LEL
0,70%Vol C_4H_{10}	ca.31% LEL	ca.47% LEL	ca.62% LEL
0,50%Vol C_6H_{14}	ca.27% LEL	ca.38% LEL	= 50% LEL
0,55%Vol C_7H_{16}	ca.22% LEL	ca.32% LEL	ca.41% LEL
0,55%Vol C_8H_{18}	ca.17% LEL	ca.25% LEL	ca.32% LEL

May vary from sensor to sensor and depend on the gas concentration and on the age of the sensor.

Expected lifetime: 3 years in clean air

MK221-1 Catalytic combustion sensor for combustible gases and vapours (with increased poison resistance)

Detection range:	0,0 .. 100 %LEL			
Response time:	t_{50}: ≤10 s	t_{90}: <20 s	for CH_4	
	t_{50}: ≤12 s	t_{90}: <30 s	for C_3H_8	
	t_{50}: ≤40 s	t_{90}: <105 s	for C_6H_{14}	
Pressure (70)80...120(130) kPa:	max. ±5(7)% LEL or ±10% of display (referred to 100 kPa)			
Humidity 0%...95% r.h.:	max. ±3% LEL	or ±10% of C_3H_8 display	(referred to 0% r.h. @ 40°C)	
		or ±20% of CH_4 display	(referred to 0% r.h. @ 40°C)	
Temperature -20(-10)...+40(55)°C:	max. ±5% LEL or ±10(15)% of display (referred to 20°C)			
Flow velocity 0 .. 6 m/s:	max. ±1% LEL or ±20% of display @ flow velocity ≥ 1.5 m/s			

Cross sensitivities [#] at 50%LEL:

Gas supply	CH_4 display	C_3H_8 display	n-Hexane display
2,00%Vol H_2	ca.65%LEL	ca.100% LEL	ca.135% LEL (theor.)
2,20%Vol CH_4	= 50% LEL	ca.75% LEL	ca.100% LEL
0,85%Vol C_3H_8	ca.33% LEL	= 50% LEL	ca.65% LEL
0,70%Vol C_5H_{12}	ca.31% LEL	ca.48% LEL	ca.63% LEL
0,70%Vol C_4H_{10}	ca.30% LEL	ca.47% LEL	ca.62% LEL
0,50%Vol C_6H_{14}	ca.25% LEL	ca.38% LEL	= 50% LEL

May vary from sensor to sensor and depend on the gas concentration and on the age of the sensor.

Expected lifetime: 3 years in clean air

MK369-0 Electrochemical sensor for carbon monoxide CO

Detection range:	5 .. 500 ppm (1000 ppm [#])		Zero point drift ≤ 10 ppm	
Response time:	t_{50}: ≤20 s	t_{90}: <50 s	t_{10}: <50 s (decay time)	

Sensor being exposed too high concentrations beyond upper detection range for several minutes, reckon with massive delays in zero point return in CO free air.

Pressure (70)90...110(130) kPa:	max. ±1 ppm	or ±2(8)% of display	(referred to 100 kPa)
Humidity 5%...95% r.h.:	max. ±1 ppm	or ±2% of display	(referred to 50% r.h. @ 20°C)
Temperature -20...+40(55)°C:	max. ±3(6) ppm or ±5(10)% of display		(referred to 20°C)
Long term stability per month:	max. ±1 ppm or ±1% of display		(referred to laboratory conditions)
Cross sensitivities [#]:	H_2S<±3%; C_2H_4:60%; NO:35%; NO_2<10%; H_2<5%; SO_2:0%; (*1)		
Expected lifetime:	2 .. 3 years		

MK380-0 Electrochemical sensor for carbon monoxide CO and hydrogen sulphide H_2S

Detection range:	0 .. 500 ppm CO and	0 .. 200/200 ppm H_2S	
Response time:	t_{50}: ≤20 s	t_{90}: <50 s	
Pressure 80...120 kPa:	max. ±3 (1) ppm or ±7 (10)% of CO (H_2S) display		(referred to 100 kPa)
Humidity 15%...90% r.h.:	max. ±3 (1) ppm or ±7 (10)% of CO (H_2S) display		(referred to 50 r.h.)
Temperature -20...+50°C:	max. ±3 (1) ppm or ±15 (10)% of CO (H_2S) display		(referred to 20°C)
Cross sensitivities CO display:	H_2S:0...40%; H_2≈20%; SO_2<20%; NO_2<2%; NO<0,3%; Cl_2:0%; (*1)		
Cross sensitivities H_2S display:	CO<2%; NO_2≈-20%; SO_2:8...20%; NO<3%; H_2:0,03%; Cl_2:0%; (*1)		
Expected lifetime:	3 years		

MK383-0 Electrochemical sensor for oxygen O_2 [#1]

Detection range:	0 .. 25 %Vol		
Response time:	t_{20}: ≤6 s	t_{90}: <20 s	
Pressure 80...120 kPa:	max. ±0,2%Vol or ±2,5% of the detection range		(referred to 100kPa)
Humidity 10%...90% r.h.:	max. ±0,2%Vol or ±2,5% of the detection range		(referred to 50 r.h.)
Temperature -20...+55°C:	max. ±0,5%Vol or ±2,5% of the detection range		(referred to 20°C)
Expected lifetime:	2 years in air		

MK427-0 Electrochemical sensor for oxygen O_2	
Detection range:	0 .. 25 %Vol
Response time:	t_{20}: ≤8 s t_{90}: <25 s
Pressure (70)80...120(130) kPa:	max. ±0,4(0,6)%Vol or ±2(3)% of the detection range (referred to 100kPa)
Humidity 0...95% r.h.:	max. ±0,5%Vol or ±2,5% of the detection range (referred to 50 r.h. @40°C)
Temperature (-20)-10...+55°C:	max. ±0,5(0,8)%Vol or ±2,5(4,0)% of the detection range (referred to 20°C)
Expected lifetime:	3 years in air

MK429-0 Electrochemical sensor for hydrogen sulfide H_2S	
Detection range:	0,2 .. 100 ppm (200 ppm [#]) zero point devation < 0,4 ppm
Response time:	T_{50}: ≤15 s t_{90}: <30 s
Pressure 70...130 kPa:	max. ±0,2%Vol or ±5% of the display (referred to 100kPa)
Humidity 5%...95% r.h.:	max. ±0,2%Vol or ±2% of the display (referred to 50 r.h. @20°C)
Temperature -20...+40(55)°C:	max. ±0,2%Vol or ±5(16)% of the display (referred to 20°C)
Long term stability per month:	max. ±0,2%Vol or ±2% of the display (referred to laboratory conditions)
Cross sensitivities	SO_2≈20%; NO_2≈-20%; CO<1%; NO<0,2%; H_2<0,1%; (*1)
Expected lifetime:	3 years

(*1) Displayed value with reference to the supplied gas concentration

Alarm thresholds – Standard setpoints

Standard setting of alarm thresholds for toxic gases without exposition alarm

Detection range	Alarm 1	Alarm 2	STEL	TWA
0...100/200 ppm H_2S	10 ppm	20 ppm	-	-
0...300/500/1000 ppm CO	30 ppm	60 ppm	-	-

Standard setting of alarm thresholds for toxic gases with exposition alarm following to TRGS900

Detection range	Alarm 1	Alarm 2	STEL (15')	TWA (8h)
0…100/200 ppm H_2S	10 ppm	20 ppm	10 ppm	10 ppm
0...300/500/1000 ppm CO	30 ppm	180 ppm	120 ppm	30 ppm

Standard setpoints of alarm thresholds for combustible gases and oxygen

Detection range	Alarm 1	Alarm 2	Alarm 3
0...25.0 Vol% O_2	19.0 Vol% (⇓)	17.0 Vol% (⇓)	23.0 Vol% (⇑)
0...5.0 Vol% CH_4	1.00 Vol%	2.00 Vol%	3.00 Vol%
0...100 %LEL CH_4 *1	20.0 %LEL	40.0 %LEL	100.0 %LEL

zu (*1): oder ein anderes der nachfolgend aufgeführten brennbaren Gase und Dämpfe

LEL-values according to IEC 79-20 resp. data base CHEMSAFE	
4,0Vol.% H_2 (Hydrogen)	5,5Vol.% CH_4O (Methanol)
4,4Vol.% CH_4 (Methane)	3,1Vol.% C_2H_6O (Ethanol)
2,3Vol.% C_2H_2 (Acetylene)	2,5Vol.% C_3H_6O (Acetone)
2,3Vol.% C_2H_4 (Ethylene)	3,2Vol.% $C_3H_6O_2$ (Methylacetate)
2,5Vol.% C_2H_6 (Ethan)	2,7Vol.% $C_3H_6O_2$ (Ethylformiat ETF)
1,7Vol.% C_3H_8 (Propane)	2,0Vol.% C_3H_8O (Isopropyl)
1,4Vol.% C_4H_{10} (Butane)	1,8Vol.% C_4H_8O (Methylethylketon MEK)
1,4Vol.% C_5H_{12} (Pentane)	2,2Vol.% $C_4H_8O_2$ (Ethylacetate)
1,0Vol.% C_6H_{14} (n-Hexane)	1,7Vol.% $C_4H_{10}O$ (n-Butanol)
1,1Vol.% C_7H_{16} (Heptane)	1,2Vol.% $C_6H_{12}O$ (Methylisobutylketon MIBK)

Technical Data

Type:	G450
Detection principle:	Electrochemical (EC): for toxic gases and oxygen Catalytic combustion (CC): for combustible gases and vapours (up to 100 %LEL)
Detection range:	See section „Sensor type and Detection range"
Response time:	See section „Sensor specification"
Expected sensor lifetime:	2...3 years - see section „Sensor specification"
Gas supply:	Diffusion with flow velocity of 0 .. 6 m/s or Pump by means of attachable electrical sampling pump G400-MP1[#]
Display:	Illuminated full-graphic LCD, automatical size adjustment for optimal read out, display of battery capacity, gas concentration as instantaneous and peak value
Alarm:	Depending on gas type 3 or 2 instantaneous and 2 dosimeter alarms, battery alarm. visual and audible warning and display indication, colouring of display depending on alarm status (orange/red) Buzzer: 103 dB (reduceable to 90 dB)
Zero point and sensitivity calibration:	Manually or automatically with calibration program by "Smart Cap" or "Smart Charger Cap" test gas supply with 0.5..0.6 l/min.
Power supply:	1. NiMH battery module (colour: black), 2500Ah, rechargeable Im=600mA (max. charging current) Um=6V DC (max. voltage) or 2. Alkaline battery module (colour: grey), non-rechargeable with 2x mignon 1.5V Type: DURACELL PROCELL MN1500 LR6 AA
Operational time(1)NiMH-II:	approx. 30h (EC+WT_{CH4}); approx. 17h (EC+WT); approx. 130h (EC)
Alkaline:	approx. 25h (EC+WT_{CH4}); approx. 14h (EC+WT); approx. 170h (EC)
Climate conditions:	
for operation:	-20...+55°C | 5...95% r. h. | 700...1300hPa
for storage:	-25...+60°C | 5...95% r. h. | 700...1300hPa (recommended 0...+30°C)
Casing:	
Material:	Rubberized plastic
Dimensions:	75 x 110 x 55 mm (WxHxD)
Weight:	290 g
Protection:	IP 67
Approvals and tests:	
Labelling and ignition protection:	⟨Ex⟩ II2G Ex ia d IIC T4 -20°C≤Ta≤+55°C for NiMH-II (black) Ex ia d IIC T3 -20°C≤Ta≤+55°C for NiMH (black) Ex ia d IIC T4/T3 -20°C≤Ta≤+45°C/+55°C for Alkaline (grey)
EC-Type Examination Certificate:	BVS 06 ATEX E 017 X (for measuring function and electronic Ex-protection see chapter "application and purpose")
Examination Certificate:	PFG 09 G 001 (for measuring function see chapter "application and purpose")
EMC Test:	DIN EN 50270 : 2006 Radio shielding: Type class I Interference resistance: Type class II

(*1): The operational time will be decreased by hitting keys (display illumination and lights) and triggered gas alarms.

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Internet: www.gasdetection.biz

EC-Type Examination Certificate

EXAM
BBG Prüf- und Zertifizier GmbH

Translation

(1) **EC-Type Examination Certificate**

(2) **- Directive 94/9/EC -**
Equipment and protective systems intended for use in potentially explosive atmospheres

(3) **BVS 06 ATEX E 017 X**

(4) **Equipment:** **Gas detector type G 450**

(5) **Manufacturer:** **Gesellschaft für Gerätebau mbH**

(6) **Address:** **44143 Dortmund**

(7) The design and construction of this equipment and any acceptable variation thereto are specified in the schedule to this type examination certificate.

(8) The certification body of EXAM BBG Prüf- und Zertifizier GmbH, notified body no. 0158 in accordance with Article 9 of the Directive 94/9/EC of the European Parliament and the Council of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres, given in Annex II to the Directive.
The examination and test results are recorded in the test and assessment report BVS PP 06.2017 EG.

(9) The Essential Health and Safety Requirements are assured by compliance with:

EN 50014:1997+A1-A2	General requirements	
EN 50018:2000 +A1	Flameproof enclosure	'd'
EN 50020:2002	Intrinsic safety	'i'

(10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

(11) This EC-Type Examination Certificate relates only to the design, examination and tests of the specified equipment in accordance to Directive 94/9/EC.
Further requirements of the Directive apply to the manufacturing process and supply of this equipment. These are not covered by this certificate

(12) The marking of the equipment shall include the following:

II 2G EEx ia d IIC T4/T3

EXAM BBG Prüf- und Zertifizier GmbH
Bochum, dated 17. February 2006

Signed: Dr. Jockers — Certification body

Signed: Dr. Eickhoff — Special services unit

Dinnendahlstrasse 9 44809 Bochum Germany Phone +49 234/3696-105 Fax +49 234/3696-110

EXAM
BBG Prüf- und Zertifizier GmbH

(13) Appendix to

(14) **EC-Type Examination Certificate**

BVS 06 ATEX E 017 X

(15) 15.1 Subject and type

Gas detector type G 450

15.2 Description

The gas detector type G450 is a portable instrument with built-in power supply battery. It is used for detection of gases in ambient air under atmospheric conditions. The measurement values are shown in a built-in display. If the presetted limits are reached, a visual alarm and an audible alarm and optionally a vibrating alarm is produced.

The gas detector type G450 is powered either by a NiMH battery pack, which has to be charged and replaced only outside the hazardous location or by an alkaline battery pack. The alkaline battery pack includes 2 cells (size AA), which have to be replaced only outside the hazardous location. The supply units are coloured marked for differentiation when mounted.

15.3 Parameters

15.3.1 Type of protection and ambient temperature range of the complete device type G450 with different combination of individual components:

	Type of protection	Ambient temperature range
Gas detector with NiMH battery pack (colour: black)	EEx ia d IIC T3	-20 °C ≤ T_a ≤ +55 °C
Gas detector with alkaline battery pack (colour: grey)	EEx ia d IIC T4 EEx ia d IIC T3	-20 °C ≤ T_a ≤ +45 °C -20 °C ≤ T_a ≤ +55 °C

15.3.2 NiMH battery pack:

Nominal voltage		2.4	V
Nominal capacity		2300	mAh
Maximum charging voltage	U_m	DC 6	V

15.3.3 Alkaline battery pack:

Nominal voltage	3	V

The approved Alkaline battery types are listed in the manufacturer instructions from the GfG Gesellschaft für Gerätebau mbH.

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BBG Prüf- und Zertifizier GmbH

(16) Test and assessment report
BVS PP 06.2017 EG as of 17.02.2006

(17) Special conditions for safe use
The measurement function for explosion protection is not the subject of this EC-Type Examination Certificate.

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.

44809 Bochum, 09.03.2006
BVS-Rip/Mi E0340/06

EXAM BBG Prüf- und Zertifizier GmbH

Special services unit

Certification body

Dinnendahlstrasse 9 44809 Bochum Germany Phone +49 234/3696-105 Fax +49 234/3696-110

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Translation

3rd Supplement

(Supplement in accordance with Directive 94/9/EC Annex III number 6)

to the EC-Type Examination Certificate
BVS 06 ATEX E 017 X

Equipment: **Gas detector type G450 and type G460**

Manufacturer: **GfG Gesellschaft für Gerätebau mbH**

Address: **44143 Dortmund, Germany**

Description
The gas detectors type G450 and type G460 can be modified according to the descriptive documents as mentioned in the pertinent test and assessment report

The gas detectors can also be powered by the NiMH battery pack (Ex ia IIC T4). The electrical circuit as well as the inserted sensors were partially modified.

The Essential Health and Safety Requirements of the modified equipment are assured by compliance with:

EN 60079-0:2006	General requirements
EN 60079-1:2004	Flameproof enclosure 'd'
EN 60079-7:2003	Increased safety 'e'
EN 60079-11:2007	Intrinsic safety 'i'

The marking of the equipment shall include the following:

⟨Ex⟩ **II 2G Ex ia d IIC T4/T3** for type G450

⟨Ex⟩ **II 2G Ex ia de IIC T4/T3** for type G460

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3 NiMH and NiMH-II battery pack:

Nominal voltage			2.4	V
Nominal capacity			2500	mAh
Maximum charging voltage	U_m	DC	6	V

4 Alkaline battery pack:

Nominal voltage		3	V

The approved Alkaline battery types are listed in the manufacturer instructions of GfG Gesellschaft für Gerätebau mbH.

Special conditions for safe use

The measurement function for explosion protection is not subject of this EC-Type Examination Certificate.

Test and assessment report

BVS PP 06.2017 EG as of 01.09.2008

DEKRA EXAM GmbH
Bochum, dated 01. September 2008

Signed: Dr. Jockers	Signed: Dr. Eickhoff
Certification body	Special services unit

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.

44809 Bochum, 07.07.2009
BVS-Rip/Ar E 1036/09

DEKRA EXAM GmbH

Certification body	Special services unit

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Parameters

1 Type of protection and ambient temperature range of the complete device **type G450** with different combination of individual components:

	Type of protection	Ambient temperature range
Gas detector with NiMH battery pack (marking Ex ia IIC T3) (colour: black)	Ex ia d IIC T3	-20 °C ≤ T_a ≤ +55 °C
Gas detector with NiMH-II battery pack (marking Ex ia IIC T4) (colour: black)	Ex ia d IIC T4	-20 °C ≤ T_a ≤ +55 °C
Gas detector with Alkaline battery pack (colour: grey)	Ex ia d IIC T4 Ex ia d IIC T3	-20 °C ≤ T_a ≤ +45 °C -20 °C ≤ T_a ≤ +55 °C

2 Type of protection and ambient temperature range of the complete device **type G460** with different combination of individual components:

	Type of protection	Ambient temperature range
Gas detector with NiMH battery pack (marking Ex ia IIC T3) (colour: black)	Ex ia de IIC T3	-20 °C ≤ T_a ≤ +50 °C
Gas detector with NiMH-II battery pack (marking Ex ia IIC T4) (colour: black)	Ex ia de IIC T4	-20 °C ≤ T_a ≤ +50 °C
Gas detector with Alkaline battery pack (colour: grey)	Ex ia de IIC T4 Ex ia de IIC T3	-20 °C ≤ T_a ≤ +45 °C -20 °C ≤ T_a ≤ +50 °C

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Translation

4th Supplement

(Supplement in accordance with Directive 94/9/EC Annex III number 6)

to the EC-Type Examination Certificate
BVS 06 ATEX E 017 X

Equipment: **Gas detectors type G450 and G460**

Manufacturer: **GfG Gesellschaft für Gerätebau mbH**

Address: **D-44143 Dortmund**

Description

The Essential Health and Safety Requirements with respect to the measuring function for explosion protection are assured by application of:

EN 60079-29-1:2007
EN 50271:2001

This supplement to the EC-type examination certificate covers devices with software version 3.31 and infrared-sensors with software version 2.07.

This supplement to the EC-type examination certificate covers the measuring function for methane, propane and n-hexane with the measuring range 0 to 100 % LEL (sensors MK221-0/-1 and MK211-6/-7), for propane with the measuring range 0 to 100 % LEL and n-nonane with concentrations up to 60 % LEL (sensors MK227-5 and MK231-5).

Test report

Test report PFG-no. 41300209P dated 30/11/2009

Special conditions for safe use

- The system option "AL latching" shall be set "on".
- After an extreme impact the zero of the sensors shall be checked and, if necessary, adjusted.
- The indications with zero gas and test gas shall be tested before every use.

DEKRA EXAM GmbH
Bochum, dated 30/11/2009

Signed: Müller
Certification body

Signed: Kiesewetter
Special services unit

Dinnendahlstrasse 9 44809 Bochum Telefon-Phone 0234/3696-105 Telefax-Fax 0234/3696-110 e-mail zs-exam@dekra.com

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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.

44809 Bochum, 30. November 2009
PFG-Kie

DEKRA EXAM GmbH

Certification body

Special services unit

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Annex to

Type Examination Certificate

PFG 09 G 001

Description of the gas detector

The gas detection apparatus type G450 and G460 are portable devices for the measurement of combustible gases and vapours mixed with air, of oxygen and of toxic gases.

Devices type G450 can be equipped with a catalytic combustion sensor for the measurement of combustible gases and vapours, a sensor for the measurement of oxygen and two sensors for the measurement of toxic gases.

Devices type G460 can be equipped with a catalytic combustion sensor for the measurement of combustible gases and vapours, a sensor for the measurement of oxygen, two sensors for the measurement of toxic gases and an infrared sensor for the measurement of of combustible gases and vapours and/or carbon dioxide.

It is not necessary that all sensors are equipped. A rechargeable NiMH-battery pack serves as power supply.

Type of protection

Ⓔx **II 2 G Ex ia d IIC T4/T3 (type G450)**

Ⓔx **II 2 G Ex ia de IIC T4/T3 (type G460)**

Special conditions for safe use

Not applicable

Additional Information

- The measuring function of the device for combustible gases and vapours according to directive 94/9/EC is subject of the 4th supplement to the EC-type examination certificate BVS 06 ATEX E 017 X.
- This type examination certificate includes the following accessories:
  - docking station DS 400 (software version 2.20) (part no. 1450401)
  - Calibration cap "Smart Cap" (part no. 1450225)
  - Smart Charger Cap (part no. 1450215)
  - Drop In Charger G400-DIC1 (part no. 1450219)
  - Drop In Charger G400-DIC2 (part no. 1450223)
- The data logger is not subject of this type examination certificate.

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Translation

Type Examination Certificate

- Gas detectors -

PFG 09 G 001

Equipment: **Gas detectors type G450 and type G460**

Manufacturer: **GfG Gesellschaft für Gerätebau mbH**

Address: **D-44143 Dortmund**

The certification body of DEKRA EXAM GmbH certifies that this equipment has been found to comply with the requirements of the standards or "Berufsgenossenschaftlichen Informationen", respectively,

EN 50104:2002 + A1:2004
EN 45544-1:1999
EN 45544-2:1999
EN 50271:2001
BGI 836 (July 2009)

with regard to the measuring function for oxygen (measurement of oxygen deficiency and enrichment) in the measuring range 0 - 25 %(v/v) (sensors MK381-0/-5 and MK427-0/-5), for hydrogen sulphide in the measuring range 0.2 - 100 ppm (sensors MK429-0/-5) or 0.4 - 100 ppm (sensors MK386-0/-5), for carbon monoxide in the measuring range 2 - 500 ppm (sensors MK344-0/-4) or 5 - 500 ppm (sensors MK369-0/-6 and MK384-0/-5) and for carbon dioxide in the measuring range 0.02 - 5 %(v/v) (sensors MK231-5 and MK224-5).

This type examination certificate covers equipment with software version 3.31 and infrared-sensors with software version 2.07.

On the basis of DIN EN 45011, this certification includes a type examination. The examination and test results and the design of the equipment are recorded in the test report PFG-Nr. 41300209P.

If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the annex to this certificate.

The manufacturer declares the conformity of the manufactured products with the certified design by marking them with the number of this type examination certificate.

DEKRA EXAM GmbH

Bochum, dated 30. November 2009

Signed: Müller
Certification body

Signed: Kiesewetter
Special services unit

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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.

44809 Bochum, 30. November 2009
PFG-Kie

DEKRA EXAM GmbH

Certification body

Special services unit

Dinnendahlstrasse 9 44809 Bochum Telefon-Phone 0234/3696-105 Telefax-Fax 0234/3696-110 e-mail zs-exam@dekra.com

EC- Declaration of Conformity

G450 MICROTECTOR II

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www.gfg.biz

Edited: 03.03.2006 Amended: 10.03.2010

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** -Certificate No. BVS 03 ATEX ZQS / E 187- issued by the notified body, DEKRA EXAM GmbH, 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 ignition protection classes explosion- proof encasing, increased safety, encapsulation and intrinsical safety, as well as their measuring function.

The portable Detector **G450** complies with **directive 94/9/EC** for devices and protective systems for proper use in explosion endangered areas (ATEX directive) and with **council directive 2004/108/EC** for electromagnetic compatibility.

For electrical explosion protection		BVS 06 ATEX E 017 X		
Labelling	⟨Ex⟩ II 2G	Ex ia d IIC T4	-20°C≤Ta≤+55°C	(NiMH-II)
	⟨Ex⟩ II 2G	Ex ia d IIC T3	-20°C≤Ta≤+55°C	(NiMH)
	⟨Ex⟩ II 2G	Ex ia d IIC T4/T3	-20°C≤Ta≤+45°C/+55°C	(Alkaline)
	CE 0158			

The directives have been complied with under consideration of the standards mentioned below:

- **Electrical explosion protection**
  Electrical apparatus for potentially explosive atmospheres.
  - General requirements EN 60079-0
  - Flameproof enclosure „d“ EN 60079-1
  - Intrinsic safety „i“ EN 60079-11

- **Safe and accurate measuring function**
  - Gas detectors- Performance requirements of detectors for flammable gases EN 60079-29-1
  - Electrical apparatus for the detection and measurement of combustible gases, toxic gases or oxygen. Requirements and tests for apparatus using software and/or digital technologies. DIN EN 50271

- **Electromagnetic compatibility**
  - Electrical apparatus for the detection and measurement of combustible gases, toxic gases and oxygen. EN 50270

The evaluation of the basic safety and health requirements has been done, documented and filed by a notified body with register no. 0158 (DEKRA *EXAM* GmbH, Dinnerdahlstraße 9 D-44809 Bochum).
The EMC testing laboratory EM TEST GmbH, Kamen has been charged with testing and evaluation of the electromagnetic compatibility.

Always adhere to the safety notes of the operation manual 205-000.34.

Dortmund, 10.03.2010

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MBA H.J. Hübner
President CEO

ATEX EG-Kon042/H. Siebrecht