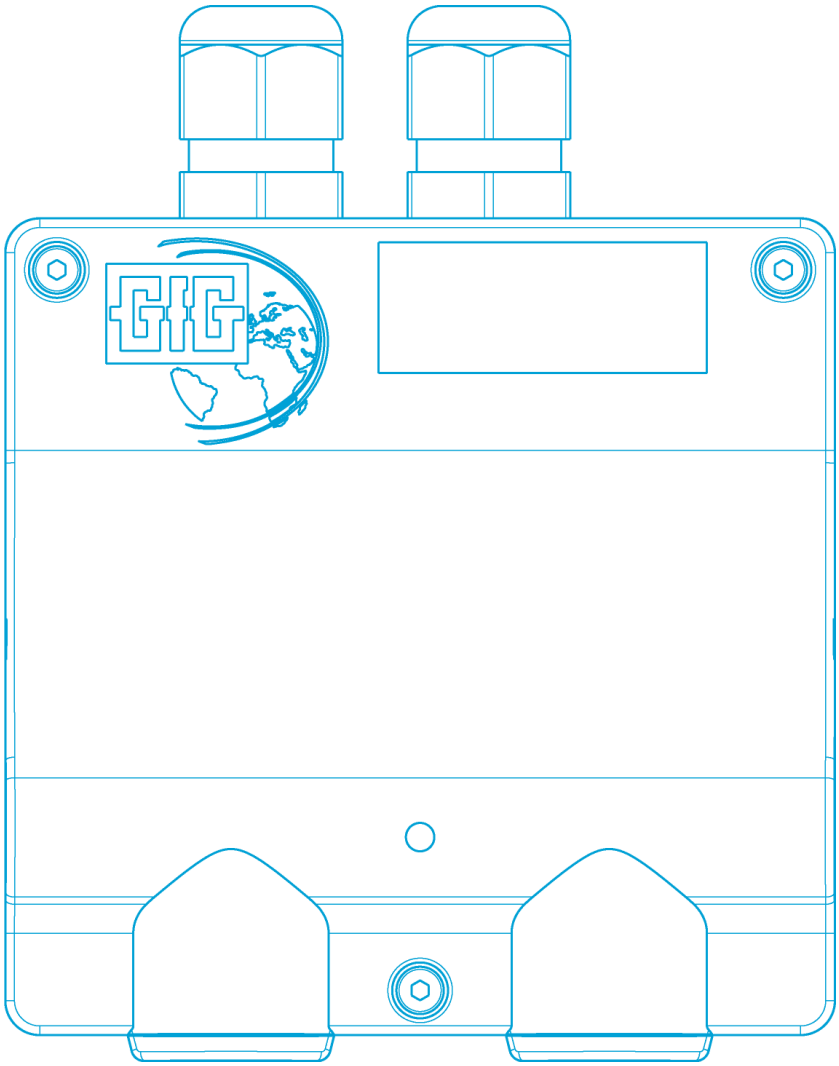
smart GasDetection Technologies

Operation Manual

Transmitter EC22DS



Translation of the original operation manual

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1 INTRODUCTION

1.1 For your Safety

This instruction manual informs you about the intended use of the product in accordance to the German Law of Market Supply (production safety law - "ProdSG"). Its purpose is to ensure the safety and health of people. It must be read and adhered to by every person using, maintaining, servicing and controlling the device. This product can only fulfill its intended purpose if it is used, maintained, serviced and controlled in accordance with GfG - Gesellschaft für Gerätebau's instructions.
Using, maintaining, servicing and controlling the product contrary to these instructions will void the warranty given by GfG. The above does not change the information on warranty and liability stated in GfG's general Terms and Conditions of Purchase and Delivery.

1.2 Operating notes

In accordance with national regulations, all gas warning devices must be tested for functionality by a qualified person after installation but before being put into operation (initial commissioning). In Germany, this is regulated by the "DGUV Information 213-056 (Explanatory leaflet T 021 / previously BGI 836, section 8.1)" and "DGUV Information 213-057 (Explanatory leaflet T 023 / previously BGI 518, section 8.1)".

The transmitter's functionality has been tested before dispatch. Calibration and adjustment were performed using appropriate test or calibration gases.
This does not release you from the obligation of calibrating and (if necessary) adjusting the device after installation.

The EC22DS transmitter is not approved for use in potentially explosive areas.

Caution: The supply voltage must not exceed 30 V DC! This also applies to voltage peaks!

2 GENERAL INFORMATION ON THE TRANSMITTER

2.1 General description

A fixed gas detection system consists of a transmitter and a controller (gas measuring and evaluation unit "GMA", not included in the scope of delivery). The transmitter and the GMA are connected via a cable. The transmitter converts the gas concentration into an electrical measurement signal which it then transmits to the controller for further evaluation. The EC22DS transmitter has a digital RS485 interface. The digital RS485 interface communicates on the basis of the Modbus (RTU) protocol.

The EC22DS transmitter does not have a display to indicate the measured value. Different states of operation are indicated by a three-colored status LED. The green LED signals that the device is ready for operation in normal measuring mode. The yellow LED signals a special condition, such as a fault or service operation. The red LED signals an exceedance of the measuring range in normal measuring mode. An alternating flashing of two colors is used to signal certain circumstances in more detail. Overviews of these signals are found in section 4.4 "Indications and notifications".

The electronics perform many tasks that facilitate operation and maintenance as well as increasing operational safety and measurement accuracy. The transmitter features:

- Compensation of temperature influences
- Permanent status display (measuring mode, fault or special condition) on the transmitter.

2.2 Measurement method

The sensors installed in the EC22DS transmitter are electrochemical sensors. Electrochemical sensors contain an electrolyte, a working electrode (anode), a counter electrode (cathode) and, if necessary, a reference electrode. The setting of the type of measured gas is done by specific electrodes in combination with a suitable electrolyte. With this measuring method, an electrical signal proportional to the gas concentration is generated in the measuring cell. This electrical signal is converted into a digital bus signal by the EC22DS's integrated electronics.

2.3 Transmission behavior

Depending on the type of measured gas, the transmitter's transmission properties are different. The adjustment times may vary depending on the type of measured gas. The displayed gas concentration and the output signal are always proportional to the gas concentration.

2.4 Device overview

The transmitter housing contains the transmitter electronics which register the measuring signal of the gas sensor located in the sensor housing. The electronics convert the measuring signal into a gas concentration which is then signaled via a RS485 bus signal using the Modbus RTU protocol.

3 MOUNTING AND INSTALLATION INSTRUCTIONS

3.1 Mounting location

It is important to know about the environmental conditions in detail and take them into account when choosing a suitable mounting location. Ventilation conditions must be considered to achieve representative measurement results.

The transmitter has to be installed in a way that ensures gases can reach the sensor, even in less favorable ventilation conditions. If necessary, a test, e.g. with smoke generator vials, must be carried out.

Another factor that must be considered when choosing the mounting location is that the transmitter must always be accessible for service and calibration work.

Also consider the following external influences:

- Rainwater, water surges, dripping water, condensate
- the dust concentration in the ambient air

The transmitter is generally protected against the ingress of water and dust. In very harsh conditions, the transmitter can be protected from damages with accessories that were specifically designed for this purpose. GfG will gladly inform you about suitable measures.

If the sensor is exposed to environmental conditions that have not been made known to GfG at the time of planning or delivery, the warranty may be voided.

3.2 Mounting

When choosing the mounting location, consider that the transmitter must always be accessible for service and calibration work. The transmitter must be mounted vertically, with the sensor pointing down.
The transmitter must be connected to the controller according to the connection diagram (*see connections and terminal assignment*). To mount the transmitter, loosen the three Allen screws and remove the housing cover. The housing is attached with three screws. The housing contains the printed circuit board. The connection terminals used to connect the transmitter to the controller are located in the upper area of the printed circuit board.

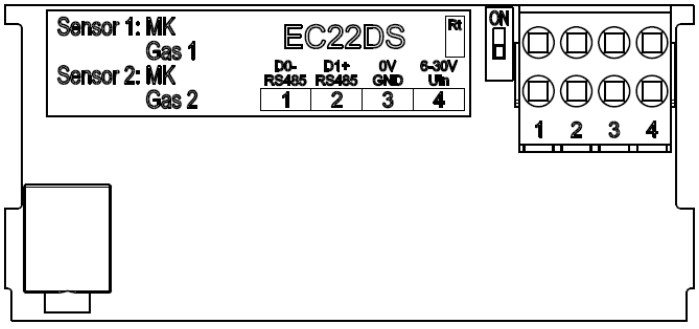
3.3 Installing electrical connections

Only trained specialists may lay the cables and carry out the connection of the electrical installation. They must comply with the relevant regulations. The wire cross-section depends on the length of the connecting cable. It must be checked in each individual situation whether the operating voltage of the bus version is sufficient to supply even the last transmitters on the transmitter bus. If necessary, the power supply must be upgraded by an additional voltage source. The housing cover must be closed and screwed back on after the installation process. The length of the cable should not exceed 1000m.

Connection diagram:

Terminals for cable connections
1: RS485 D0– (Data–)
2: RS485 D1+ (Data+)
3: GND 0V
4: Uin 6-30VDC (24VDC)

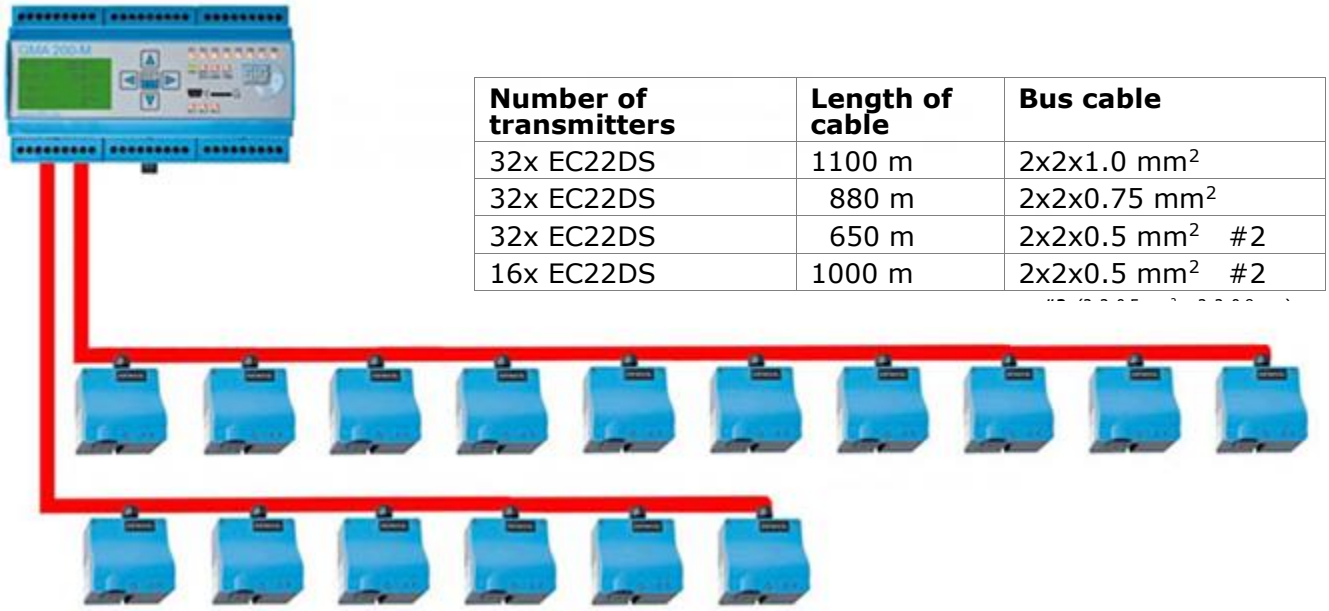
Slide switch S1 (Rt)
Terminating resistor for RS485
(Factory setting = OFF)



For digital data transmission via RS485, the bus cabling depends on several factors. This includes the bus's structure (string or ring), the number of transmitters on the bus, the distance of each transmitter to the GMA, the transmitter type / version, the sensor type and, of course, the bus

cable type. The length of the cable should not exceed 1200 m.

The following example shows the maximum cable lengths for the installation of either 32 or 16 EC22DS with a 10 m spacing at the end of the bus cable harness.



Number of transmitters	Length of cable	Bus cable
32x EC22DS	1100 m	2x2x1.0 mm^2
32x EC22DS	880 m	2x2x0.75 mm^2
32x EC22DS	650 m	2x2x0.5 mm^2 #2
16x EC22DS	1000 m	2x2x0.5 mm^2 #2

4 Operating notes

4.1 Commissioning

The EC22DS transmitter's functionality and display are tested before dispatch. Calibration and adjustment are performed using appropriate test or calibration gases. But deviations may occur due to transport, mounting and environmental factors.
This is why the gas detection system must be commissioned by a trained person.

After activating the transmitter, it may need a few minutes to:

- perform the self-test, during which the program memory and RAM are checked
- read and evaluate the device's parameters, including a simultaneous memory check
- read and evaluate the sensor's parameters, including a simultaneous memory check
- stabilize the sensor

Memory tests are performed during the first few seconds of the starting phase.

The EC22DS's status LED will indicate the starting phase by alternatively flashing green and yellow. If the device encounters an error in the starting phase, it will switch to fault mode. This is indicated by the status LED alternatively flashing yellow and red (see section 4.4.2 "Indication of special conditions (Commissioning and errors)".)

After finishing the starting phase and stabilizing the sensor, the transmitter automatically switches to measuring mode.

Note:
After the sensor has been stabilized, the commissioning of the transmitter requires a check and, if necessary, an adjustment of the zero point (ZERO) and subsequently the sensitivity (SPAN).

4.2 Measuring mode

Under normal, fault-free operating conditions, the status LED will permanently be lit up green. The functionality of the electronics is monitored by continuous tests of the sensor, processor and memory. Gas concentration is measured continuously and updated by the second.

4.2.1 Measurements exceeding the measuring range

If the measuring range is exceeded in the range of 100 % to 112 %, the status LED will indicate this by alternatively flashing green and red. During this, the green LED will be lit for four seconds and then be interrupted for one second by the red LED.

If the measuring range is exceeded beyond 112 %, the status LED will also indicate this by alternatively flashing green and red. In this case, however, the green LED will only be lit for one second before being interrupted for four seconds by the red LED.

4.2.2 Measurements falling below the measuring range

If the measured values fall short of the measuring range within the range of 0 % and -5 %, the status LED will not indicate this. It will continue to glow green, just like in normal operation.

If the measured values fall short of the measuring range within the range of -5 % to -7.5 %, the status LED will indicate this by alternatively flashing green and yellow. During this, the green LED will be lit for four seconds and then be interrupted for one second by the yellow LED.

If the measured value falls short of the measuring range by more than -7.5 %, the status LED will also indicate this by alternatively flashing green and yellow. In this case, however, the green LED will only be lit for one second before being interrupted for four seconds by the yellow LED. The evaluation unit (e.g. the controller) will then be alerted to the error of the transmitter via the RS485 bus outlet.

4.2.3 Sensor life

Electrochemical sensor have a limited service life. The expected service life of the transmitters used in the EC22DS depends on the sensor type and operating conditions, but can exceed three years. When the limit of the expected service life is reached, the transmitter will use the status LED to signal that the sensor should be replaced during the next planned maintenance. The LED, which is permanently lit green during normal operation, will be interrupted by a short yellow pulse every five seconds. This influences neither the measurement nor the remaining service life of the sensor.

4.2.4 LED test

An LED test is performed automatically upon starting the transmitter or activating the magnetic switch. During this test, all colors of the status LED will consecutively be checked.

4.3 Calibration and adjustment

4.3.1 Zero point calibration

When calibrating (checking) or adjusting (setting) the zero point, the selection of zero gas works differently for oxygen sensors than for any other sensors.

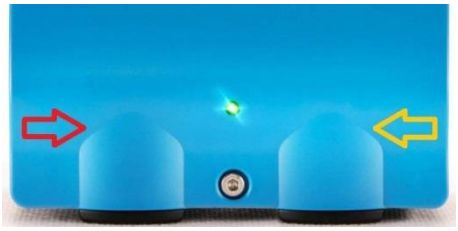
- Oxygen sensors can only be calibrated and adjusted with 100 vol % N_2.
- For other electrochemical sensors, fresh air (without disruptive gas components) or synthetic air (when in aggressive atmospheres) can be used.

<u>Calibration (check):</u>
Attach a calibration adapter to the appropriate diffusion opening of the transmitter housing. Using the calibration adapter, the zero gas can then be supplied to the sensor without pressure at a flow rate of approx. 0.5 $^{l}/_{min.}$ Since the transmitter itself does not have a display, the measured value can only be read at the display of the evaluation device. If the measured value deviates from zero, the transmitter should be adjusted. This can be done in two ways, as explained below.

<u>Adjusting the zero point:</u>
The zero point can be adjusted in different ways. These are explained below.

4.3.2 Zero point adjustment with the AutoCal Magnetic Contact [ZERO]

The easiest way of performing the zero point adjustment is to use the left or right AutoCal Magnetic Contact corresponding to the sensor. To activate the corresponding contact, a suitable magnet must be held against the either of the parts of the transmitter's cover that are labeled with the red and yellow arrows. The contact must be engaged for at least five seconds to activate the adjustment.



During this 1st phase (0. - 5. sec.), the status LED will be flashing green with 1Hz and is lit 50 % of the time. If the contact is released within the 1st phase (which is too soon), no adjustment is performed and the transmitter continues operating as before.

After the first five seconds, the 1Hz flashing will change to very short (10 %) bouts of lighting up the green LED for another five seconds. To start the zero point adjustment, the contact must be released in the 2nd phase (5. - 10. sec.). The adjustment process is then indicated by the status LED flashing yellow. If the measured value stays constant during a defined time period, the new zero point is set and the measured value is set to 0ppm. A successful adjustment is indicated by the green LED flashing rapidly - a failed adjustment on the other hand with the yellow LED flashing rapidly. The adjustment process is then completed automatically.

If the contact was engaged for more than 10 seconds, the AutoCal sensitivity adjustment could be started during the 3rd phase (10.-15. sec.), but it would fail as there is no test gas available. If the contact was engaged for more than 15 seconds, no adjustment would be performed and the transmitter would continue operating as before.

4.3.3 Zero point adjustment with the GfG app via IrDA interface

To perform the zero point adjustment, you will need an android smartphone with the GfG app, a TRM22-IrDA interface and a corresponding USB cable.

When the data connection is established, the current measured gas value is displayed in the app under "Gas value - Act:"

The zero point adjustment can be started with the **ZERO** button, if the measured gas value is not more than 10 % of the measurement range. The zero gas concentration will always be 0ppm.

"Messages:" will give you information on the progress of the adjustment process, any problems or the successful completion of the adjustment.

If the measured value stays constant during a defined time period, the new zero point is set and the measured value is set to 0ppm.

4.3.4 Sensitivity adjustment

Depending on the type of test gas used, special behavior guidelines apply when working with toxic gases. More information on this can be found on the corresponding data sheets.

To calibrate (check) or adjust the gas sensitivity, attach a calibration adapter to the appropriate diffusion opening of the transmitter housing. Using the calibration adapter, the test or calibration gas (fresh or synthetic air for oxygen sensors) can then be supplied to the sensor without pressure at a flow rate of approx. 0.5 $^{l}/_{min.}$.

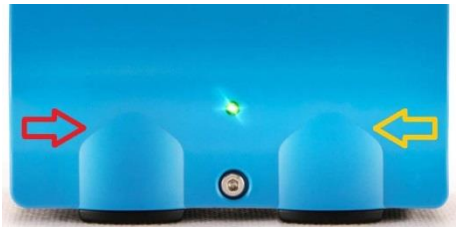
Since the transmitter itself does not have a display, the measured value can only be read at the display of the evaluation device. If the measured value deviates from the test gas concentration, a sensitivity calibration should be performed.

<u>Adjusting the measured gas value:</u>

Before every sensitivity adjustment, the zero point should be checked and, if necessary, readjusted. The sensitivity can be adjusted in different ways. These are explained below.

4.3.5 Sensitivity adjustment with the AutoCal Magnetic Contact [SPAN]

If the test gas concentrations set in the transmitter is known and a test gas with this concentration is available, the easiest way of adjusting the sensitivity is to use the left or right AutoCal Magnet Contacts. To activate the corresponding contact, a suitable magnet must be held against the either of the parts of the transmitter's cover that are labeled with the red and yellow arrows. The contact must be engaged for at least five seconds to activate the adjustment.



During this 1st phase (0. - 5. sec.), the status LED will be flashing green with 1Hz and be lit 50 % of the time. If the contact is released within the 1st phase, no adjustment is performed and the transmitter continues operating as before.

After the 1st phase, the 1Hz flashing will change to very short (10 %) bouts of lighting up the green LED for another five seconds. If the contact was released during this phase, it would start the zero point adjustment.

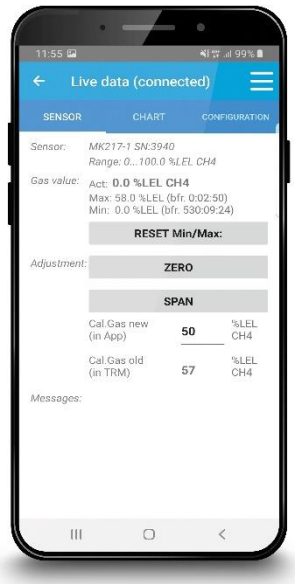
To start the sensitivity adjustment however, the contact must be released during the 3rd phase (10. - 15. sec.). During this phase, the 1Hz flashing of the green LED will be considerably longer (90 %). The adjustment process is then indicated by the status LED flashing yellow. If the measured value stays constant during a defined time period, the sensitivity is adjusted. The measured value will then reflect the set test gas concentration. A successful adjustment is indicated by the green LED flashing rapidly - a failed adjustment on the other hand with the yellow LED flashing rapidly. The test gas must now be removed. The adjustment process is then completed automatically.

If the contact is engaged for more than 15 seconds, no adjustment is performed and the transmitter continues operating as before.

4.3.6 Sensitivity adjustment with the GfG app via IrDA interface

To perform the sensitivity adjustment, you will need an android smartphone with the GfG app, a TRM22-IrDA interface and a corresponding USB cable.

When the data connection is established, the current measured gas value is displayed in the app under "Gas value - Act:"



The test gas concentration set in the app is displayed under "Cal. gas new (in app)". This is also where the test gas concentration can be adjusted. "Cal. Gas old (in TRM)" will display the test gas concentration that was used for the last sensitivity adjustment.

The sensitivity adjustment can now be started via the **SPAN** button. The test gas now has to be brought to the sensor.

If the measured gas value is at least 7 % of the measuring range and a stable measuring value has been recorded over a defined period of time, the sensitivity is then adjusted and the new measured value is displayed.

"Messages:" will give you information on the progress of the adjustment process, any problems or the successful completion of the adjustment.

4.4 Indications and notifications

4.4.1 Overview of all status LED states

The following table will give you an overview of the status LED's different states and their meanings.

green LED	yellow LED	red LED	Description see section...
off	ON for 3 s	off	Indication of special conditions... No.001
off	off	ON for 0.5 s	Indication of special conditions... No.002
flashing with 1Hz	flashing with 1Hz	off	Indication of special conditions... No.003, 004
1 pulse every 5 s	ON	off	Indication of special conditions... No.101
off	ON	1-5 pulses every 5 s	Indication of special conditions... No.102...111
flashing with 1Hz	off	off	Indications in service mode... No.201...203
off	flashing with 1Hz	off	Indications in service mode... No.204, 205
flashing with 10Hz	off	off	Indications in service mode... No.206
off	flashing with 10Hz	off	Indications in service mode... No.207
ON for 1 s	off	ON for 4 s	Indications in measuring mode... No.301, 302
ON for 4 s	off	ON for 1 s	Indications in measuring mode... No.303
ON	off	off	Indications in measuring mode... No.304...305
ON for 4 s	ON for 1 s	off	Indications in measuring mode... No.306
ON for 1 s	ON for 4 s	off	Indications in measuring mode... No.307, 308
ON	1 pulse every 5 s	off	Indications in measuring mode... No.309

4.4.2 Indication of special conditions (Commissioning and errors)

The following table describes all conditions indicated by the status LED either being constantly lit yellow or alternating between yellow and another color.

Behavior during start of the device:

No.	green LED	yellow LED	red LED	Cause	Note / Explanation
001	off	ON for **3 s**	off	Program and memory test during the first few seconds after starting the device	automatic transition to the initialization phase after approx. 4 seconds
002	off	off	ON for **0.5 s**	Test of the red LED	
003	**flashes** alternating with 1 Hz	**flashes** alternating with 1 Hz	off	Transmitter's initialization phase	automatic transition to the sensor stabilization phase after approx. 3 seconds
004	**flashes** alternating with 1 Hz	**flashes** alternating with 1 Hz	off	Sensor stabilization phase	automatic transition to measuring mode after the time has passed

Behavior in case of malfunctions:

No.	green LED	yellow LED	red LED	Cause	Note / Explanation
101	**1 pulse**/5 s (alternating)	**ON**	off	The sensor is no longer reacting to gas properly. It might be too old.	Sensor must be replaced
102	off	**ON**	**1 pulse** /5 s (alternating)	The supply voltage of the transmitter is either too low or too high.	Check and readjust voltage supply
103	off	**ON**	**2 pulses** /5 s (alternating)	Temperature measurement is likely incorrect.	
104	off	**ON**	**2 pulses** /5 s (alternating)	An error was detected at the analog / digital converter.	
105	off	**ON**	**4 pulses** /5 s (alternating)	The memory test detected an error concerning the program memory.	Restart transmitter. If the error occurs again, a firmware update is necessary.
106	off	**ON**	**4 pulses** /5 s (alternating)	The memory test detected an error concerning the RAM.	Restart transmitter. If the error occurs again, a firmware update is necessary.
107	off	**ON**	**4 pulses** /5 s (alternating)	Error in the parameter memory or when trying to access the ext. parameter memory	
108	off	**ON**	**4 pulses** /5 s (alternating)	A logical error has been detected during program processing.	
109	off	**ON**	**5 pulses** /5 s (alternating)	A hardware malfunction has been detected while testing the external watchdog.	Restart the device. If the error occurs again, a firmware update is necessary.

110	off	**ON**	**5 pulses** /5 s (alternating)	A wrong circuit board or circuit board error has been detected.	
111	off	**ON**	**5 pulses** /5 s (alternating)	A hardware malfunction has been detected in the digital potentiometer.	

The EC22DS can access more detailed information than can be displayed with the multi-colored LED status bar via the IrDA interface on the GfG app.

4.4.3 Indications in service mode and during sensor adjustment

The following table describes all conditions indicated by the status LED either being constantly lit yellow or alternating between yellow and another color.

No.	green LED	yellow LED	red LED	Cause	Note / Explanation
201	**flashes** 5x with 50% on	off	off	Preparation AutoCal	
202	**flashes** 5x with 10% on	off	off	Preparation Zero point adjustment	
203	**flashes** 5x with 90% on	off	off	Preparation Sensitivity calibration	
204	off	**flashes** with 1Hz	off	Zero point adjustment has been activated	AutoCal adjustment of the zero point
205	off	**flashes** with 1Hz	off	Sensitivity calibration has been activated	AutoCal adjustment of the sensitivity
206	**flashes** 5 s with 10 Hz	off	off	Adjustment has been successful	
207	off	**flashes** 5 s with 10 Hz	off	Adjustment has not been successful	

4.4.4 Indications in measuring mode

The following table describes all conditions indicated by the status LED either being constantly lit green or alternating between green and another color.

No.	green LED	yellow LED	red LED	Cause	Note / Explanation
301	ON **for 1 s** (alternating)	off	ON **for 4 s** (alternating)	The gas concentration has exceeded the measuring range of the transmitter electronics.	
302	ON **for 1 s** (alternating)	off	ON **for 4 s** (alternating)	The gas concentration has exceeded the measuring range considerably (Gas≥112,5%MR).	
303	ON **for 4 s** (alternating)	off	ON **for 1 s** (alternating)	The gas concentration has exceeded the measuring range (100...112%MR).	
304	**ON**	off	off	Error free measuring mode	
305	**ON**	off	off	The gas concentration falls short of the measuring range (-5,0…0,0%MB)	
306	ON **for 4 s** (alternating)	ON **for 1 s** (alternating)	off	The gas concentration falls short of the measuring range (-7,5…-5,0%MB)	Zero point adjustment is recommended
307	ON **for 1 s** (alternating)	ON **for 4 s** (alternating)	off	The gas concentration falls short of the measuring range (below -7.5%MR)	Zero point adjustment is necessary
308	ON **for 1 s** (alternating)	ON **for 4 s** (alternating)	off	The gas concentration falls short of the measuring range of the transmitter electronics.	Zero point adjustment and sensitivity check are necessary.
309	**ON**	**1 pulse** /5 s (alternating)	off	Expected operating life of the sensor has been exceeded.	Adjustment or sensor replacement is necessary.

The EC22DS can access more detailed information than can be displayed with the multi-colored LED status bar via the IrDA interface on the GfG app.

4.4.5 Priority of indications and notifications during measuring mode

Higher priority notifications will always be displayed over lower priority ones. The lower priority statuses are not reset.

Priority	Status	Description see section...
▼	Gas concentration has exceeded the measuring range considerably	Indications in measuring mode No. 301, 302
	Gas concentration has exceeded the measuring range	Indications in measuring mode No. 303
	Measurements fall below the measuring range	Indications in measuring mode No. 305…308
	Sensor replacement	Indications in measuring mode No. 309

The indications of sensor error No. 101 and transmitter disruptions No. 102...111 will entirely suspend the measurement.

4.5 Fault, cause, remedy

Fault	Cause	Remedy
Status LED is not lit	No supply voltage	Check power supply and cable connection
No bus communication	Line is interrupted or was connected incorrectly	Check connection, then reestablish or correct it
	Wrong bus address Wrong baud rate	Correct settings
Zero point cannot be set anymore	Sensor is defective	Replace sensor
Sensitivity cannot be set anymore	Sensor is defective	Replace sensor

5 Appendix

5.1 Cleaning and care

External contaminations and stains can be removed with a damp cloth. Do not use solvents or cleaning agents!

5.2 Service and maintenance

Service and maintenance includes regular visual inspections, function checks and system checks as well as any repairs of the gas detection system. In Germany, this is regulated by the "DGUV Information 213-056 (Explanatory leaflet T 021 / previously BGI 836, section 9)" and "DGUV Information 213-057 (Explanatory leaflet T 023 / previously BGI 518, section 9)".

5.2.1 Visual inspection

A visual inspection should be carried out regularly, at least once a month, and should include the following:

Checking the status display
Checking for mechanical damages and external contaminations

5.2.2 Function check

Function checks can be carried out in intervals that depend on the monitored gas hazard. These intervals may not exceed four months. In Germany, this maximum inspection interval is determined by the T 021 and T 023 regulations of the Social Accident Insurance Institution BG RCI.

It includes the following:

- Visually inspecting the device according to section 5.2.1 of this instruction manual
- Checking and evaluating the displayed measured values
- Triggering the alarm thresholds
- Triggering the test functions of display element and acoustic signals without triggering the switching functions
- Checking saved notifications, errors and maintenance requirements

5.2.3 System check (proof test)

A system check must be carried out in regular intervals. These intervals may not exceed one year. It includes the following:

- Performing a function control test according to section5.2.2 of this instruction manual
- Checking all safety functions. This includes triggering the switching functions.
- Checking the parameter settings via a target / actual comparison
- Checking the reporting and registration elements

5.2.4 Repairs

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

5.3 Sensor replacement

The transmitter's cover must be removed to replace the sensor. The device must be de-energized to continue. You can then remove the electronics from the guide rail along with the sensor. Then, the old sensor can be pulled off and replaced by the new one. To reassemble the device, follow the disassembly instructions in reverse. Only a sensor of the same type may be used as a replacement sensor. Its serial number must be registered in the TRM22Config software after it has been installed and commissioned.

5.4 Information on the environmentally safe disposal of used parts

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

5.5 Accessories and spare parts

	Designation	Item No.
1.	Calibration adapter for EC22 and IR22	2220200
2.	Replacement sensors for EC22DS	on request

5.6 Sensor specifications

MK229-0 Electrochemical sensor for nitrogen monoxide NO			
Measuring ranges:	0...10ppm	0...20 or 30 ppm	0...40 or 50 ppm
Resolution / tolerance range:	0.05 ppm / ±0.15 ppm	0.1 ppm / ±0.2 ppm	0.1 ppm / ±0.3 ppm
Adjustment time:	t50 < 5 sec	t90 < 15 sec	
Pressure 80...120kPa:	max. ±1 ppm or ±7% of the displayed value		(at a ref. point of 100kPa)
Humidity 15%...90% RH:	max. ±1 ppm or ±7% of the displayed value		(at a ref. point of 50% RH at 20 °C)
Temperature -20...+40(50) °C:	max. ±2 (3) ppm or ±7% of the displayed value		(at a ref. point of 20°C)
Cross sensitivities:	H_2S<35%; NO_2<5%; CO=SO_2=H_2=0%; (*1)		
Expected lifetime:	> 3 years in air		
Stabilization time:	3 minutes to 1 day - depending on the switch-off time		

MK448-0 Electrochemical sensor for carbon monoxide CO			
Measuring ranges:	0...200 or 300 ppm	0...500ppm	
Resolution / tolerance range:	1 ppm / ±2 ppm	1 ppm / ±3 ppm	
Adjustment time:	t90 ≤ 30 sec		(at 20 °C)
Pressure 80...120kPa:	max. ±3ppm or±5% of the displayed value		(at a ref. point of 100kPa)
Humidity 15%...90% RH:	max. ±3ppm or±2% of the displayed value		(at a ref. point of 50% RH at 20°C)
Temperature -20...+50°C:	max. ±3 (5)ppm or±7 (101) % of the displayed value		(at a ref. point of 20°C)
Cross sensitivities:	C_2H_4<90%, H_2<60%, NO<20%, NO_2≈-10%, Cl_2<7%, H_2S<0,7%, Cl_2=SO_2=0% (*1)		
Expected lifetime:	> 3 years in air		

Continued on the next page.

MK468-0 Electrochemical sensor for nitrogen dioxide NO_2			
Measuring ranges:	0...10ppm	0...20 or 30 ppm	0...40 or 50 ppm
Resolution / tolerance range:	0.01 ppm / ±0.05 ppm	0.02 ppm / ±0.10 ppm	0.05 ppm / ±0.20 ppm
Adjustment time:	$t90 \leq 45$ sec		(at 20 °C)
Pressure 80...120kPa:	max. ±0.2ppm or±10% of the displayed value		(at a ref. point of 100kPa)
Humidity 15%...90% RH:	max. ±0.2ppm or±10% of the displayed value		(at a ref. point of 50% RH at 20°C)
Temperature -20...+50°C:	max. ±0.2ppm or±10% of the displayed value		(at a ref. point of 50% RH at 20°C)
Cross sensitivities:	Cl_2<100%; H_2S<-10%; NO<-2%; CO= CO_2=H_2=NH_3=SO_2=0; (*1)		
Expected lifetime:	> 3 years in air		

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

5.7 Technical data

Designation	**EC22DS**
Environmental conditions	
Operating temperature:	-20...+50°C (depending on sensor)
Storage temperature:	-25...+60°C (0...+30°C recommended)
Humidity:	-15...95% RH (depending on sensor)
Pressure:	80...120kPa (depending on sensor)
Power supply	
Operating voltage:	24V DC (6-30V DC permitted)
Current consumption:	type. 5mAat 24V; 6mA at18V; 8mA at12V; 14mA at6V
Fuse:	110mA (can be reset independently)
Sensors	
Measuring principle:	electrochemical
Sample gas feed:	diffusion
Measuring ranges and sample gas:	depending on sensor
Measured value processing	
Update rate:	1 s
Preparation delay:	5 s plus 20-90 s stabilization time of the sensors
Indications & notifications	
Status LED:	three colored: green for operation, yellow for error or service
AutoCal magnetic contacts:	one contact per sensor for ZERO and SPAN adjustment
Service connector	
Type:	3.5 mm stereo jack socket (internal)
Digital input:	for configuration and firmware update
Signal output	
digital:	RS485; half-duplex; 9600/19200/38400 baud; Modbus protocol, Slide switch for 120Ω terminating resistor
Connecting cable	
Cable glands:	2x M16x1,5 (for 4.5-10 mm diameter cables)
Connecting terminals:	4x double terminals (0.08...2.5 mm^2 conductor cross-section)
Cable:	4-wire, e.g. control cable LiYCY or LiYY 4x 0.5...1.0...(1.5) mm^2 or bus cable Y(St)Y 2x2x1.0 mm^2 or 2x2x0.8 mm ***1**
Housing	
Protection class:	IP40 according to IEC 60529
Material:	plastic PC
Dimensions:	97 x 123 x 50 mm (WxHxD)
Weight:	125…150 g
Approvals & certifications:	
Electromagnetic Combability:	DIN EN 50270:2015 Interference emission: type class I; Interference resistance: type class II

***1:** The bus cable Y(St)Y 2x2x0.8 is only suitable for powering several bus transmitters at once over very short distances. The possible range depends on the number and position of the transmitters connected to the bus cable. For more information, refer to section3.3

5.8 EU Declaration of Conformity

EU Declaration of Conformity

Transmitter
EC22 DS

Edited: 23.10.2019 Amended:

GfG Gesellschaft für Gerätebau mbH

Klönnestraße 99
44143 Dortmund
Tel: +49 (231) 56400-0
Fax: +49 (231) 516313
E-Mail: info@gfg-mbh.com
www.gfg.biz

GfG Gesellschaft für Gerätebau mbH develops produces and sells gas sensors and gas warning devices which are subject to a **quality management system** as per DIN EN ISO 9001.
Subject to supervision by means of a **quality system**, surveilled by the notified body, DEKRA Testing and Certification GmbH (0158), is the production of electrical apparatus of instrumentation Group I and II, categories M1, M2, 1G and 2G for gas sensors, gas detectors, gas warning systems in types of protection flameproof enclosures, increased safety, encapsulation and intrinsic safety, as well as their measuring function.

The Transmitter **EC22 DS** complies with council directive **2014/30/EU** for electromagnetic compatibility and with directive **2011/65/EU** (RoHS) on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

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

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

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

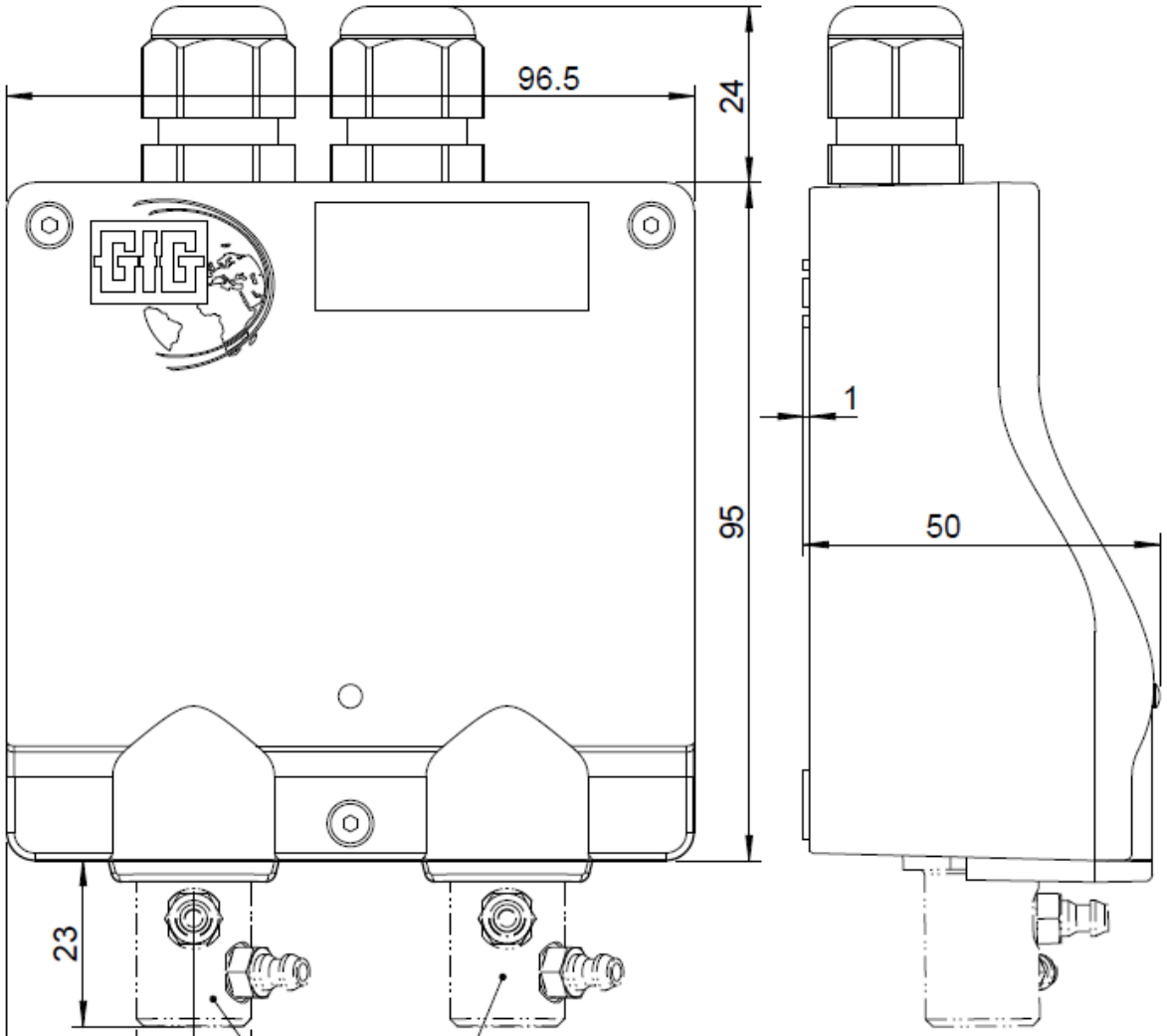
The directive 2011/65/EU is complied considering the following standard:

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

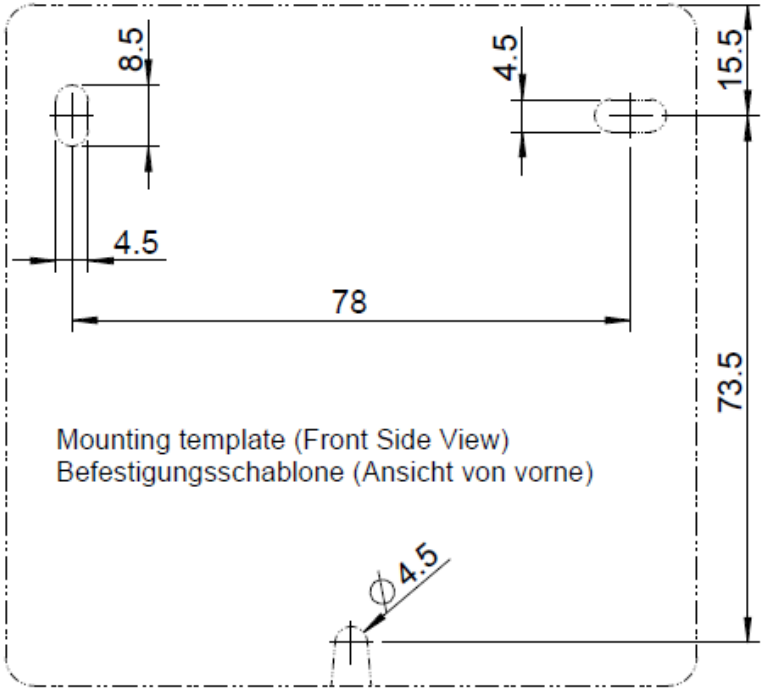
Dortmund, 23 October 2019

i.V.

B. Siebrecht
QMB



Kalibrieradapter
Calibration adapter



Mounting template (Front Side View)
Befestigungsschablone (Ansicht von vorne)

General Tolerance ISO 2768 - m	Material:					Scale: 1:1
Rev.	Changes	Date	Name	Date	Name	Verified
				2019-06-03	Leonhardt	Böttger
				Adhere to protection note ISO 16016 Schutzvermerk ISO 16016 beachten		
				GfG Gesellschaft für Gerätebau mbH Klönnestr.99, D - 44143 Dortmund		

Title:
EC22DS
Package dimensions and mounting template

Document-No.: 218-005.13

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Replaces:

Replaced by: