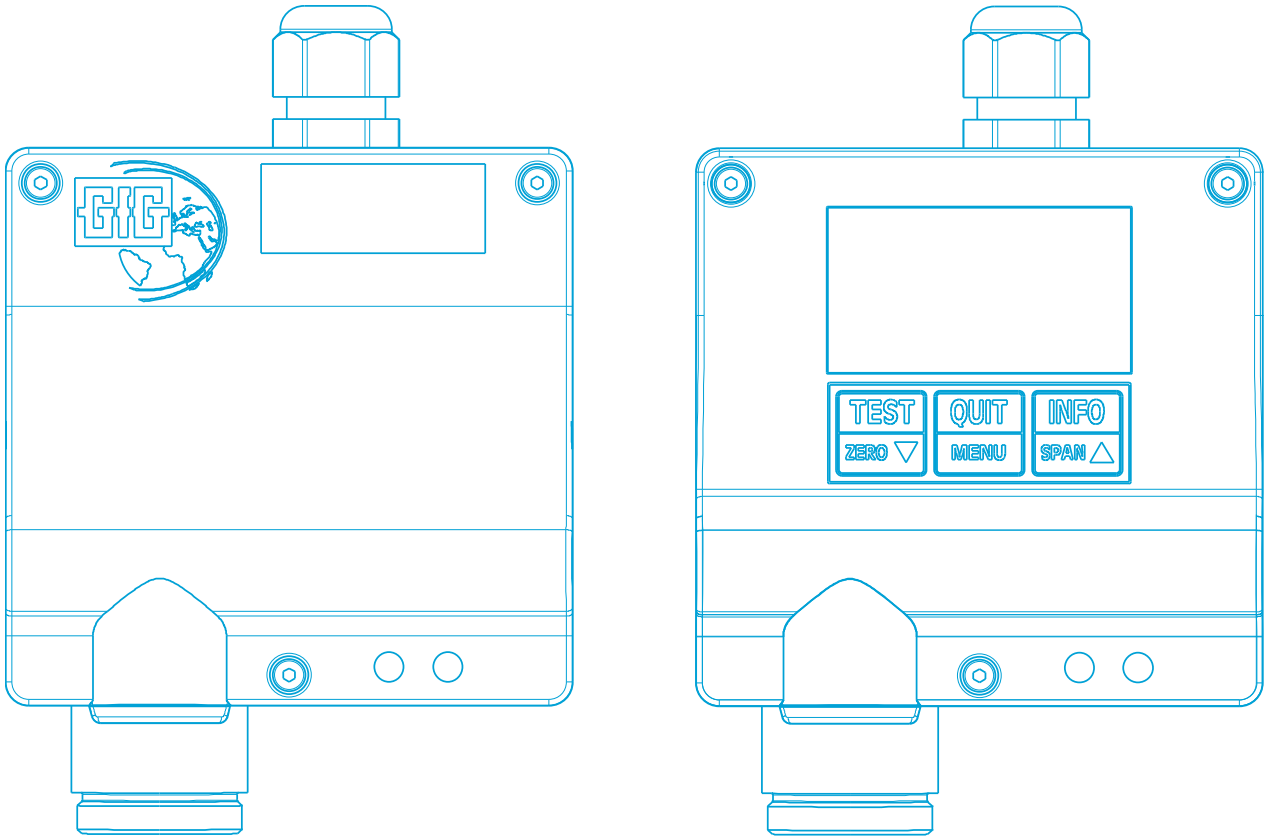
Operation Manual

Transmitter CS22



smart
GasDetection
Technologies

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1 INTRODUCTION

1.1 For Your Safety

In accordance with the law on the provision of products on the market (Product Safety Act - ProdSG), these operating instructions refer to the intended use of the product and are intended to protect the safety and health of persons. It must be read and observed by all persons who apply or use, maintain, service and inspect this product. This device can serve its intended purpose only if it is operated, serviced, maintained and inspected according to the instructions given by the Gesellschaft für Gerätebau mbH.
The warranty issued by GfG Gesellschaft für Gerätebau mbH (GfG) shall be void, if it is not used, cared for, maintained and checked in accordance with GfG's specifications. The previously mentioned does not change the statements about the Warranty and Liability in the Sales and Delivery Terms of GfG.

1.2 Operating Instructions

According to national regulations, gas detection devices must be checked for proper operation by a qualified person after installation and before initial operation. In Germany, the following standards apply: "DGUV Information 213-056 (leaflet T 021 / previously BGI 836 Section 8.1)" and "DGUV Information 213-057 (leaflet T 023 / previously BGI 518 Section 8.1)".

The transmitter has been tested for function and display before delivery. The calibration and adjustment was carried out with appropriate test and calibration gases.
This does not exempt the user from calibration and adjustment after installation.

The transmitter CS22 is **not** approved for use in hazardous areas.

ATTENTION
Attention: The supply voltage must not exceed 30 Vdc!
This also applies to voltage peaks!

2 GENERAL INFORMATION

2.1 General Description

A fixed gas detection system consists of a transmitter and a controller (GMA, not included in the scope of delivery). Transmitter and GMA are connected via a cable. The transmitter converts the gas concentration into an electrical measuring signal and sends it to the controller for further processing.

The CS22 transmitter can optionally be equipped with an additional graphic display with operating keys and a signalling horn. The display has a "green" background lighting during measuring operation. In the event of a fault or alarm, the display colour changes to "red" for visual alarm. The display variant also features an integrated horn for acoustic alarm.

Each transmitter of the 22 series has two status LEDs, which signal the operating status of the device. A "green" one to signal operational readiness and a "yellow" one to indicate a fault or special status.
The transmitters of the 22 series can be equipped with either an analogue current interface or a digital RS485 interface. The current interface can output the measurement information with 4-20 mA as standard or alternatively with 0.2-1 mA. Communication of the digital RS485 interface takes place according to the Modbus (RTU) protocol.

The electronics perform many tasks which, on the one hand, facilitate operation and maintenance and, on the other hand, considerably increase operational safety and measuring accuracy. The transmitter is characterized by:

- Display of measured concentration (variant with display)
- Settings without opening the housing by keystroke (variant with display)
- Compensation of temperature influences
- Permanent status indication (measuring operation, fault or special status) on the transmitter

2.2 Measurement Method

The CS22 uses chemisorption as the measuring principle. At the core is a sensor element that is constructed differently depending on the application and type of gas. If there is no target gas in the ambient air, the sensor has a high internal resistance. The internal resistance changes as soon as target gas comes into contact with the sensor surface. This change is the indication of the gas concentration and is converted by the electronics integrated in the transmitter into a standardized analogue current signal (4-20 mA or 0.2-1 mA) or into a digital bus signal. The measuring principle of chemisorption is characterized by good long-term stability.

2.3 Functional Limitations with Insufficient Oxygen

It should be noted that the measurement of gas and/or vapour concentrations can no longer be carried out accurately if at the same time the oxygen concentration is very low. In this case the sensor lacks the oxygen necessary for the chemical reaction.
The sensor can be permanently damaged by prolonged exposure in an atmosphere with low oxygen concentration.

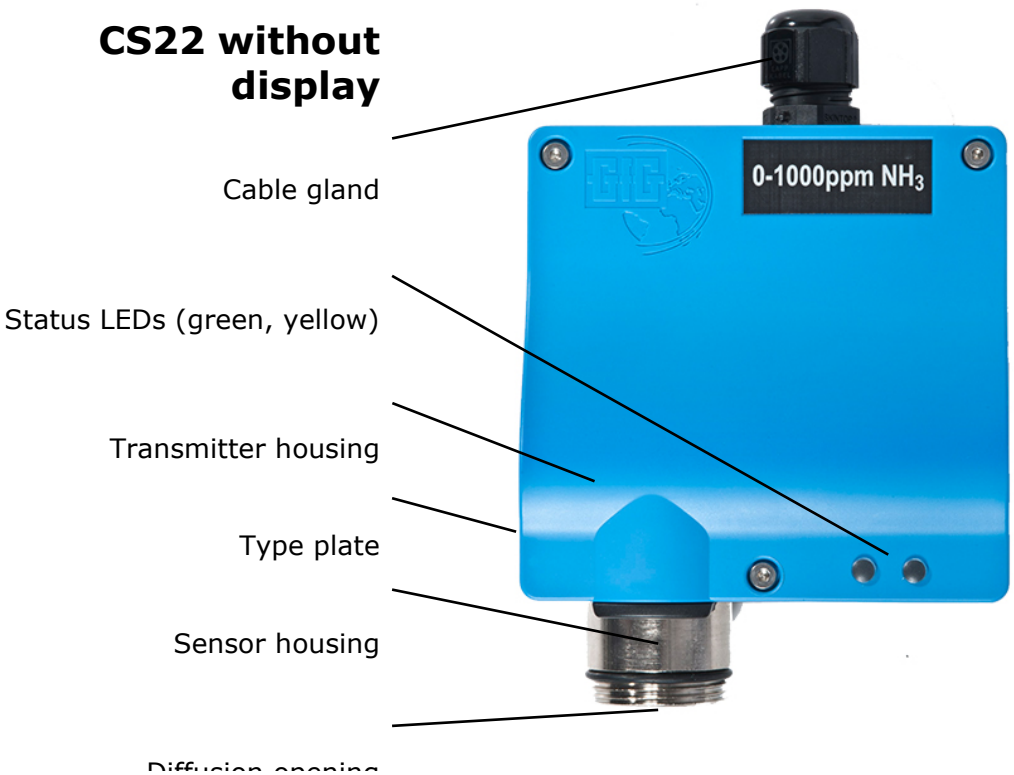
2.4 Indication Errors with Sensor Poisons

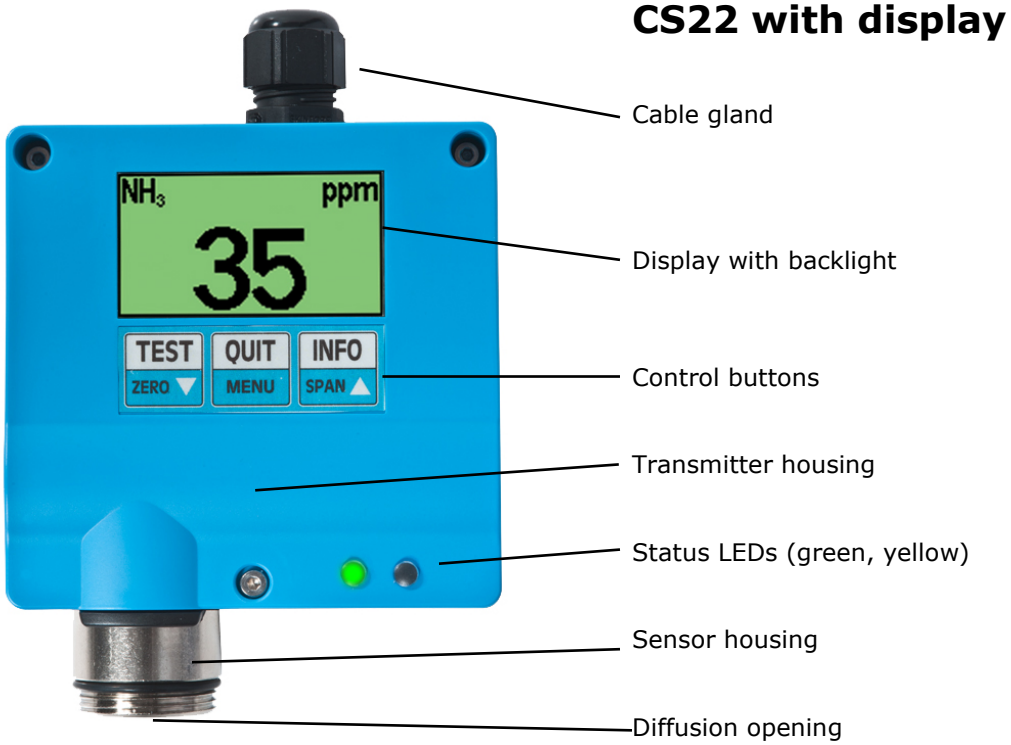
Certain substances, which are called "sensor or catalyst poisons", can impair the sensor in its signal behaviour. The "sensitivity", i.e. the ability of the sensor to emit signals, decreases. Substances of this kind include sulphur, lead and silicon compounds. Special attention should be paid to any interfering gases present at the measuring point that could irreversibly impair the function of the gas detection devices. Depending on their type, concentration and duration of exposure, such substances can cause disturbances ranging from a more or less steady, long-term decrease to a sudden sharp drop in sensitivity.

2.5 Signal Transmission Behaviour

Depending on the type of gas to be measured, the transmitter has differing transmission characteristics. The adjustment times may vary depending on the gas to be measured. Displayed gas concentration (i.e. in the App) and signal output (RS485) are always proportional to the gas concentration.

2.6 Device Setup





The gas sensor and the transmitter electronics are installed in the transmitter housing. The electronics converts the measuring signal into a gas concentration and transmits it either by means of an analogue current signal of 4-20mA or 0.2-1mA or a digital RS485 bus signal according to the Modbus RTU protocol. In the variant with display, gas concentration and status information are shown on the device.

The transmitter can be adjusted by means of a multimeter and the two built-in potentiometers or - if available - via the display and the operating buttons.

3 MOUNTING AND INSTALLATION

3.1 Mounting Location

When determining the mounting location, it is important to know the environmental conditions exactly and to take them into account when choosing the location. To obtain meaningful measurement results, the ventilation conditions must be taken into account.

The transmitter must be installed within the room in such a way that gases can reach the sensor even with unfavourable ventilation. If necessary, an evaluation, e.g. with smoke tubes, must be carried out.

When determining the mounting location, it must also be ensured that the transmitter is always freely accessible for service and calibration purposes.

External influences must also be taken into account such as:

- rainwater, gushing water, dripping water, condensate
- the dust content in the atmosphere

The transmitter is largely protected against ingress of water and dust. Under very demanding measuring conditions, special accessories can protect the transmitter from harm. GfG will be happy to advise you on suitable measures.

If the sensor is exposed to environmental conditions that were not known to GfG at the time of planning or delivery, the warranty may be void.

3.2 Installation

When determining the mounting location, it must also be ensured that the transmitter is always freely accessible for service and calibration purposes. The transmitter must be installed vertically with the sensor pointing downwards.
The transmitter is connected to the controller according to the wiring diagram (see connections and terminal assignment). For installation, the three Allen screws have to be loosened and the housing cover removed. The housing is fixed with three screws. The circuit board is located in the housing. The terminals for the connection to the controller are located in the upper part of the circuit board.

3.3 Electrical Terminal Installation

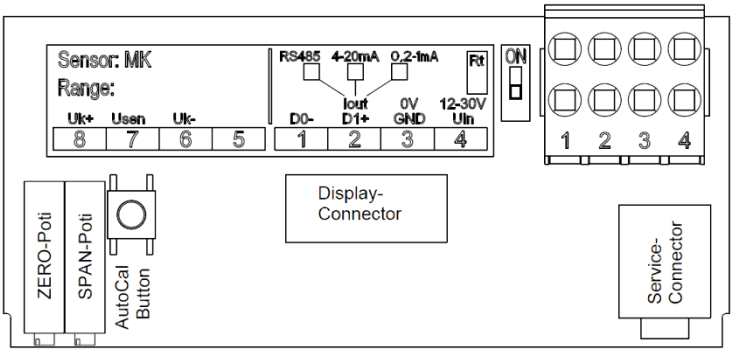
Installation of cables and connection of the electrical system may only be carried out by a qualified electrician in compliance with the relevant regulations. The wire cross-section depends on the length of the connecting cable and the transmitter variant. It has to be checked in each individual case whether the operating voltage of the bus version is sufficient to supply the last transmitters on the transmitter bus. If necessary, the power supply must be enhanced by an additional voltage source. After installation, the cover of the housing must be closed and screwed back on.

For analogue data transmission, a cable with a wire cross-section of 0.75 mm² can be used for shorter distances of up to 500 m. For longer distances, the core cross section must be 1.5 mm². The cable length should not exceed 1200 m.

Wiring diagram

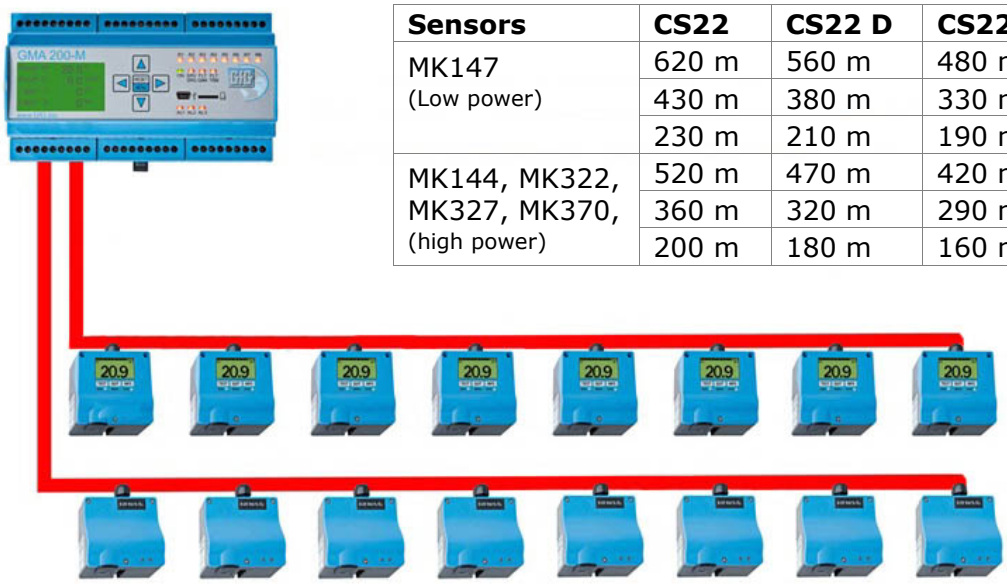
Clamps for cable connection
1: Data– D0
2: Data+ D1 / 4-20 mA / 0,2-1 mA
3: 0V GND
4: 24 Vdc (12 Vdc to 30 Vdc)

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



For digital data transmission via RS485, the bus cabling depends on various factors. This includes the structure of the bus as a strand or as a ring, the number of transmitters on the bus, the distance of the individual transmitters from the GMA, the transmitter type/version, the sensor type and of course the bus cable type. It has to be checked in each individual case whether the operating voltage of the bus version is sufficient to supply the last transmitters on the transmitter bus with sufficient power. If necessary, the power supply must be enhanced by an additional voltage source. The cable length should not exceed 1200 m.

The following example shows the maximum cable lengths for the installation of 8x CS22 each at a distance of 10 m at the end of the bus cable. CS22 stands for devices without display, CS22D for devices with display and CS22DA for devices with display and alarm device.



Sensors	CS22	CS22 D	CS22 DA	Bus cable
MK147 (Low power)	620 m	560 m	480 m	2x2x1,5 mm²
	430 m	380 m	330 m	2x2x1.0 mm²
	230 m	210 m	190 m	2x2x0.5 mm²
MK144, MK322, MK327, MK370, (high power)	520 m	470 m	420 m	2x2x1,5 mm²
	360 m	320 m	290 m	2x2x1.0 mm²
	200 m	180 m	160 m	2x2x0.5 mm²

(2x2x0,5 mm² = 2x2x0,8 mm)

4 OPERATING INSTRUCTIONS

4.1 Commissioning

Function and display of the CS22 transmitter are tested before delivery. Adjustment was carried out with appropriate test or calibration gases. However, deviations may occur due to transport, installation and ambient conditions.
The gas detection system must, therefore, be put into operation by a qualified person and checked for function.

After switching on, the transmitter needs 1-2 minutes for:

- the self-test, during which program memory and working memory are checked
- reading in and evaluating device parameters while simultaneously checking the memory
- Reading in and evaluating device parameters while simultaneously checking the memory
- the run-in of the sensor

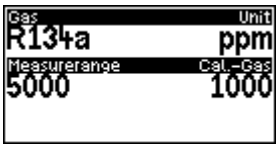
During the start-up phase a memory test is performed during the first few seconds.

Version with analogue current interface (0.2-1mA):
Immediately upon switch-on, the current interface delivers 0.0 mA and after 4 seconds 0.08 mA. The green and the yellow LED are lit.

Version with analogue current interface (4-20 mA):
Immediately upon switch-on, the current interface delivers 0.0 mA and after 4 seconds 1.6 mA. The green and the yellow LED are lit.

Version with digital Modbus interface (RS485):
With the Modbus version, "Startup" is displayed on the connected controller, e.g. GMA200. If necessary, refer to the Modbus appendix of the TRM22 operation manual.

The display of the CS22 first shows the information about the firmware versions. The measuring range, unit of measurement, gas type and calibration gas concentration are displayed next. The remaining seconds of the run-in phase are counted down on the display. The CS22 automatically switches to measurement mode after the sensor has run in.



If a device error is detected during the start-up phase, the device switches to fault operation.

Version with analogue current interface (0.2-1 mA):
The current interface then delivers 0.06 mA. An error message appears on the display (see Indication of special states and malfunctions).

The yellow fault LED lights up permanently.

Version with analogue current interface (4-20 mA):
The current interface delivers 1.2 mA. An error message appears on the display (see Indication of special states and malfunctions).

The yellow fault LED lights up permanently.

Version with digital Modbus interface (RS485):
In the Modbus version, an error message is shown in the display of the transmitter and/or the GMA (see Indication of special states and malfunctions).
The yellow fault LED lights up permanently.

Note:
The initial commissioning of the transmitter requires a check and, if necessary, adjustment of the zero point (ZERO) and subsequently also of the sensitivity (SPAN) after the run-in phase.

4.2 Measuring mode

During fault-free measuring operation, the green operation LED is permanently on and the yellow fault LED is off. The functioning of the electronics is constantly monitored by various tests, such as sensor, processor and memory tests. The gas concentration is measured continuously and is updated every second.

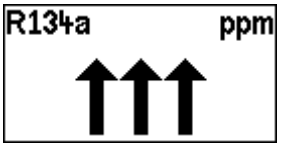
During measuring operation, the digital display shows the currently detected gas concentration.

Up to three limit value alarms can be configured on the CS22 via the display. The signalling is done acoustically and optically on the display by means of a red backlight. An alarm is triggered as soon as the gas concentration exceeds or falls below the set alarm limit value. Depending on the function setting, the limit value alarms can be reset automatically or, in the case of latching alarms, after the alarm limit value has been undershot, with an acknowledgement by pressing the button QUIT MENU button.

i	During normal measuring operation, the display of the transmitter shows a bar graph above the current gas concentration with a set measuring range and, alternating every 5 seconds, also the gas type and gas unit.

4.2.1 Overrange

An exceeding of the measuring range between 100% and 112% of the measuring range is indicated on the display by arrows ↑↑↑ alternating with the measured value.



Transmitter with analogue current interface 0.2-1 mA:
The current interface outputs a signal in the range 1.0...1.1mA corresponding to the measured value.

Transmitter with analogue current interface 4-20 mA:
The current interface outputs a signal in the range 20...22 mA corresponding to the measured value.

Transmitter with digital Modbus interface (RS485):
In the Modbus variant, the display of the transmitter and/or the GMA shows the corresponding measured value alternating with↑↑↑ (see Indication of special states and malfunctions).

An even more significant exceeding of more than 112 % of the measuring range is indicated in the display by permanent arrows ↑↑↑ and a rapidly flashing yellow status LED.

Transmitter with analogue current interface 0.2-1 mA:
The current interface delivers 1.1 mA.

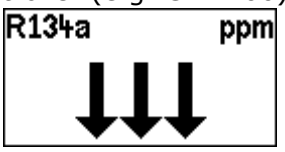
Transmitter with analogue current interface 4-20 mA:
The current interface delivers 22 mA.

Transmitter with digital Modbus interface (RS485):
In the Modbus version, ↑↑↑ appears permanently in the display of the transmitter and/or the GMA (see Indication of special states and malfunctions).

4.2.2 Underrange

Measured values below the zero point are displayed as numerical values with a negative sign. If the measured value falls below 0...-5 % of the measuring range, the measured value continues to be shown on the display of the transmitter or on the controller (e.g. GMA200).

If the measured value falls below -5.0 to -7.5 %, arrows ↓↓↓ appear in the display of the transmitter alternating with the measured value.



If the measuring signal falls below the measuring range of -7.5%, the arrows appear permanently in the display ↓↓↓.

Transmitter with analogue current interface 0.2-1 mA:
The current interface outputs a signal in the range 0,14 mA to 0,2 mA corresponding to the measured value.

Transmitter with analogue current interface 4-20 mA:
The current interface outputs a signal in the range 2.8 mA to 4.0 mA mA corresponding to the measured value.

Transmitter with digital Modbus interface (RS485):
In the Modbus version, the corresponding measured value is shown in the display of the transmitter and/or the GMA (see Indication of special states and malfunctions).

4.2.3 Control buttons

With the control buttons of the transmitter, TEST ZERO ▼ QUIT MENU INFO SPAN ▲ sensor adjustments and settings can be made via the menu.

4.2.4 Test of display, LED and horn [TEST]

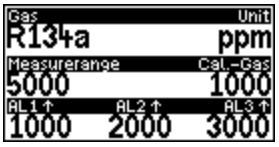
In measuring mode, the display and LED of a transmitter with display can be tested by briefly pressing the TEST / ZERO ▼ button.

In this case, all LEDs are triggered, all segments of the display are depicted and additionally the status LEDs as well as an audible alarm tone are briefly triggered.

4.2.5 Display of operating parameters [INFO]

During measuring operation, the following important operating parameters can be displayed successively and automatically by briefly pressing the INFO / SPAN ▲ button.

- Target gas
- Measuring unit
- Measuring range
- Calibration or test gas concentration
- Alarm limit values (with activated alarm function)



This information also appear during the device start-up phase.

4.2.6 Operating life of the sensor

Chemisorption sensors have a limited operating life. The expected operating life of the sensors used in the CS22 is approximately 5 years, depending on the operating conditions. When the expected operating life is reached, the transmitter indicates that the sensor should be replaced during the next maintenance. The red illuminated display then shows a corresponding message and the yellow fault LED lights up briefly every 5 seconds. This does not affect the measuring operation and the remaining sensor life.

4.3 Calibration and Adjustment

4.3.1 Zero point calibration

During calibration (checking) or adjustment (setting) of the zero point, unpolluted fresh air (without interfering gas components) or in a polluted atmosphere synthetic air can be used as calibration gas. Under no circumstances may 100% nitrogen be used.

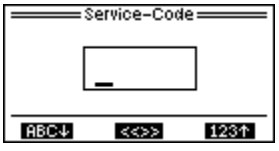
Calibration (checking):

This requires a calibration adapter to be screwed to the sensor housing. Using the calibration adapter, the test gas can then be fed to the sensor unpressurised at a flow rate of approximately 0.5 $^{l}/_{min}$. If the displayed value deviates from zero, the deviation can be readjusted.

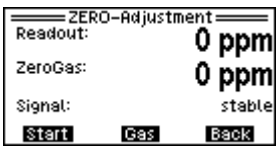
Adjustment:
The zero point adjustment can be carried out in different ways depending on the transmitter version. These options are described below.

4.3.2 Zero point adjustment using display and keypad [ZERO]

In order to be able to carry out the zero point adjustment, it is necessary to switch to the service code request by pressing and holding the Button TEST / ZERO ▼ (>3 sec.). After entering the standard service code "0011" (factory setting), the "ZERO adjustment" program is activated. This is indicated by the flashing of the yellow status LED and, for transmitters with analogue interface (4-20 mA or 0.2-1 mA), by an output signal of 2.4 mA respectively 0.12 mA.



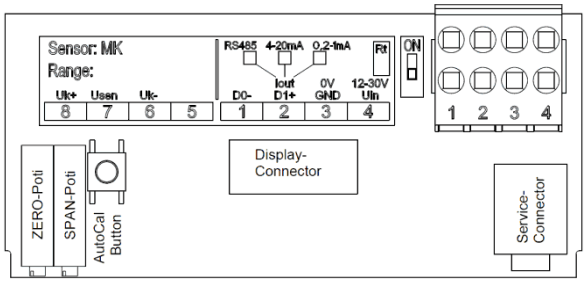
Now the current measured value (display value) and the set calibration gas concentration are displayed. As long as the measured value does not exceed 25% of the measuring range, the zero point adjustment can be started with the left button [Start]. If the measured value remains constant during a defined period of time, the new zero point is accepted and displayed. Use the right button to exit the "ZERO adjustment" program and return to measuring mode.



If a zero point adjustment was not possible because the current measured value exceeds 25% of the measuring range due to a strong drift, the zero point can be adjusted by qualified service personnel using the extended service code "0055" (factory setting) even if the deviation is up to 35% of the measuring range. It must be ensured that the sensor is either in fresh air that is free of target gas or that calibration gas is supplied to the sensor.

4.3.3 Zero point adjustment using the AutoCal button [ZERO]

For transmitters without display, the easiest way to carry out the zero point adjustment is to use the AutoCal button. To operate this button, the transmitter cover has to be removed. To initiate the adjustment, the button has to be pressed for at least 5 seconds. During this initial phase (first 5 seconds), the green status LED flashes at 1Hz (equally long on and off).



If the button is released during the first phase, i.e. too early, the adjustment is not started and the measuring operation continues as normal.

After the first 5 seconds, the 1Hz flashing changes for the next 5 seconds. Than the green LED is only on for a short period (10 % of the time). To start the zero point adjustment, the button has to be released in this second phase (5.-10. s). The adjustment process is then signalled by the yellow status LED flashing and a current output signal of 2.0 mA (respectively 0.1 mA). If the measured value remains constant during a defined period of time, the new zero point is accepted and the measured value is set to 0 ppm or 0.0 % LEL. A successful adjustment is indicated by fast flashing of the green LED - a failed adjustment is indicated by fast flashing of the yellow LED. The adjustment process is then automatically terminated.

If the button is operated for more than 10 seconds, the AutoCal sensitivity adjustment can be started in the third phase (10.-15. s), but it would fail due to the missing test gas. If the button is actuated for even longer than 15 seconds, no adjustment is performed and the measuring operation continues as normal.

4.3.4 Zero point adjustment with the ZERO potentiometer

If the transmitter does not have a display, zero adjustment can be carried out with the transmitter cover open at the ZERO potentiometer using a small screwdriver, a multimeter and a cable with service plug (see section 5.5 "Accessories and spare parts"). The cable has to be plugged into the voltage measuring sockets of the multimeter and the service plug into the service connector of the transmitter. (see also note)

As long as the knob of the ZERO potentiometer is not turned, a voltage value of 0.2-1 Vdc can be read from the multimeter, which corresponds proportionally to the current measurement value in the range of 0-100 % of the measuring range.

As soon as the knob of the ZERO potentiometer is turned, the set point for the zero adjustment can be read on the multimeter. This is indicated by flashing of the yellow status LED. Turn the knob until a voltage value of 0.200 V is displayed. As soon as this set point remains unchanged for a longer period of time, the transmitter starts the zero adjustment. The yellow status LED is turned off as soon as the adjustment process is completed.

Zero adjustment using the ZERO potentiometer can be carried out for displayed values up to 25% of the measuring range. If after adjustment, the value displayed by the transmitter returns to the original (unadjusted) measured value, despite correct application of the calibration gas, the adjustment could probably not be carried out successfully due to an exceeding of the tolerable signal limits or increased signal noise. This may indicate that the sensor is defective and should therefore be replaced as soon as possible.

Note:
If no cable with service plug is available, the output current (Iout) can be measured directly between terminal 2 and terminal 3 (GND) on transmitters with analogue interface (4-20 mA or 0.2-1 mA). During this current measurement nothing must be connected to terminal 2 except the multimeter.

4.3.5 Sensitivity calibration

When handling toxic and flammable gases, depending on the calibration gas used, special behavioural instructions must be observed. Information on this can be found in the corresponding safety information sheets.

For calibration (check) or adjustment of the gas sensitivity, a calibration adapter must be screwed to the sensor housing. Using the calibration adapter, the zero gas can then be fed to the sensor unpressurised at a flow rate of approximately 0.5 $^{l}/_{min}$.

The displayed value is observed on the screen. If the displayed value deviates from the calibration gas concentration, it is necessary to adjust the sensitivity.

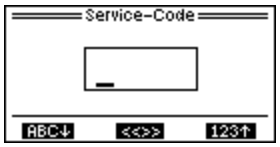
Adjustment:
Before each sensitivity adjustment the zero point should be checked and readjusted if necessary. The sensitivity can be adjusted in different ways depending on the transmitter version. These options are described below.

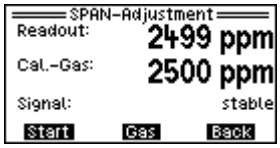
4.3.6 Sensitivity adjustment using display and keypad [SPAN]

In order to be able to carry out the sensitivity adjustment, it is necessary to switch to the service code request by pressing and holding the Button INFO SPAN ▲ (>3 sec.). After entering the standard service code "0011" (factory setting), the "SPAN Adjustment" program is activated. This is indicated by the flashing of the yellow status LED and, for transmitters with analogue interface (4-20 mA or 0.2-1 mA), by an output signal of 2.4 mA respectively 0.12 mA.

Now the current measured value (display value) and the set calibration gas concentration (Cal. gas) are displayed. After pressing the middle button [Gas] the test gas concentration can be changed using the left or right button and stored using the middle button.

As long as the measured value does not exceed 7% of the measuring range, the sensitivity adjustment can be started with the left button [Start]. As soon as a stable measured value is recorded in a defined time interval, the sensitivity is adjusted and the new measured value is displayed. Use the right button to exit the "SPAN adjustment" program and return to measuring mode.

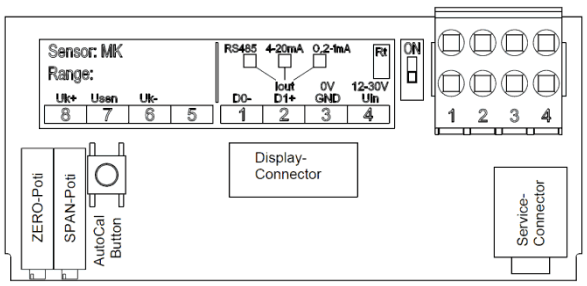




4.3.7 Sensitivity adjustment using the AutoCal button [SPAN]

If the calibration gas concentration set in the transmitter is known and a calibration gas with this concentration is available, the easiest way to adjust the sensitivity of transmitters without display is to use the AutoCal button.

To operate this button, the transmitter cover has to be removed.



To initiate the adjustment, the button has to be pressed for at least 10 seconds. During a initial phase (first 5 seconds), the green status LED flashes at 1 Hz (equally long on and off). If the Push button is released during the first phase, the adjustment is not started and the measuring operation continues as normal. After the first 5 seconds, the 1Hz flashing changes for the next 5 seconds. Than the green LED is only on for a short period (10 % of the time). If the button would be released in this second phase, the zero adjustment would start.

To start the sensitivity adjustment, the button may be released only in the third phase (10.-15. s). The 1 Hz flashing of the green LED changes in such a way that the green LED is lit most of the time (90 %). The adjustment process is then signalled by the yellow status LED flashing and a current output signal of 2.0 mA (respectively 0.1 mA). If the measured value remains constant during a defined period of time, the sensitivity is adjusted in such a way that the measured value displays

the set test gas concentration. A successful adjustment is indicated by fast flashing of the green LED - a failed adjustment is indicated by fast flashing of the yellow LED. The test gas now has to be removed. The adjustment process is then automatically terminated.

If the button is actuated for even longer than 15 seconds, no adjustment is performed and the measuring operation continues as normal.

4.3.8 Sensitivity adjustment using the SPAN potentiometer

If the transmitter does not have a display, sensitivity adjustment can be carried out with the transmitter cover open at the SPAN potentiometer using a small screwdriver, a multimeter and a cable with service plug (see section 5.5 "Accessories and spare parts"). The cable has to be plugged into the voltage measuring sockets of the multimeter and the service plug into the service connector of the transmitter. (see also note)

As long as the knob of the SPAN potentiometer is not turned, a voltage value of 0.2-1 Vdc can be read from the multimeter, which corresponds proportionally to the current measurement value in the range of 0-100 % of the measuring range.

As soon as the knob of the SPAN potentiometer is turned, the set point for the sensitivity adjustment can be read on the multimeter. This is indicated by flashing of the yellow status LED. Turn the knob until a voltage value of e.g. 0.600 V (for 50 % MR) is displayed. As soon as this set point remains unchanged for a longer period of time, the transmitter starts the sensitivity adjustment. The yellow status LED is turned off as soon as the adjustment process is completed.

If after adjustment, the value displayed by the transmitter returns to the original (unadjusted) measured value, despite correct application of the calibration gas, the adjustment could probably not be carried out successfully due to an exceeding of the tolerable signal limits or increased signal noise. This may indicate that the sensor is defective and should therefore be replaced as soon as possible.

Note:
If no cable with service plug is available, the output current (Iout) can be measured directly between terminal 2 and terminal 3 (GND) on transmitters with analogue interface (4-20 mA or 0.2-1 mA). During this current measurement nothing must be connected to terminal 2 except the multimeter.

4.4 Main and Service Menu [MENU]

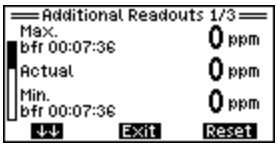
To switch to the main menu and from there to the service menu, the middle [MENU] button has to be pressed for at least 3 seconds. Access to the main menu is not protected by an access code.

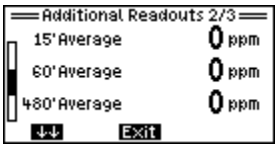
4.4.1 Main menu

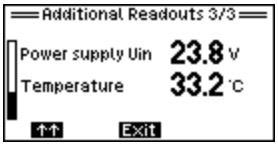
While in the main menu and when switching to the individual menu items, the transmitter remains in measuring mode. This means that in the background, data gathering, processing and signal output continue to function. There is one exception for the service menu, which is described in the next section. The main menu is divided into:

Main menu with the options:

- Further measured values
- Transmitter status
- Transmitter info
- Service Menu



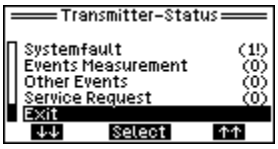


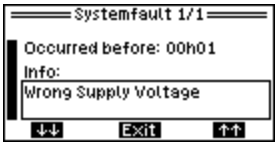


Further measured values

Display of further transmitter measured values. The left button (TEST / ZERO ▼) is used to call up the following values consecutively:

- Minimum, maximum and current measured value
  The measured value memory is reset by briefly pressing the right button.
- Average values for configured time intervals
  Time weighted averages (of the last 15 minutes, last hour and last 8 hours).
- Supply voltage and temperature





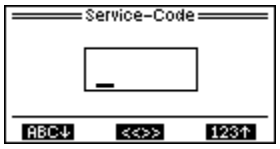
Transmitter status

Information on current system errors, errors in the measuring process, service requirements and events can be called up under transmitter status. Behind these groups are numbers in brackets. These figures refer to the number of information available on that topic. Exclamation marks indicate active events. Existing messages can be displayed by selecting the appropriate category and inactive messages can be deleted after leaving the detail view.

Transmitter information

This overview shows transmitter specific details like firmware version, serial number and sensor type. If an RS485 bus interface is available, the configured baud rate and the bus address are also displayed here.

4.4.2 Service menu



To enter the service menu, a special access code has to be entered. For the standard service menu this is the code "1100". Additional functions are available in an extended service menu. Access to the extended service menu is restricted to GfG service personnel.

The service menu is divided as follows:

System settings: This is where general settings for the RS485 bus interface or the analog interface, the language, the display contrast, the tolerance band and the horn are found.

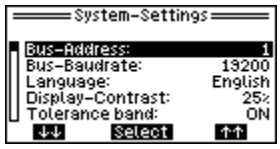
Sensor settings: The settings required for sensor replacement and the measuring range selection can be found here.

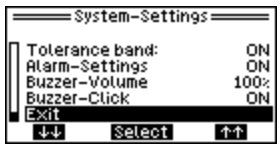
Alarm settings: This is where alarm limit values can be configured.

Simulation of measured values: To test the output signal interface and the downstream signal processing, measured values can be generated in this menu without test gas.

These setting options are described in more detail in the following subsections.

4.4.2.1 System settings:





If the transmitter has an RS485 bus interface, the **bus address** can be set in the range from 1 to 247 (0=inactive). The same bus address must not be used more than once in the same bus segment.

Bus baud rate can be set to 9600, 19200 or 38400 baud. By default it is set to 19200 Baud. For very long communication lines, the baud rate can be reduced to 9600 baud and increased to 38400 baud if there are many nodes on the bus. Within a bus segment, the baud rate for all nodes on the bus has to be set to the same value.

The **Language** can be set to German or English and affects all display readings, especially the menus.

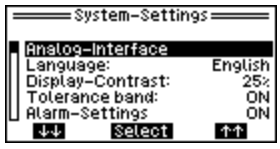
Display contrast can be adjusted from 0 to 100 %. This value can vary from display to display and is usually set to 25...40 %.

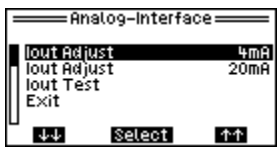
Tolerance band can be "ON" or "OFF". When set to "ON" (standard), slight signal deviations from zero gas are displayed as 0 ppm or 0.0 % LEL. The actual measured value is only displayed if the tolerance band is exceeded or undercut. In the "OFF" setting, the actual measured value is always displayed.

Alarm Settings activates the alarm function and the associated service menu for alarm configuration.

Horn volume can be set from 0 to 100 %, but is only of interest if the transmitter is used for local gas hazard alarms.

Click Sound can be "ON" or "OFF". In the "ON" setting (default), the internal horn emits a short click sound each time a button is pressed.



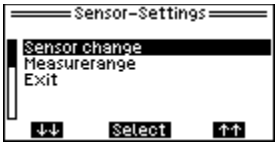


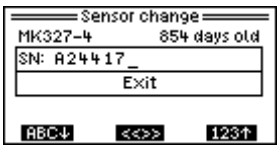
If the transmitter has an analog 4-20mA (or 0.2-1mA) interface, the current interface can be adjusted and tested in the extended service menu under Analog Interface.

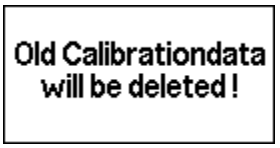
Iout adjustment: Attention!!! The adjustment of the current interface may only be carried out with the aid of a very accurate current measuring instrument.

Iout test: The current output ranging from 0.5 to 24.5 mA can be tested here. Attention!!! Connected controllers may react to these test levels.

4.4.2.2 Sensor settings:





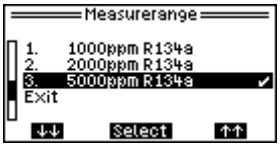


The following sensor-related settings are only possible in the extended service menu:

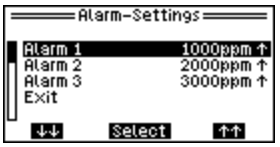
Sensor replacement: If the gas sensor is worn-out and is to be replaced by a new gas sensor of the same type (MK..), the serial number of the new gas sensor must be entered here. After completion of the entry, the Calibration data of the old sensor are deleted and replaced by standard values. The zero point and gas sensitivity of the new gas sensor must be adjusted in any case.

Measuring range: The transmitter will be delivered by GfG with the measuring range requested by the customer. If, however, a different measuring range is requested later on and additional measuring ranges are available for this sensor, a new measuring range can be selected in this menu item.

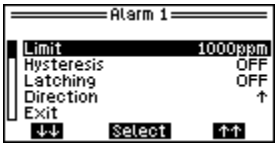
Due to the different gas types, the calibration values of the previous measuring range are not taken over. Therefor, if a different measuring range or gas type is selected, the zero point and the gas sensitivity may have to be readjusted.



4.4.2.3 Alarm settings



Alarm1 to Alarm3: Selection of the alarm limit value to be configured.



These settings are available for all three alarms:

Threshold: Setting the alarm limit value.

Hysteresis: Adjustable switch-off hysteresis.

Latching: If latching is activated, the alarm remains active until acknowledged.

Direction: Setting whether an alarm is to be triggered when the alarm threshold is exceeded or undercut.

4.4.2.4 Simulation of measured values:

By means of the measured value simulation, the output signal interface, the measured value transmission and the downstream signal processing can be checked. For a limited time, measured values can be generated without the presence of a corresponding test gas.

In the beginning, the display will read the actual measured value. The simulation mode is not started until the left or right key is pressed. The maximum remaining simulation time is then displayed above the label of the control buttons. If the simulated value is changed using the left or right button, the remaining simulation time is reset to 5 minutes. The simulation mode can be stopped by pressing the middle button. If no key is pressed, the simulation mode is stopped after the remaining simulation time has elapsed and the system automatically switches to the measuring mode.

4.5 Indications and Notifications

4.5.1 Overview of status LED states and current output signals

The following table lists the different display states of the both status LEDs and the current output signals with reference to their meanings.

green LED	yellow LED	Current output	Description see section ...	
Off	Flashes at 1 Hz	0.0 mA	Indication of special states…	No. 001
Off	On	0.0 mA	Indication of special states…	No. 002
Off	On	1.2 mA	Indication of special states…	No.102...114
Single flash all 5 s	On	1.2 mA	Indication of special states…	No. 101
Flashes at 1 Hz	On	1.6 mA	Indication of special states…	No. 002, 003
On	Flashes at 1 Hz	2.0 mA	Indications in service mode...	No. 204, 205
On	Flashes at 1 Hz	2.4 mA	Indications in service mode...	No. 203
On	Flashes at 1 Hz	4-20 mA	Indications in service mode...	No. 201, 202
On	Single flash all 5 s	2.8-22 mA	Indications in measuring mode	No. 309
On	On	2.8 mA	Indications in measuring mode	No. 307, 308
On	Off	2.8-22 mA	Indications in measuring mode	No. 303…306
On	Flashes at 5 Hz	22 mA	Indications in measuring mode	No. 301, 302

4.5.2 Indication of special states (device start and fault)

The following table lists the states in which the yellow error LED is permanently lit and the 4-20 mA current output gives a signal ≤ 1.6 mA.
For the 0.2-1 mA current output, the signals in brackets apply (≤0.08 mA).

Behaviour at device start-up

No.	Display readings	green LED	yellow LED	Current output	Cause	Note/Explanation
001	Boot V1.12 GfG CS22 Error:Flash	Off	Flashes at 1 Hz	0.0 mA	An error was detected in the program memory during the memory test.	Restart the transmitter If error message reoccurs a firmware update is necessary.
002	Boot V1.12 GfG CS22 Verify	Off	On	0.0 mA	Program and memory tests within the first seconds of the device start	after approx. 4 seconds automatic transition to the initialization phase
003	V2.09 GfG CS22	Flashes at 1 Hz	On	1.6 mA (0.08 mA)	Initialisation phase of the transmitter	after approx. 3 seconds automatic transition to the sensor run-in phase
004	Warm up XX seconds remaining	Flashes at 1 Hz	On	1.6 mA (0.08 mA)	sensor run-in phase	after the time has expired, automatic transition into measuring mode

Behaviour on failure:

No.	Display readings	green LED	yellow LED	Current output	Cause	Note/Explanation
101	Sensor defective	Single impulse every 5 s	On	1.2 mA (0.06 mA)	Sensor no longer responds properly to gas. Possibly the sensor is too old.	Sensor has to be replaced
102	Supply voltage wrong	Off	On	1.2 mA (0.06 mA)	The supply voltage of the transmitter is too low or too high.	Check and readjust voltage supply
103	Fault Sensor Uk	Off	On	1.2 mA (0.06 mA)	Heating voltage for the sensor is too low or too high.	
104	Fault Sensor Rk	Off	On	1.2 mA (0.06 mA)	Heating resistance of the sensor is too low or too high.	Perhaps the wrong type of sensor or not connected correctly
105	Fault Sensor Ik	Off	On	1.2 mA (0.06 mA)	Heating current for the sensor is incorrect.	Perhaps sensor not connected correctly.
106	Temp. signal <MIN Temp. signal >MAX	Off	On	1.2 mA (0.06 mA)	Most likely the temperature measurement is faulty.	
107	Watchdog error	Off	On	1.2 mA (0.06 mA)	A Hardware error was detected while testing the external watchdog.	Restart the device. If the error message reoccurs, replace the device.
108	FLASH Error	Off	On	1.2 mA (0.06 mA)	An error was detected in the program memory during the memory test.	
109	RAM Error	Off	On	1.2 mA (0.06 mA)	A faulty RAM was detected during the memory test.	
110	EEPROM error1 EEPROM error2 EEPROM error2c EEPROM error1+2 EEPROM error1<>2	Off	On	1.2 mA (0.06 mA)	Error in the parameter memory or accessing the external parameter memory chip.	
111	Wrong PCB type	Off	On	1.2 mA (0.06 mA)	An invalid type of circuit board or a circuit board error has been detected.	
112	Digipoti error	Off	On	1.2 mA (0.06 mA)	A hardware error was detected in the digital potentiometer.	
113	ADC error 1 ADC error 2	Off	On	1.2 mA (0.06 mA)	An error was detected on the analogue/digital converter.	
114	Programexecution error	Off	On	1.2 mA (0.06 mA)	A logical flow error was detected during program processing.	

4.5.3 Signals in service mode and during sensor adjustment

The following table lists the states in which the green operation LED is permanently lit and the 4-20 mA current output delivers a signal of 2.0...2.4 mA
For the 0.2-1 mA current output, the signals in brackets apply (0,10…0,12mA).

No.	Display readings	green LED	yellow LED	Current output	Cause	Note/Explanation
201	Adjustment Zero point (ZERO potentiometer)	On	Flashes at 1 Hz	4-20 mA (0,2-1 mA)	AutoCal program for zero point adjustment was activated with ZERO potentiometer	Test gas adjustment is done using the ZERO potentiometer
202	Adjustment Sensitivity (SPAN potentiometer)	On	Flashes at 1 Hz	4-20 mA (0,2-1 mA)	AutoCal program for sensitivity adjustment was activated with SPAN potentiometer	Calibration gas setting is done using the SPAN potentiometer
203	Menu item	On	Flashes at 1 Hz	2.4 mA (0.12 mA)	The service menu was activated using the buttons	Select menu item. If no entry is made for one minute, the system automatically returns to measuring mode
204	Adjustment Zero point	On	Flashes at 1 Hz	2.0 mA (0.10 mA)	The Zero point adjustment was activated using the buttons	AutoCal adjustment of the zero point
205	Adjustment Sensitivity	On	Flashes at 1 Hz	2.0 mA (0.10 mA)	The Sensitivity adjustment was activated using the buttons	AutoCal adjustment of the sensitivity

4.5.4 Indications in measuring mode

The following table lists the states in which the green operation LED is permanently lit and the 4-20 mA current output delivers a signal of 2.8...22 mA
For the 0.2-1 mA current output, the signals in brackets apply (0.14…1.1 mA).

No.	Display readings	green LED	yellow LED	Current output	Cause	Note/Explanation
301	↑↑↑ permanently	On	Flashes at 5 Hz	22 mA (1.1 mA)	The gas concentration has exceeded the measuring range of the transmitter electronics.	If flammable gases are to be detected: Explosion Hazard!!!
302	↑↑↑ permanently	On	Flashes at 5 Hz	22 mA (1.1 mA)	The gas concentration has clearly exceeded the measuring range (Gas ≥ 112.5 % MR)	If flammable gases are to be detected: Explosion Hazard!!!
303	↑↑↑ alternating with the measured value	On	Off	20-22 mA (1-1.1 mA)	The gas concentration has exceeded the measuring range (100...112 % MR)	If flammable gases are to be detected: Explosion Hazard!!!
304	Measured value	On	Off	4-20 mA (0.2-1 mA)	Fault-free measuring operation	
305	Measured value	On	Off	3.2-4 mA (0.16-0.2 mA)	Falling below the measuring range (−5.0…0.0 % MR)	
306	Measured value alternating with ↓↓↓	On	Off	2.8-3.2 mA (0.14-0.16 mA)	Falling below the measuring range (−7.5…-5.0 % MR)	Zero point adjustment is advisable
307	Permanently ↓↓↓	On	On	2.8 mA (0.14 mA)	Falling below the Measuring range (below -7.5 % MR)	Zero point adjustment is necessary
308	Permanently ↓↓↓	On	On	2.8 mA (0.14 mA)	Measuring signal has fallen below the measuring range of the transmitters electronics	Zero point adjustment is necessary and sensitivity has to be checked
309	*Sensor replacement required*	On	Single impuls every 5 s	2.8-22 mA (0.14-1.1 mA)	Expected operating life of the sensor exceeded.	Sensor replacement or adjustment required

4.5.5 Priority of signals and messages in measuring mode

The status indicators with lower priority are overwritten by the indicators with higher priority. The states of lower priority are not reset.

Priority	Condition	Description see section …	
▼	significant overrange	Indications in measuring mode	No. 301, 302
	slight overrange	Indications in measuring mode	No. 303
	Underrange	Indications in measuring mode	No. 305…308
	Sensor replacement	Indications in measuring mode	No. 309

The sensor error No. 101 and the transmitter faults No. 102...114 suspend the measuring operation with their respective messages.

4.6 Fault, Cause, Remedy

Fault	Cause	Remedy
Zero point can no longer be adjusted	Sensor defective	Replace sensor
Sensitivity can no longer be adjusted	Sensor defective	Replace sensor
Output current has dropped to 0 mA	Fuse or electronics defective	Replace printed circuit board
	Connection interrupted	Reconnect

5 Annex

5.1 Cleaning and Care

External soiling of the transmitter housing 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 inspection, function checks and system checks as well as repair of the gas warning system. In Germany, the following standards apply: "DGUV Information 213-057 (leaflet T 023 / previously BGI 518 Section 9)".

5.2.1 Visual inspection

The visual inspection should be carried out regularly, with a maximum interval of one month, and should include the following activities:

- Check of the operating LED and the status messages,
  "e.g. operating LED "On", alarm and fault LEDs "Off"
- Check for mechanical damage and external soiling

5.2.2 Function Check

The function check can be carried out at intervals that depend on the gas hazard to be monitored. The intervals between checks should not exceed 4 months. In Germany, this maximum inspection interval is defined in regulation T 023 of the Employer's Liability Insurance Association BG RCI.

It comprises the following activities:

- Visual Inspection according to section 5.2.1 of this operations manual
- Control and evaluation of the measured value displayed
- Triggering of the alarm thresholds
- Triggering of test functions for signalling elements as well as optical and acoustic signal transmitters without triggering switching functions
- Control of saved messages, faults and maintenance requirements

5.2.3 System check (Proof Test)

The system check has to be carried out at regular intervals. The period may not exceed 1 year. It comprises the following activities:

- Functional check according to section 5.2.2 of this operations manual
- Checking all safety functions, including the triggering of switching functions
- Checking the parameter settings by target/actual comparison
- Control of the reporting and registration facilities

5.2.4 Repair

The repair includes all maintenance and replacement work. They may only be performed by the manufacturer and by persons authorized by the manufacturer GfG Gesellschaft für Gerätebau mbH. Only original spare parts and original assemblies tested and approved by the manufacturer may be used.

5.3 Sensor replacement

To change the sensor the transmitter cover has to be removed. In the de-energized state, the cables of the sensor then can be removed from the connection terminals 6...8. Then the printed circuit board has to be pulled out of the guidance rails so that the old sensor can be unscrewed. The replacement sensor is installed in the reverse order. Only a sensor of the same type may be used as a replacement sensor. After installation and commissioning, its serial number must be entered in the service menu of the transmitter.

5.4 Notes on the environmentally friendly disposal of used parts

According to §11 of the general terms and conditions of GfG, the buyer of the device assumes the obligation to dispose of the device or device components in an environmentally friendly manner according to §§11, 12 ElektroG. On request, the proper disposal can also be carried out by GfG in Dortmund.

5.5 Accessories and Spare Parts

	Name	Part No.
1.	Calibration adapter for the transmitters CC22, ZD22, CS22, CI22	2000209
2.	Test cable with service plug for the transmitters CC22, ZD22, CS22, CI22	2220201
3.	Replacement sensor MK144-5 for CH_4 and C_3H_8	upon request
4.	Replacement sensor MK147-5 C_2H_6O and C_3H_6O	upon request
5.	Replacement sensor MK322-4 for R22	upon request
6.	Replacement sensor MK327-4 for R134a, R143a, R245fa, R404A, R407C, R410A and R507A	upon request
7.	Replacement sensor MK328-5 for C_6H_{14}	upon request
8.	Replacement sensor MK370-6 for NH_3	upon request

5.6 Lower explosion limits (LEL) of gases and vapours

LEL values according to DIN EN 60079-20-1:2010					
4.0 % v/v H_2	hydrogen	(CASRN 1333-74-0)	6.0 % v/v CH_4O	methanol	(CASRN 67-56-1)
4.4 % v/v CH_4	methane	(CASRN 74-82-8)	3.1 % v/v C_2H_6O	ethanol	(CASRN 64-17-5)
2.3 % v/v C_2H_2	acetylene	(CASRN 74-86-2)	2.5 % v/v C_3H_6O	acetone	(CASRN 67-64-1)
2.3 % v/v C_2H_4	ethylene	(CASRN 74-85-1)	3.1 % v/v $C_3H_6O_2$	methyl acetate	(CASRN 79-20-9)
2.4 % v/v C_2H_6	ethane	(CASRN 74-84-0)	2.7 % v/v $C_3H_6O_2$	ethyl formate EtF	(CASRN 109-94-4)
1.7 % v/v C_3H_8	propane	(CASRN 74-98-6)	2.0 % v/v C_3H_8O	isopropyl	(CASRN 67-63-0)
1.4 % v/v C_4H_{10}	butane	(CASRN 106-97-8)	1.5 % v/v C_4H_8O	methyl ethyl ketone MEK	(CASRN 78-93-3)
1.1 % v/v C_5H_{12}	pentane	(CASRN 109-66-0)	2.0 % v/v $C_4H_8O_2$	ethyl acetate	(CASRN 141-78-6)
1.0 % v/v C_6H_{14}	n-hexane	(CASRN 110-54-3)	1.4 % v/v $C_4H_{10}O$	n-butanol	(CASRN 71-36-3)
0.85 % v/v C_7H_{16}	heptane	(CASRN 142-82-5)	1.2 % v/v $C_6H_{12}O$	methylisobutylketone MIBK	(CASRN 108-10-1)
0.70 % v/v C_9H_{20}	nonane	(CASRN 111-84-2)	1.0 % v/v C_7H_8	tolenel	(CASRN 108-88-3)

5.7 Sensor Specification

MK327-4 Chemisorption sensor for refrigerant R134a				
Measuring ranges:	0-1000 ppm	0-2000 ppm	0-5000 ppm	R134a
Resolution:	5 ppm	5 ppm	5 ppm	R134a
Tolerance band:	±30 ppm	±30 ppm	±30 ppm	R134a
Adjustment time:	T50 ≤ 5 s or T90 ≤ 15 s			
Expected lifetime:	5 years			

MK327-4 Chemisorption sensor for refrigerant R438A		
Measuring range:	0-1000 ppm	R438A
Resolution:	5 ppm	
Tolerance band:	±30 ppm	
Adjustment time:	T50 ≤ 5 s or T90 ≤ 15 s	
Expected lifetime:	5 years	

MK327-4 Chemisorption sensor for refrigerant R449A		
Measuring range:	0-1000 ppm	R449A
Resolution:	5 ppm	
Tolerance band:	±30 ppm	
Adjustment time:	T50 ≤ 5 s or T90 ≤ 15 s	
Expected lifetime:	5 years	

MK327-4 Chemisorption sensor for refrigerant R1234yf		
Measuring range:	0-1000 ppm	R1234yf
Resolution:	5 ppm	
Tolerance band:	±30 ppm	
Adjustment time:	T50 ≤ 5 s or T90 ≤ 15 s	
Expected lifetime:	5 years	

MK327-4 Chemisorption sensor for refrigerant R1234ze		
Measuring range:	0-1000 ppm	R1234ze
Resolution:	5 ppm	
Tolerance band:	±30 ppm	
Adjustment time:	T50 ≤ 5 s or T90 ≤ 15 s	
Expected lifetime:	5 years	

MK327-4 Chemisorption sensor for refrigerant R410A		
Measuring range:	0-1000 ppm	R410A
Resolution:	5 ppm	
Tolerance band:	±30 ppm	
Adjustment time:	T50 ≤ 5 s or T90 ≤ 15 s	
Expected lifetime:	5 years	

MK327-4 Chemisorption sensor for refrigerant R448A		
Measuring range:	0-1000 ppm	R448A
Resolution:	5 ppm	
Tolerance band:	±30 ppm	
Adjustment time:	T50 ≤ 5 s or T90 ≤ 15 s	
Expected lifetime:	5 years	

MK327-4 Chemisorption sensor for refrigerant R407C		
Measuring range:	0-1000 ppm	R410C
Resolution:	5 ppm	
Tolerance band:	±30 ppm	
Adjustment time:	T50 ≤ 5 s or T90 ≤ 15 s	
Expected lifetime:	5 years	

MK327-4 Chemisorption sensor for refrigerant R507[A]		
Measuring range:	0-1000 ppm	R507[A]
Resolution:	5 ppm	
Tolerance band:	±30 ppm	
Adjustment time:	T50 ≤ 5 s or T90 ≤ 15 s	
Expected lifetime:	5 years	

MK327-4 Chemisorption sensor for refrigerant R454B			
Measuring ranges:	0-1000 ppm	0-2000 ppm	R454B
Resolution:	5 ppm	5 ppm	
Tolerance band:	±30 ppm	±30 ppm	
Adjustment time:	T50 ≤ 5 s or T90 ≤ 15 s		
Expected lifetime:	5 years		

MK327-4 Chemisorption sensor for refrigerant R404A			
Measuring ranges:	0-1000 ppm	0-2000 ppm	R404A
Resolution:	5 ppm	5 ppm	
Tolerance band:	±30 ppm	±30 ppm	
Adjustment time:	T50 ≤ 5 s or T90 ≤ 15 s		
Expected lifetime:	5 years		

MK327-4 Chemisorption sensor for refrigerant R23		
Measuring ranges:	0-1000 ppm	R23
Resolution:	5 ppm	
Tolerance band:	±30 ppm	
Adjustment time:	T50 ≤ 5 s or T90 ≤ 15 s	
Expected lifetime:	5 years	

MK328-5 Chemisorption sensor for n-Hexane C_6H_{14}		
Measuring range:	0-100 % LEL	C_6H_{14}
Resolution:	0.5 % LEL	
Tolerance band:	±3 % LEL	
Adjustment time:	T50 ≤ 5 s or T90 ≤ 15 s	
Expected lifetime:	5 years	

MK370-6 Chemisorption sensor for ammonia NH_3 (refrigerant R717)					
Measuring ranges:	0-300 ppm	0-1000 ppm	0-3000 ppm	0-1.000 % vol.	NH_3
Resolution:	1 ppm	2 ppm	5 ppm	0.001 % vol. NH_3	
Tolerance band:	±20 ppm	±20 ppm	±20 ppm	±0.002 % vol. NH_3	
Adjustment time:	T50 ≤ 5 s or T90 ≤ 15 s				
Expected lifetime:	5 years				

5.8 Technical data

Type designation	**CS22**
Ambient Conditions	
Operating temperature:	-20 °C to +50 °C (sensor-dependent)
Storage temperature:	-25 °C to +60 °C (recommended 0 °C to +30 °C)
Humidity:	5 % RH to 90 % RH (sensor-dependent)
Pressure:	80 kPA to 120 kPA (sensor-dependent)
Power Supply	
Operating voltage:	24 Vdc (12 Vdc to 30 Vdc allowed)
Power consumption	for RS-485 and 0.2-1 mA version 4-20 mA Version
without display ***1**:	typically 50/62/86 mA@ 24 V/18 V/12 V max. 72/84/108 mA @24 V/18 V/12 V
with display ***1**:	typically 56/70/100 mA@ 24 V/18 V/12 V max. 78/92/122 mA @ 24 V/18 V/12 V
with display+horn ***1**:	typically 67/84/120 mA @ 24 V/18 V/12 V max. 89/106/142 mA @ 24 V/18 V/12 V
without display ***2**:	max. 66/82/115 mA @ 24 V/18 V/12 V max. 88/104/137 mA @ 24 V/18 V/12 V
with display ***2**:	typically 60/75/106 mA @ 24 V/18 V/12 V max. 82/97/128 mA @ 24 V/18 V/12 V
with display+horn ***2**:	max. 75/95/135 mA @ 24 V/18 V/12 V max. 97/117/157 mA @ 24 V/18 V/12 V
Fuse:	250 mA (not changeable)
Sensors	
Measuring range / gas	sensor-dependent
Gas feed:	diffusion
Value Processing	
Update rate	1 s
Ready delay:	5 s plus 120 s sensor run-in phase (warm-up)
Display & control elements	
Status LEDs	green = operation mode, yellow = fault or service
Display, buttons:	2.2” graphic display and 3 buttons (display version only)
AutoCal button:	for ZERO and SPAN adjustment (within the housing)
Potentiometer:	for ZERO and SPAN adjustment (within the housing)
Service Connector	
Type:	3.5 mm stereo jack socket (within the housing)
Analog output:	0.2...1.0 V corresponding to 0...100 % MR for sensor calibration
Digital input:	for configuration and firmware updates
Signal Output	
analogue:	4...20 mA (max. load: 400 Ω/650 Ω/150 Ω @24 V/18 V/12 V supply)
or analogue:	0.2...1 mA (max. load: 14K/9K3/14K5 @ 24 V/18 V/12 V supply)
or digital:	RS-485; Half duplex; 9600/19200/38400 Baud; Modbus protocol, Slide switch for 120 Ω terminating resistor,
Power cable	
Cable glands:	1 or 2 glands M16x1.5 (for cable diameter 4.5-10 mm)
Terminals:	4 double terminals (0.08 mm^2 to 2.5 mm^2 conductor cross-section)
Cable (analogue):	3-core e.g. LiYY 3x0.75...1.5 mm^2 or LiYCY
Cable (digital):	4-core e.g. LiYY 4x0.75...1.5 mm^2 or cable Y(St)Y 2x2x0.8 ***3**
Housing	
Enclosure protection type:	IP54 in accordance with IEC 60529
Material:	Plastic
Dimensions (H x W x D):	96 x 140 x 49 mm including sensor
Weight:	175 g or 220 g (version with display)
Approvals/Tests	
Electromagnetic compatibility:	DIN EN 50270:2006 Interference emission: Type class I Interference resistance: Type class II

***1:** For low power sensor MK147
***2:** For high power sensors MK144, MK322, MK327, MK328 and MK370
***3:** The cable Y(St)Y 2x2x0.8 is suitable for powering several bus transmitters via the same cable only for short cable runs. The maximum possible distance depends on the number and local distribution of the transmitters on the bus cable. More on this in section 3.3.

5.9 Declaration of Conformity

EU Declaration of Conformity

Transmitter
CS22

Edited: 31.05.2017 Amended: 16.10.2019

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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 **CS22** 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 testing laboratory AMETEK CTS Germany GmbH at Kamen has tested and certified the electromagnetic compatibility.

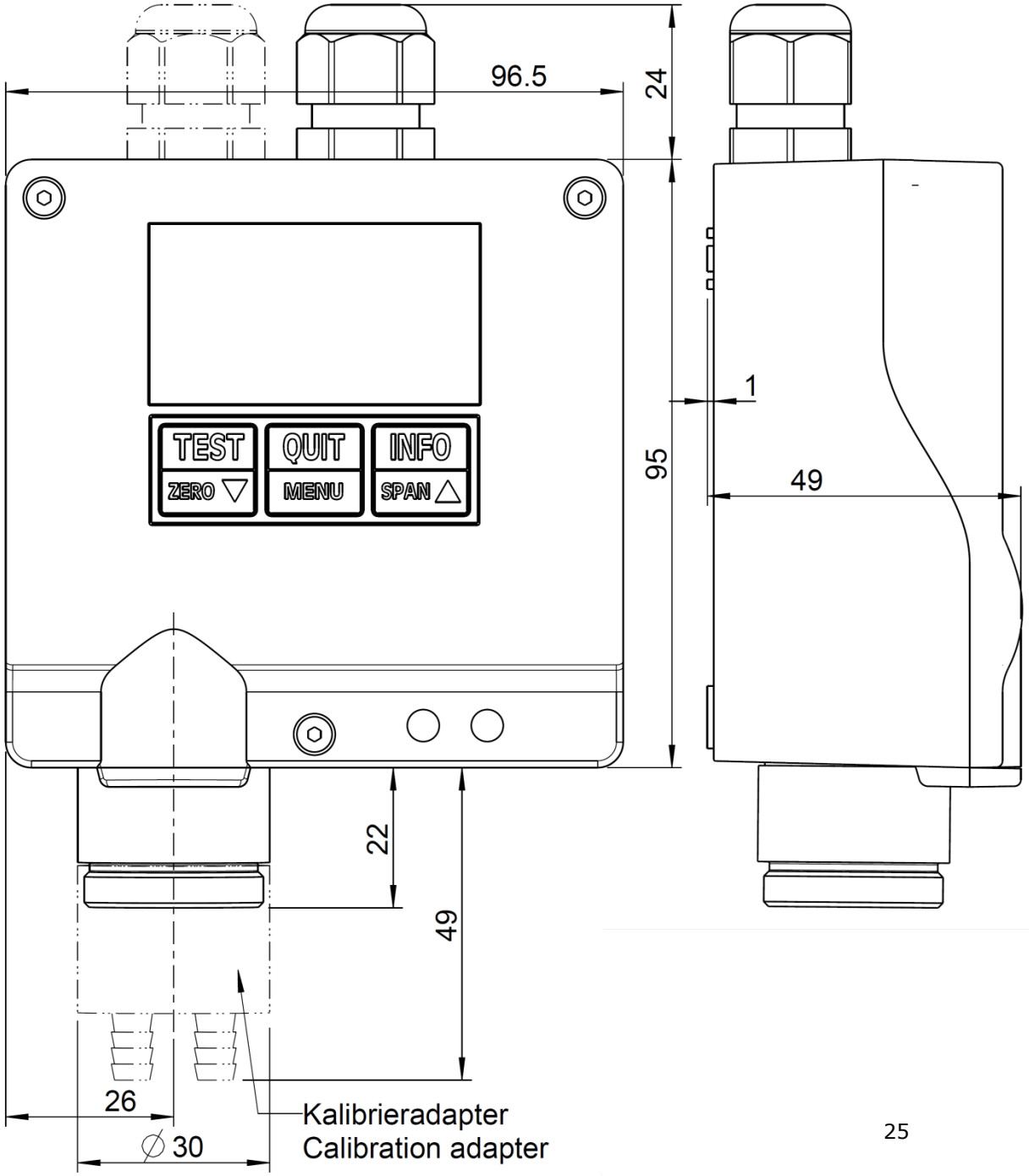
The directive 2011/65/EU is complied considering the following standard:

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

Dortmund, 16 October 2019

i.V.

B. Siebrecht
QMB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95
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49
TEST
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MENU
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SPAN
22
49
26
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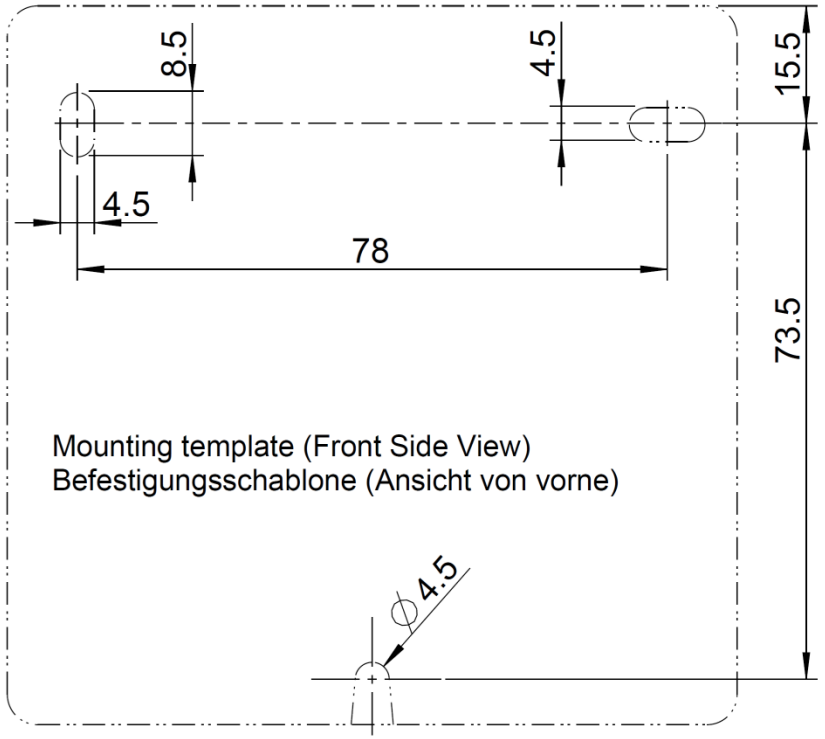
Kalibrieradapter
Calibration adapter


8.5
4.5
15.5
4.5
78
73.5
Mounting template (Front Side View)
Befestigungsschablone (Ansicht von vorne)
∅ 4.5