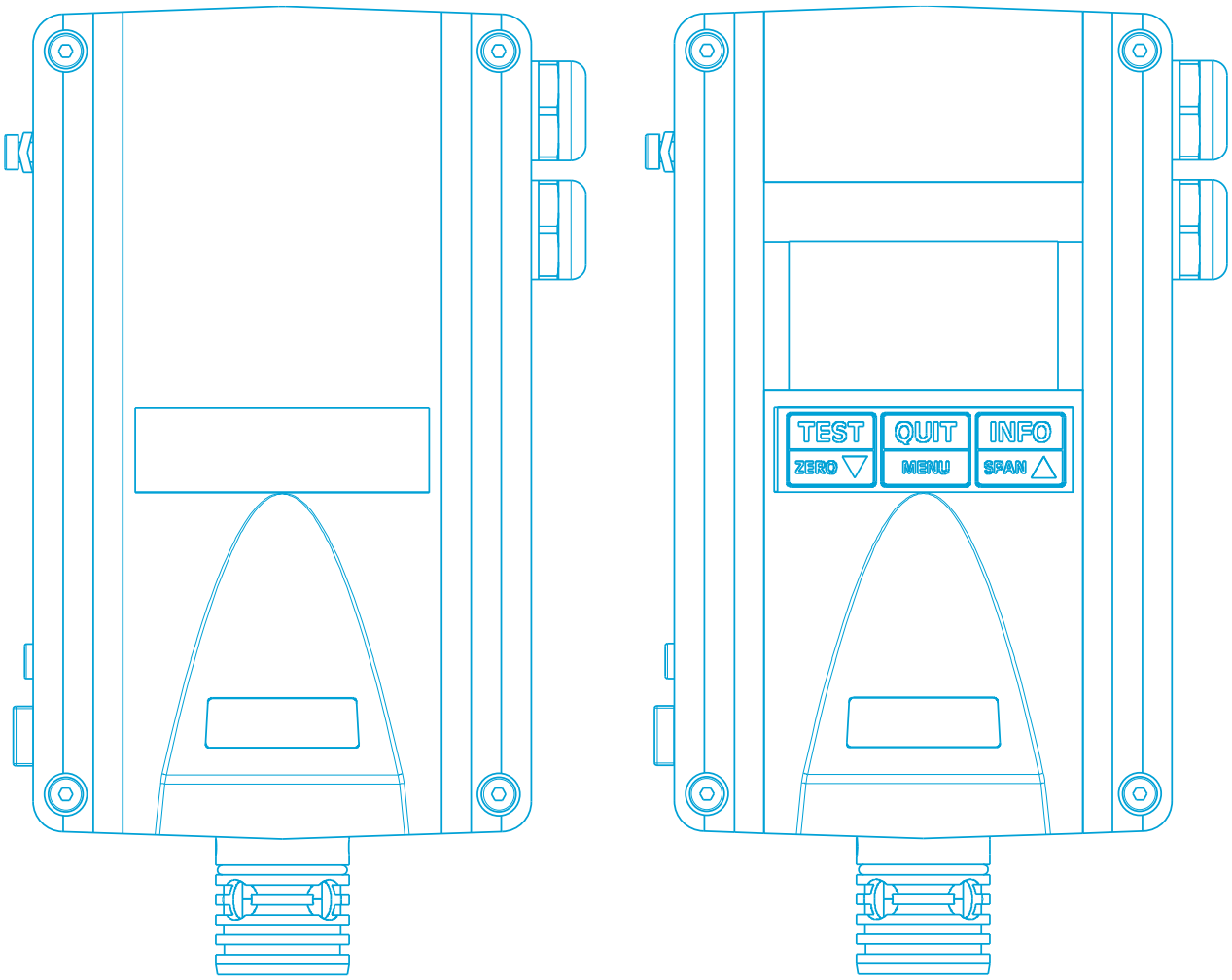
Operation Manual

Transmitter CC28



smart
GasDetection
Technologies

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

For your Safety

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

Operating instructions

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 (commissioning).

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

The CC28 transmitter (including CC28 D and CC28 DA) is approved for use in potentially explosive areas and holds a EU Type Examination Certificate issued by DEKRA Testing and Certification GmbH in accordance with 2014/34/EU guidelines.

Certificate: BVS 04 ATEX E 132 X

Designation: Ⓔx II 2G Ex db eb mb [ib] IIC T4 Gb -20°C≤Ta≤+50°C

The transmitter is certified for use in potentially explosive areas with measuring function for explosion protection according to an EU Type Protection Certificate issued by DEKRA Testing and Certification GmbH in accordance with the 2014/34/EU guidelines.

Certificate: BVS 05 ATEX G 001 X

The test is based on DIN EN 60079-29-1 "Gas detection devices - Requirements for the operational behavior of devices for measurements of combustible gases" and DIN EN 50271 "Electrical devices for detection and measurement of combustible gases, toxic gases or oxygen - Requirements and tests for warning devices which use software and / or digital technologies".

⚠ **The EU Type Examination Certificate BVS 05 ATEX G 001 X includes the following sensors, measuring ranges and gases:**		
MK208-1, MK217-1	0 ... 100 % LEL	CH_4 (Methane), C_3H_8 (Propane)
MK208-1	0 ... 100 % LEL	C_9H_{20} (n-Nonane), C_3H_8O (Isopropanol)
MK217-1	0 ... 100 % LEL	H_2 (Hydrogen)
MK208-1	0 ... 4.00 vol %	NH_3 (Ammonia)

The functions marked with (#) are not part of the EU Type Examination Certificate BVS 05 ATEX G 001 X.

Surge voltages need to be avoided on all signal and supply terminals, as they could result in a loss of function of the transmitter.

General description

A fixed gas detection system consists of a transmitter and a controller (GMA). The transmitter and controller are connected via cable. The transmitter converts the gas concentration into an electrical measurement signal which it then transmits to the controller for further evaluation.

The CC28 D transmitter differs from the standard CC28 transmitter, as it features a display; the CC28 DA also features an acoustic alarm in addition to a display.

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

- Indication of concentration on the display or remote control
- Easy adjustment using the control keys or remote control without opening the housing
- Compensation of temperature influences
- Ex protection in temperature range of -20 to +50 °C
- Function test in temperature range (see sensor specification)
- Smart Sensor System – Sensor replacement using plug-in, preadjusted sensors
- Permanent status display (operation / fault) on the transmitter

Measurement method

The CC28 uses the catalytic combustions principle for operation (Figure **Fehler! Textmarke nicht definiert.**). The gas and air mixture (or vapor and air mixture) diffuses through the sinter metal into the measuring chamber. The measuring chamber contains an active and a passive sensor element. The heated active sensor burns (oxidizes) the measured gas arriving in the chamber on its catalyst layer. This increases the temperature of the sensor and thus results in a change of the electrical resistance. The gas concertation is measured according to this change in resistance. The passive sensor is exposed to the same environmental conditions as the active sensor and is used to compensate for environmental influences, such as temperature changes.

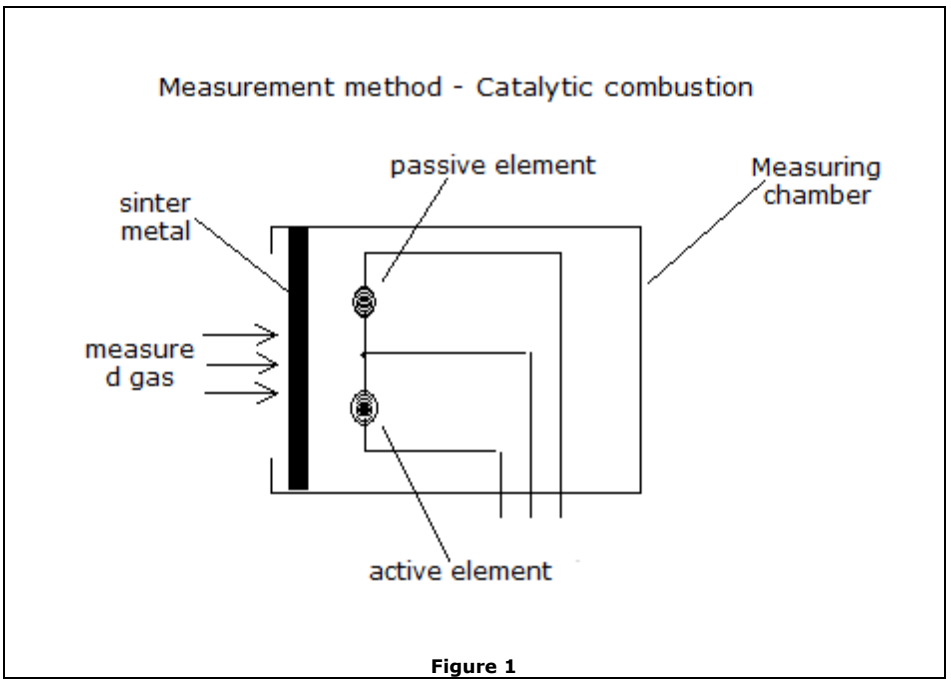
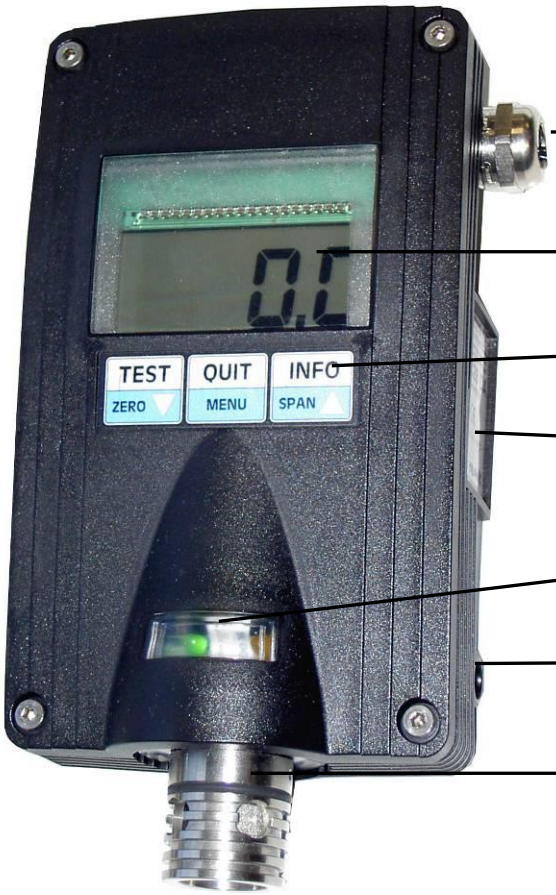


Figure 1

Device design

CC28 D



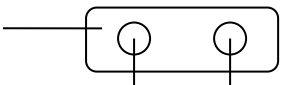
Cable gland

Display

Control buttons

Type label indicating date of production
e.g. SN:0504xxxx (05=year, 04=month)

Status display



green yellow
Operation in case of malfunctions

Buzzer
(only on CC28 DA)

Sensor housing

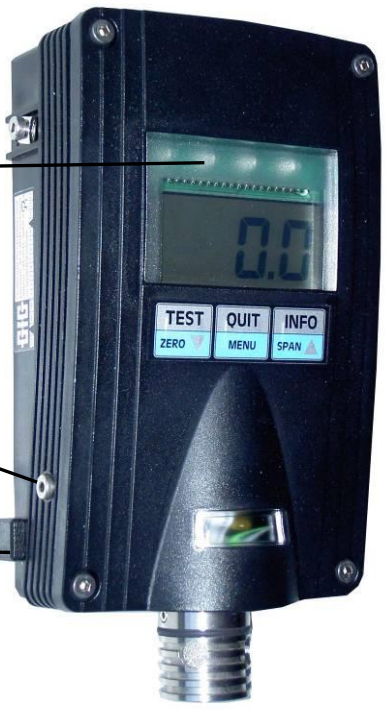
CC28 DA

Potential equalization

Alarm LEDs

Button for quick adjustment
(AutoZero button)
behind safety screw

Terminal for
remote control



The transmitter type is indicated on the type label. The sensor and sensor board are installed in the sensor housing. The sensor board carries the components for the sensor circuitry. The electric zero point and display sensitivity (adjustment) can be set via the integrated display or the remote control RC2. For a quick zero point check, you can also use the securely attached button at the side of the transmitter. The

electronics of the main painted circuit board convert the measuring signal into a linear measured value output (4...20mA).

Servicing a transmitter without display (CC28) may only be done using the remote control RC2.
The remote control RC2 cannot be used in potentially explosive environments.

The buttons, functions and indications of the remote control RC2 are identical to those of the transmitter.

Mounting location of the transmitter

The housing was tested according to EN 60079-0 table 8 for devices of Group II with an impact energy of 4 Joule (low grade of mechanical dangers). The housing must be protected from heavy impacts.

It is important to know about the environmental conditions in detail and take them into account when choosing a suitable mounting location. To achieve representative measuring results, the following aspects need to be considered:

- **ventilation conditions**
- **density of the gases**

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.

If the transmitter has to be installed in a location where flow rates of >3.0 m/s are expected, a wind shield is mandatory. It is generally advisable to prevent the flow from hitting the bottom side (sensor side) of the transmitter. If flow at the bottom side of the transmitter cannot be avoided, falsification of the displayed values that exceed the tolerance according to EN 60079-29-1 may occur.

The majority of combustible gases and vapors has higher density than air, which means the transmitter must be installed near the floor. For gases with lower density than air, the transmitter must be installed close to the ceiling. Some substances have a density that is very similar to that of air. In this case, the transmitter should be installed at "breathing height" approximately 1.5 m from the ground. The following table shows the relative density of some selected gases and vapors. Information on other substances is available on request.

Gas / vapor	relative density in relation with air	Recommended mounting position
Hydrogen, methane und ammonia	lighter	close to ceiling
Ethylene, ethane, acetylene, methanol	approximately the same	at "breathing height"
Propane, butane, hexane, nonane, propanol, toluol, ethyl acetate, acetone, diethyl ether, all other organic solvents and fuel compounds	heavier	close to floor

The following external influences need to be taken into account as well:

- **Rain water, water surges, dripping water, condensate and**
- **the dust concentration in the ambient air**

The transmitter is generally protected against the ingress of water and dust (IP64).

If the transmitter has been exposed to the environmental conditions representative of its IP rating, it must be assumed that its measuring function is compromised. The calibration intervals must therefore be shortened and the maintenance requirements must be adjusted.

- **Regularly check the device for dust and water sediment, especially at the sensor**

In very harsh conditions, the transmitter can be protected from damages with accessories that were specifically designed for this purpose.
GfG recommends a separate weatherproof housing which can be acquired as an accessory.

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.

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. You may only deviate from the specified vertical mounting position by a maximum of 15°.

The transmitter must be connected to the controller according to the connection diagram (p. 27). To install the device, remove the four special screws and take of the transmitter's cover. The housing is attached with two screws.

The inside of the housing contains the painted circuit board, which is enclosed in a casting compound (casting encapsulation "m"). The connection compartment (increased safety "e") used to connect the device to a controller, is located to the side of the PCB.

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. Always use shielded cables (e.g. LIYCY 3 x 1,5 mm^2) for installations. The wire cross-section depends on the length of the connecting cable. Cables with a cross-section of 0.75 mm^2 may be used for short distances of up to 200 m. For longer distances, the cable cross section must be 1.5 mm^2. The length of the cable may not exceed 1000m.
The shield is fixed to the M16x1.5 fitting. If the transmitter is attached to any conductive material (such as a steel beam), you will have to carry out a potential equalization. Only the transmitter may be installed within potentially explosive areas - the controller and the supply unit must be installed outside of it.

The transmitter may not be connected directly to a DC supply grid.

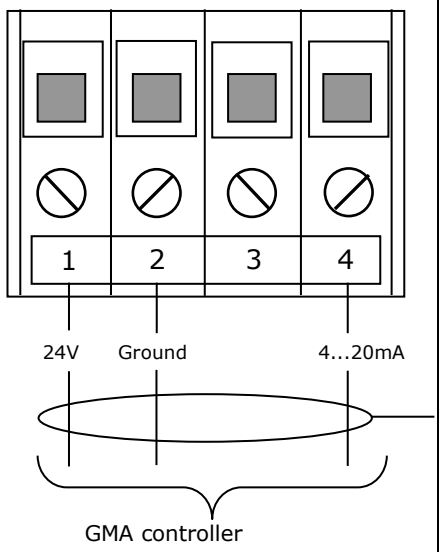
You may only install the transmitter if there are no ambient gases.
The transmitter may only be opened while it is de-energized.

If the transmitter is not powered by the GMA controller, the operational voltage of its power supply may not exceed 30 V DC.

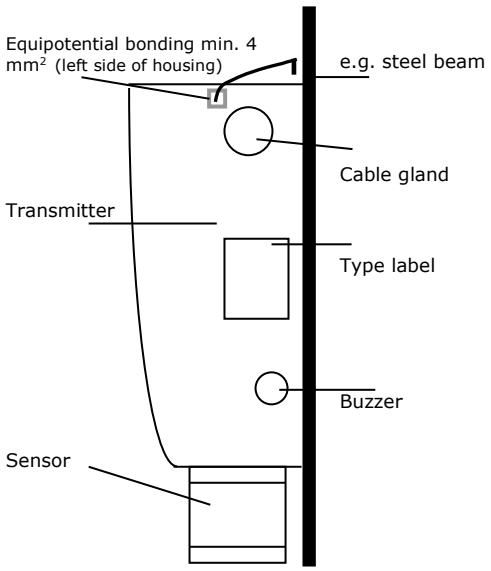
The housing cover must be closed and screwed back on after the installation process.

Ensure that there are no voltages exceeding the maximum voltage U_m (indicated on the type label) occurs at the transmitter terminals at any time, even in case of faults.
U_m = 250 V AC or U_m = 45 V DC

Connection diagram



Equipotential bonding



Commissioning

The CC28 transmitter's functionality and display are tested before dispatch. Calibration is carried out with appropriate test gases. But deviations may occur due to transport, mounting and environmental factors. This is why the gas detection system must be commissioned and tested for proper functioning by a trained specialist or a person approved by the manufacturer.

After activating the gas detection system, 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 parameters, including a simultaneous memory check
- read and evaluate the sensor parameters, including a simultaneous memory check
- stabilize the sensors

A memory test is performed automatically during the first six seconds of the start-up phase. This is indicated by the current interface emitting 0mA and the yellow and green LEDs being lit. When the process is completed, the current interface will emit 1.6mA, the fault LED will be lit and the operation LED will flash slowly. The display will first show LoAd, and then AdJ. The CC28 D and CC28 DA will then successively display the measuring unit, type of gas, measuring range, alarm threshold and calibration gas concentration. For the CC28, this information will be displayed on the remote control RC2.

The CC28 will automatically switch to measuring mode after the 2-minute start-up phase of the sensor - the display will show a 120 second countdown.

If the device encounters an error in the starting phase, it will switch to fault mode. The current interface will then emit 1.2mA, and an error code will be displayed. (SYS Err.). Both the operation and fault LEDs will be continuously lit. In the display version, the alarm LEDs and display backlight will alternately flash.

Note:
When a sensor is used for the first time or after a replacement sensor has been installed, the measuring range might be exceeded or undershot(____ or ----). If this is the case, the device's zero point must be adjusted via the automatic zero point adjustment (ZERO).

If a SCAL Err. should occur (acknowledgeable), the sensor must be readjusted (SPAN) or, if applicable, the sensor's measuring range adjusted in the service menu.

The zero point needs to be checked after a stabilization time of min. 30 minutes. After the stabilization, the display should have adjusted at 0 . If this is not the case, the zero point needs to be readjusted (settings see p. 12)

Measuring mode

In measuring mode, the digital display will indicate the current measured gas concentrations. If the device is used in temperatures below -20°C, the digital display is no longer guaranteed to function properly.
The displayed values of the device's display and any connected remote controls are always identical.
The gas concentration is measured continuously. The CC28 will immediately detect if thresholds are exceeded (only on CC28 DA) or if there are ambiguities in the sensor signal, and will visually alert you. Functions of the electronics, such as the parameter memory or the sensor are continuously monitored. In normal, fault-free measuring mode, the green operation LED is lit permanently and the yellow fault LED is off.

To indicate that the CC28 D or CC28 DA are in measuring mode, the display will briefly replace the indication of the gas concentration with that of the gas unit and type of gas in one minute intervals.

Falling below the measuring range

Measured values below the zero point are displayed as negative numeric values. The current interface displays values between 4.0 and 2.8 mA, depending on the measured value.
If the measured value falls below –7,5% of the measuring range, this condition is indicated by the fault LED being continuously lit and the display " ____" being shown alternating with the negative measured value. The current interface will continuously emit 2.8mA. This is considered a fault.
If the measured value falls below -25.0% of the measuring range, this condition will be indicated by the fault LED being lit and ____ being displayed continuously. This is considered a fault.

If the measured signal falls below the measuring range of the transmitter electronics, " ____" will be displayed continuously and the current interface will emit 1.2mA. This is considered a fault.

Exceeded measuring range

If the measured value exceed the measuring range between 100 % and 112.0 %, the display will indicate this by showing ---- alternating with the measured value. The current interface will display values between 20 and 22mA (≥21,6mA) .
If the measuring range is exceeded by 112.0% of the measuring range, an ambiguity alarm will be triggered. ---- will flash on the display and the current interface will emit 22mA.

Measured values within the range of the zero point

The CC28 will suspend smaller measurement deviations in the range of the zero point between -0.2…+0.2 vol % NH_3 or between -2,5…+2,5% LEL of all other gases. It will instead display a value of 0.0. To avoid fluctuations, the displayed value is adjusted to the actual measured data, up to double the value of this zero point range. This behavior is similar during current output. The zero point range is by default turned on by the manufacturer. The manufacturer can turn this feature of upon customer request. This has to be declared during the order of the device or sensor.

Control buttons

The buttons on the transmitter and on the remote control are functionally identical. The displays of the CC28 D and CC28 DA are also identical to the remote control's.

Display, LED and buzzer test

Briefly pressing the TEST / ZERO ▼ button while the device is in measuring mode will start a display and LED test. The test will activate all LEDs and every element of the display (8.8.8.8)for two seconds. The CC28 DA will additionally activate the alarm LEDs and the buzzer briefly.

Indication of operating parameters

If you press the INFO / SPAN ▲ button while the device is in measuring mode, the following important operational parameters are automatically displayed.

The same information is displayed when the device is turned on.

	Display / Example	Adjusting the display
1a	UEL%	Measuring unit (displayed in % of LEL)
1b	UOL	Measuring unit (displayed in vol %)
2	CH4	Type of gas
3	SCAL 100	Measuring range (final value in "measuring unit")
4	CL%AS 80.0	Calibration concentration (value in "measuring unit")
5	A1 20.0	Threshold alarm (value in "measuring unit")
6	A2 40.0	Threshold alarm (value in "measuring unit")

Value in "measuring unit" means that die displayed value is either indicated in % LEL or vol %. The unit vol % is only used when ammonia is measured.

Threshold alarm (only on CC28 DA version)

The CC28 has two threshold alarms. An alarm is triggered as soon as the gas concentration exceeds (or falls below) the set alarm threshold (settings can be changed in the service menu). The alarm thresholds can be set in the service menu. Their factory settings are specified in the "Internal memory CC28" section of the Annex. The CC28 DA indicates threshold alarms by activating the row of LEDs above the display, the display backlight and a buzzer. When the first threshold alarm (A1) is exceeded, the display backlight and the row of LEDs are activated in slow alternation. The display will alternately show the current measured value and A1.

When the second threshold alarm (A2) is exceeded, the display backlight, the row of LEDs and the buzzer are activated in rapid alternation. The display will alternately show the current measured value and A2.

Resetting the threshold alarms can be done either automatically or manually (meaning with or without latching alarm), depending on the function settings in the service menu. If an alarm is set as non-latching, it will automatically be reset as soon as the measured value (minus the hysteresis) falls back below the alarm threshold.

The function of the buzzer is determined and cannot be changed: Activated with alarm 2, automatically canceled when values fall below second alarm threshold, can always be acknowledged. If the device is used in temperatures below -20°C, the buzzer is no longer guaranteed to function properly.

Pressing the QUIT MENU button will reset an alarm after the values fall below the alarm threshold.

Ambiguity alarm

Due to the measuring method, it is generally possible that the oxygen inside the sensor is used when a very high gas concentration is inserted, which would decrease the gas combustion at the sensor. This would result in the signal decreasing as well, even if the sensor is in a gas concentration well above its measuring range. To avoid wrong signal evaluation, the CC28 will alarm you when an ambiguous signal is detected.

This alarm is triggered when the measuring range is exceeded from 112% LEL up, as well as when a predefined signal increase speed is detected (Delta alarm).

When ambiguity alarms are triggered, the fault LED will flash rapidly. The CC28 will also activate its display backlight, the row of LEDs and the buzzer in quick alternation. Additionally, the display will show ---- (see also: Exceeding the measuring range).

The ambiguity alarm is by default a latching alarm and can only be reset by pressing the QUIT MENU button (or by pressing the AutoZero button for devices without display.) The measured value has to be back within the measuring range for this to be effective.

The transmitter cannot detect on its own if the danger of a potentially explosive gas mixture or an even higher gas concentration has passed. You will have to determine if the danger has passed with a portable detection device, that has been turned on outside of the hazardous area.

If the alarm has been triggered by a high gas concentration, the sensor's zero point and sensitivity have to be adjusted after the alarm has been reset. Consider that the zero point and sensitivity may change significantly within the first few days.

Sensor service life

Catalytic combustion sensors have a limited service life. The expected service life of the sensor for combustible gases used in a CC28 is approximately three to five years, depending on the operation conditions. A few month before reaching the service life limit, the transmitter will signal that the sensor should be replaced during the next planned maintenance. This is indicated by the fault LED flashing regularly and the display alternately showing CHnGi SEnS and the measured value. If the sensor is not replaced within the next months, the device will stop operating when the expected operating life of he sensor has been exceeded. The current interface will then emit 1.2mA, the yellow fault LED will be lit and the green operation LED will flash shortly in regular intervals.

Faults

If a fault within the transmitter is detected, the yellow fault LED will continuously be lit up, the current interface will emit 1.2mA and error codes SYS Err. or SEnS Err will be displayed. A fault occurs when:

- the sensor or the transmitter's electronics are defective
- errors occur during the self-test of the device
- no sensor is plugged in

For more possible causes, see "Indication of special conditions and faults", p. 21.
The yellow fault LED will turn off as soon as the fault is corrected.

Checking and AutoCal adjusting the zero point (ZERO)

This check can only be carried out in atmospheric air without interfering gas components. To perform the test in contaminated atmospheres, you can also use zero gas, which is free of any combustible components and interfering contaminations. In this case, you will have to insert the zero gas into the sensor without pressure using a flow adapter with a flow rate of approximately 0.5±0.1 l/min for at least 30 seconds You can also use zero gas with a RH of 0% directly from a compressed gas cylinder.
The zero point must be readjusted after changing the measured gas replacing a sensor. If the displayed value is anything but 0 while in measuring mode, the zero point will need to be corrected as well. When the displayed value remains constant, you can begin setting the zero point with the AutoCal program. The AutoCal program will then proceed to set the zero signal automatically.

Conditions

The automatic zero point adjustment can only be activated via the AutoZero button or the regular access code 0011, if the current displayed value is less than 25 % LEL.

Qualified users may activate the zero point adjustment with the access code 0055 at a displayed value of up to 35 % LEL. This access code should only be used by trained safety staff employed by the operator.

If the current displayed zero point exceeds the value of 35 % LEL at one point and you are absolutely sure that this is not caused by the presence of gas, a temporary hour code (valid for max. 1 h) can be activated in the menu item inFo in the service menu. This will allow you to access the zero point setting without restrictions.

Note:
This may be a sign of the sensor being damaged. It should be replaced as soon as possible.

Process

On devices without display, you will have to press the AutoZero button to discern if the measured value is within the tolerance range for zero adjustment (< 25 % LEL). If the measured value is higher than 25 % LEL when you press the AutoZero button, the device will stay in measuring mode - as indicated by the fault LED staying off. In this case, you can only carry out the zero point adjustment with a remote control.

To use the quick adjustment via the protected AutoZero button on the side of the housing, you will have to remove the screw above the button and then press the button for at least three seconds. The current output will change to 2.0mA, the fault LED will flash regularly and the third step of following description will be performed automatically.

Now, use the keyboard on the display or the remote control to follow these instructions in order:

1. Start the process by holding down the TEST / ZERO ▼ button for at least three seconds.
   The current output will emit a 2.0mA signal during the entire process and the fault LED will be lit continuously.
   The notification CodE will be displayed briefly.
2. Then, enter the numeric access code 0011 (or. 0055) . Use the buttons TEST / ZERO ▼ and INFO / SPAN ▲ to change the digit in your current position and confirm it with the QUIT / MENU button.
3. After you have entered the correct code, the display will alternate between showing the current measured value and 2Ero; the fault LED will flash. If the measured value stays constant for a predefined interval of time, the display will then alternate between showing 2Ero and AdJ for a few seconds. The hardware will internally set its zero points during this time. If this is successful, the new zero point is set, the AutoCal closes automatically after displaying SAVE and the device switches back into measuring mode.

Notes:
If the current measured value is outside the permitted thresholds for the used access code, the display will briefly show FAiL during the third phase and the device will switch back to measuring mode.

The AutoCal program can be shortened to a constant measured value by pressing the TEST / ZERO ▼ button or the AutoZero button during the check. The hardware will then begin the zero point setting / adjustment.

To cancel the AutoCal program during the waiting time without adjusting the zero point, briefly press the TEST / ZERO ▼ button or the AutoZero button. The display will briefly show ESC.

After completing the quick adjustment via the button on the side of the device, the screw and sealing have to be screwed back in again and tightened until stop.

The following error notifications may occur during the zero point adjustment:

Display	Note	Fault LED
CAL Err.2	The gas signal is not stable.	rapid flashing
CAL Err.3	The zero point is outside the permitted tolerance range.	

All error notifications must be confirmed with QUIT / MENU or the AutoZero button on the side of the device. The transmitter will change back to measuring mode with unchanged zero point setting after confirming.

Checking and AutoCal Setting of the Sensitivity (SPAN)

On devices without display, you will need the RC2 remote control to make this adjustment.
The current calibration gas concentration in % LEL (or vol % for ammonia) can be displayed by pressing INFO / SPAN ▲ on the parameter (CLiAS) . The value of the calibration gas concentration should be above 20 % of the main alarm.

Many combustible gases are also toxic. Special safety precautions have to be considered when handling toxic gases and vapors.

To check or adjust the display sensitivity, attach a flow adapter to the sensor mount. The test or calibration gas should then be inserted without pressure at a flow rate of approximately 0.5±0.1 l/min. for at least 60 seconds. You can also use 0% RH test or calibration gas directly from a compressed gas cylinder . Watch the display closely during this process. If the displayed value deviates from the test or calibration gas concentration, you will have to adjust the sensitivity. When the displayed value remains constant, you can begin setting the sensitivity with the AutoCal program. The AutoCal program independently attunes the measured signal to the calibration gas. Now, follow these instructions in order:

→ **The sensor must be free of any calibration gas before it is readjusted (Display will show 0) .**

1. Start the AutoCal process by holding down the INFO / SPAN ▲ button on the control panel for at least three seconds. The current output will emit a 2.0mA signal during the entire process and the fault LED will be lit continuously. The notification CodE will be displayed briefly.
2. Then, enter the numeric access code 0011 . Use the buttons TEST / ZERO ▼ and INFO / SPAN ▲ to change the digit of your current position and confirm it with the QUIT / MENU button.
3. After you have entered the correct access code, the display will alternate between showing the measured value and SPAn; The fault LED will be flashing. The device will then wait for a significant increaseof concentration. If the measured value stays consistent during a defined time period (after a set time of two minutes), the new sensitivity settings are adopted (display will show SAVE). The adjustment data has successfully been reset. The device will not switch back to measuring mode just then though, as the current concentration of calibration gas would trigger an alarm. The device will remain in adjustment mode until it detects that the gas concentration has decreased and the displayed value has stabilized. The display will alternate between showing 2Ero and the current measured value. After successful stabilization the device will switch back to measuring mode. If no decrease in the gas concentration or stabilization of the measured value can be detected, the device will automatically switch back to measuring mode after three minutes.

The AutoCal program can be shortened at any point by pressing the INFO / SPAN ▲ button. The display will briefly show SAVE and the measured value will be used to refresh the sensitivity.

To cancel the AutoCal program without sensitivity adjustment, press the INFO / SPAN ▲ button briefly. The display will briefly show ESC.

The following error notifications may occur during the adjustment:

Display	Note	Fault LED
CAL Err.1	No calibration gas has been detected.	rapid flashing
CAL Err.2	The calibration gas signal is not stable.	
CAL Err.3	The sensitivity is outside the permitted tolerance range.	

All error notifications have to be confirmed with the QUIT / MENU button. The transmitter will switch to measuring mode without readjustment. The adjustment has to be repeated.

To test the sensor's response time, you will have to expose it to test or calibration gas (without pressure, using the flow adapter) at a flow rate of approximately 0.5±0.1 l/min. This has to be done in environments free of the gas you want to measure. You will then have to compare the duration it takes to reach 50 % or 90 % of the expected limit value to the times given in the operation manual or to older ones from your records.

Service menu and advanced service menu

Activating the service menu

The service menu enables you to view and change all important parameters of the CC28. Accessing the service menu will disrupt the monitoring function. The device will switch to service mode. No alarms will be triggered. The special condition "service" will be indicated by the fault LED slowly flashing and a current

output signal of 2.4mA. If no buttons are pressed for one minute, the device will automatically leave service mode and switch back to measuring mode.

All parameter changes you make in the service menu apply to the current type of gas only!
If you need to change both the type of gas and parameters, you will have to set the new type of gas first, so it is affected by the parameter adjustments.

The service menu can be accessed in two different extension levels.

The Standard Service Menu is accessed via the code 1100 . It allows you to set calibration gas concentrations and, on the CC28 DA, all values related to the alarms.

The Advanced Service Menu is accessed via the code 5050 . The advanced service menu will allow you to adjust the measured gas and limit values of the measuring range. This access code should only be used by trained safety staff employed by the operator.

On devices that have been function tested (labelled BVS 05 ATEX G 001 X), the advanced service menu can be used to change settings that will void the function test of the transmitter!
If the final value of the measuring range is changed from 100 % LEL to another value or the measured gas is changed from a tested gas to a non-tested one (see table on p. 4), the function test will lose its validity.

Use the keyboard on the display or the remote control to follow these instructions in order:

1. Press QUIT / MENU button for at least three seconds. The transmitter will switch to service mode. The notification CodE will be displayed briefly.
2. Then, enter the numerical access code 1100 (or 5050). Use the buttons TEST / ZERO ▼ and INFO / SPAN ▲ to change the digit of your current position and confirm it with the QUIT / MENU button.
3. After you have correctly entered the access code, the display will show LiAS. Use the TEST / ZERO ▼ and INFO / SPAN ▲ buttons to select other menu items.

You can activate selected menu items by briefly pressing the QUIT MENU button. The parameter setting can then be adjusted with the TEST ZERO ▼ and INFO SPAN ▲ buttons. The menu item is closed by briefly pressing the QUIT MENU again.

	Indications and notifications	Description	Note
INFO SPAN ▲	inFo	Display of software version, serial number and "Code" for hourly code.	
	F2	Setting of alarm function 2	only visible and adjustable on CC28 DA
	F1	Setting of alarm function 1	
	H2	Setting the hysteresis of alarm 2	
	H1	Setting the hysteresis of alarm 1	
	A2	Setting alarm threshold 2	
	A1	Setting alarm threshold 1	
	CLiAS	Setting calibration gas concentration	
	SCAL	Setting the final value of the measuring range	only adjustable in the advanced menu.
Starting Menu item →	LiAS	Changing the measured gas	
TEST ZERO ▼	SAVE	Exiting the service menu and saving the changed parameters	
	ESC	Exiting the service menu without saving the changed parameters	

Menu item LiAS – Changing the measured gas (only adjustable in advanced menu)

This function can be used to to explicitly select the parameters of different types of gas that have been stored on the sensor. Only gases that are suitable for this sensor are displayed.

1. Accessing the menu item LiAS.
2. The display will show the currently selected measured gas.
   You can also access this information in the standard service menu.
3. You can set the measured gas with the buttons TEST ZERO ▼ and INFO SPAN ▲
   In the standard service menu, the display will then briefly show FAiL and switch back to the current measured gas (Pos. 2)
4. Selecting the gas you want measure; It can be saved by briefly pressing the QUIT MENU button.
5. The CC28 will restart (rSEt) (only when selecting a different measured gas).

If the type of gas is changed several times and changed back to a previously parameterized type of gas, the device will automatically adopt the previously saved parameter settings. However, if the type of gas is changed and the device is then restarted, it will use the standard parameters (see table on p. 31) for types of gases that are used for the first time. In any case, you will have to adjust the zero point with AutoCal function after changing the type of gas. You will also have to test the sensor's sensitivity to the new gas and, if necessary, readjust it using the AutoCal function.

The different gases will be indicated on the display with abbreviations in this table.

Display	Gas
Acetn	Acetone
but.	n-Butane
btoL	Butanol
bton	2-Butanone
C2H2	Acetylene
C2H4	Ethylene
C2H6	Ethane
C3H4	Propyne
C3H6	Propylene
C3H8	Propane
C6H6	Benzene

Display	Gas
C7H8	Toluol
CH4	Methane
c.HEn	Cyclohexane
dEE.	Diethyl ether
di''E.	Dimethyl ether
EtAc	Ethyl acetate
EtoL	Ethanol
H2	Hydrogen
HEn.	Hexane
HPt.	Heptane
38	Natural gas

Display	Gas
i.but	Iso-Butane
''i''EAc	Methyl acetate
''i''EoL	Methanol
''i'' ib.	MIBK
nH3	Ammonia
non.	Nonane
Oct.	Octane
Pnt.	Pentane
ProL	2-Propanol
yLoL	Xylene
56	Carbon monoxide

Menu item SCAL – Changing the limit values of the measuring range (only adjustable in advanced menu)

The measuring range can be set to 50, 75 or 100 % LEL. The measuring range of ammonia (4 vol %) cannot be changed.
The adjustment consist of five steps:

1. Activating the menu item SCAL by pressing the QUIT / MENU button.
2. The display will indicate the current limit value of the measuring range.
   As an example, it would display "100" for 100 % LEL.
3. You can now set the parameters using the buttons TEST / ZERO ▼ and INFO / SPAN ▲ .
   In the standard service menu, the display will shortly show FAiL before reverting back to the measured value (Pos. 2).
4. Leave the menu SCAL by briefly pressing the QUIT / MENU button.
5. If applicable, save the parameters (SAVE).

Notes:

The EU Type Examination Certificate BVS 05 ATEX G 001 X only applies to the limit value of the measuring range of 100 % LEL or 4.00 vol % NH_3.

Changing the measuring range is mainly an adjustment to the current output. The standardized output signal of 4-20mA will be used for the new smaller measuring range. This will not change the displayed information. The measuring range of 0-50% LEL will result in the display of numerical values between 0 and 50.0 (which means the displayed values will stay at % LEL).

"Exceeding the measuring range" or "falling short of the measuring range" refers to the percentage of the measuring range, which means that for a measuring range of 0-50% LEL, the ambiguity alarm will be triggered at approximately 56% LEL!
Alarm thresholds are shown in percentage of the LEL (not percentage of the measuring range)!

When the measuring range is decreased, the alarm thresholds must be checked and, if applicable, adjusted. If alarm thresholds had been set at a higher value than the new limit value of the measuring range, they are automatically set to the current limit value of the measuring range.

If the device detects that the current measuring range will not be detectable (sensor is too sensible for measuring electronics, see also SCAL Err.), the display will instead automatically show the highest possible value when entering the menu.

Menu item CLIAS – Setting the calibration gas concentration

The calibration gas concentration can be set in the range of 10 - 105 % of the current measuring range.

1. Activate the menu item CLIAS using QUIT MENU .
2. The display will indicate the current set value of the calibration gas concentration in % LEL (vol % for ammonia).
3. You can now set the parameters using the buttons TEST ZERO ▼ and INFO SPAN ▲ .
4. Leave the menu CLIAS by briefly pressing the QUIT MENU button.
5. If applicable, save the parameters: Select menu item SAVE , confirm with QUIT MENU .

Menu item A1, A2 – Setting the alarm thresholds (only visible on the CC28 DA)

The alarm thresholds can be set within the entire measuring range, but A1 cannot be set higher than A2. If a threshold is set to 0, the corresponding alarm is turned off. A2 can only be set to zero, if A1 has been set to 0 before.

1. Activating the menu item A1 or A2.
2. The display will show the current value of the alarm threshold.
3. You can now set the parameters using the buttons TEST ZERO ▼ and INFO SPAN ▲ .
4. Leave the menu A1 or A2 by briefly pressing the QUIT MENU button.
5. If applicable, save the parameters (SAVE).

Note:

The CC28 DA's buzzer is always connected to the trigger of alarm 2.

Menu item H1, H2 – Setting the hysteresis (only visible on the CC28 DA)

This function will allow you to set the hysteresis - the difference between turn-on and turn-off points of the alarm thresholds. The parameters are set in percentage of the LEL and limited to a maximum of 5% LEL (for ammonia, the unit is vol % and the max. limit is 0.2 vol %).

Example:

On a CC28 with a measuring range of 0 ... 100 % LEL, the hysteresis for alarm 1 has been set to 4.0. This means that the alarm's turn off point is 4 % LEL below the alarm threshold.
This results in the following alarm triggers:

Alarm 1	= 10 % LEL
Alarm trigger	≥ 10 % LEL
Hysteresis H1	3 % LEL
Alarm turn-off point	< 7 % LEL

1. Activate the menu item H1 or H2.
2. The display will indicate the current set value for the alarm hysteresis.
3. You can now set the parameters using the buttons TEST ZERO ▼ and INFO SPAN ▲ .
4. Leave the menu H1 or H2 by briefly pressing the QUIT MENU button.
5. If applicable, save the parameters (SAVE).

Menu item F 1, F2 – Setting the alarm function (only visible on the CC28 DA)

1. Activating the menu item F 1 or F2.
2. The display will show the current set code for the alarm function.

Display	Alarm when exceeding …
n S	not saving (= not latching) (# at alarm 2) not acknowledgeable
S C	saving (=latching) acknowledgeable when falling below threshold

3. You can now set the parameters using the buttons TEST ZERO ▼ and INFO SPAN ▲ .
4. Leave the menu F 1 or F2 by briefly pressing the QUIT MENU button.
5. If applicable, save the parameters (SAVE).

Note:

On the CC28 DA, the buzzer's function is set to: "Alarm on exceeding thresholds, not saving, acknowledgeable even with alarm triggers still present".

The EU Type Examination Certificate BVS 05 ATEX G 001 X applies only to to setting "S C" saving (latching) for alarm 2.

Menu item InFo – Display of the type of sensor, the sensor's serial number, the software version, the serial number and a code

1. Accessing the menu item InFo.
2. The display will consecutively show the MK number, (S.tYP xxx.x), sensor's serial number (S.nr xxxx), software version (SoFt xxxx), the 8 digit transmitter serial number in two parts (F.nr- xxxx F.nr_ xxxx) and an hourly code (CodE xxxx).

The number displayed in CodE corresponds to a time limited access code which can be used to activate the zero point adjustment without restrictions (see automatic zero adjustment).

Menu item ESC – Exiting the service menu <u>without saving</u>

1. Selecting the menu itemESC.
2. Exit the service menu without saving the changed parameters by briefly pressing the QUIT MENU button.

Menu item SAVE – Exiting the service menu and <u>saving</u>

1. Select the menu item SAVE.
2. Exit the service menu and save the changed parameters by briefly pressing the QUIT MENU button.

Notes:

When changing the type of gas, confirming the menu item will immediately save your settings and activate the parameters for the chosen type of gas.

Apart from this exception, several parameters can be changed consecutively without saving in between. Saving at the end of this process will save all parameters that have been changed in the service menu.

Sensor replacement

The sensors MK 208-1, MK 217-1 and MK 219-1 are equipped with an EEPROM on which the sensor data (serial number etc.), the adjustment data and the adjustable types of gases are stored. The sensors are connected to the transmitter by a plug connector.

To change the sensor, you will have to remove the Allen screw on the side of the impact protection (see img. on p. 6, sensor housing). Open the cover and slide out the sensor using appropriate tools. Insert the new sensor into to the housing from the bottom. Consider that the sensor's label has to face forwards. The anti-rotation protection ensures that the sensor is guided to the plug the correct way. When the sensor is locked in place, secure it with the Allen screw. Note that you must adhere to Ex area safety measures when opening the housing (see p. 7).

After you have removed the sensor, the yellow fault LED will be lit and the current output signal will fall to 1.2mA. On the CC28 D, the display will show SEnS Err.1 . On the CC28 DA, the alarm LED will slowly flash additionally.
After inserting a new sensor, the device will automatically restart. The display will first show rSEt and then tESt (memory test; current output will stay at 0mA). After that, the warm-up phase is started withLoAd . It includes the green LED flashing and a current output signal of 1.6mA. When the new sensor's data is compatible with the data on measuring tasks the device has stored, the detector will automatically switch from warm-up to measuring mode. Since the hardware zero points of different sensors or sensor types can vary significantly, the zero point will definitely have to be adjusted ZEro (see p. 12) after replacing a sensor. No restrictions apply to the first zero point adjustment after replacing a sensor. You can even adjust the zero point on values that are considerably outside of the measuring range (____ ----).

Possible error notifications CHEC LiAS or CHEC SCAL

CHEC LiAS If the new sensor is not specified for the type of gas that is set as "sample gas" on the device, this will be detected during the warm-up phase. The green LED will switch its light-up pattern from slow flashing to a double pulse (2× short flashes). The yellow fault LED stays on, the current output signal stays at 1.6 mA and the display will show CHEC LiAS. If you want to continue monitoring the type of gas set on the device, you will have to replace the sensor with one that is suitable for this gas (e.g. replacing an MK 217-1 sensor with an MK 208-1 sensor). If you want to use the new sensor anyway (e.g. as an interim solution), you can access the advanced service menu directly from this error condition by holding down the QUIT / MENU button (for at least three seconds) and entering the access code 5050 (see p.14/15). Once there, you will be able to select the menu item LiAS (will appear immediately after entering the access code) to look at all types of gas the new sensor is specified for. When you have selected a type of gas and confirmed it by pressing the QUIT / MENU button, the device will be set to this sample gas and restarted. You will then have to readjust the zero point ZEro and sensitivity SPAn to the new sample gas (see p. 12 - 14).

CHEC SCAL New sensors are set to a measuring range of 0-100 % LEL for all gases. If the last measuring range set on the device and the presets of the sensor do not match, this will be detected in the warm-up phase. The green LED will switch its light-up pattern from slow flashing to a double pulse (2× short flashes). The yellow fault LED stays on, the current output signal stays at 1.6 mA and the display will show CHEC SCAL. To check of, if applicable, adjust the measuring range, you can access the service menu directly from this error condition by holding down the QUIT / MENU button (for at least three seconds) and entering the error code 1100 or 5050 (see p. 14/15). Once there, you be able to select the menu item SCAL to adjust the settings. The process will be continued after leaving the menu via SAVE .

Example:
If the measuring range of the device SCAL was set to 50 % or 75 %, a new sensor will trigger the display CHEC SCAL .
If the device is set to 100 % but the newly inserted sensor has been used before in a device set to 50 % or 75 %, the display will also show CHEC SCAL .

Notes:
When a sensor is used for the first time or after a replacement sensor has been installed, the measuring

range might be exceeded or undershot(_ _ _ _ or - - - -). If this is the case, the device's zero point must be adjusted via the automatic zero point adjustment (ZERO)

If a SCAL Err. should occur (acknowledgeable), the sensor must be readjusted (SPAN) or, if applicable, the sensor's measuring range adjusted in the service menu.

The zero point needs to be checked after a stabilization time of at least 30 minutes. After the stabilization time, the display should have adjusted at 0. If this is not the case, the zero point needs to be readjusted (settings see p. 12)

After a sensor has been replaced, a complete service and adjustment according to DIN EN 60079-29-2 section 8.9 must be performed, regardless of service and adjustment intervals.

Checking and adjusting the zero point and the sensitivity must be done according to the CC28 operation manual (pages 11 - 13).

Transmission behavior

Depending on the type of measured gas, the transmitters transmission properties are different. The adjustment times may vary depending on the type of measured gas. The signal transmission is always proportional to the gas concentration.

Indication of special conditions and faults

The following table lists all special conditions during which the yellow service LED is lit permanently. At transmitters without display, the following error notifications should be analyzed with the remote control RC2 for a better diagnosis. You can also analyze the values of the current output.

No.	Display	green LED	yellow LED	Current output	Cause	Note / Remedy
01	"tESt"	On	On	0 mA	Memory test when starting the system	is automatically completed after 6 seconds
02	"LoAd" Operational parameters " AdJ "	Flashes	On	1.6 mA	Booting the system after starting or after changing sample gas (see p. 10)	Automatically switches to sensor warm-up phase
03	Countdown of remaining seconds	Flashes	On	1.6 mA	Sensor warm-up phase	is automatically completed after 120 seconds
10	"tESt" flashing	OFF or Flashes	lit-up or On	0 mA	Supply voltage too low <13…15VDC	Increase supply voltage
11	"CHnLi" "SEnS"	Single pulses	On	1.2 mA	Sensor service life has run out	Sensor must be replaced
12	"CHEC" " L iAS "	Double pulses	On	1.2 mA	After sensor replacement: Sensor is not specified for measured gas	Replace sensor again or choose different sample gas; see section "Replacing the sensor"
13	"CHEC" "SCAL"	Double pulses	On	1.2 mA	After sensor replacement: Measuring range settings of sensor and device do not match	Check measuring range SCAL and, if applicable, adjust it; see section "Replacing the sensor"
14	" SYS " "Err.1"	Off	On	1.2 mA	Error during RAM access	Restart the device. If the error occurs again, the device needs to be replaced.
15	" SYS " "Err.2"	Off	On	1.2 mA	Error during ROM access	
16	" SYS " "Err.3"	Off	On	1.2 mA	Error during EEPROM access (internal)	

17	" SYS " "Err.4"	Off	On	1.2 mA	*Reserved*	
18	" SYS " "Err.5"	Off	On	1.2 mA	Error during regulation of chamber voltage	
19	" SYS " "Err.6"	Off	On	1.2 mA	Error during regulation of hardware control point	
20	" SYS " "Err.7"	Off	On	1.2 mA	Temperature measurement not plausible	
21	"SEnS" "Err.1"	Off	On	1.2 mA	No sensor available / detected	Insert sensor (automatic restart)
22	"SEnS" "Err.2"	Off	On	1.2 mA	Error during EEPROM access (sensor)	Replace sensor (automatic restart)
23	"SEnS" "Err.3"	Off	On	1.2 mA	Wrong sensor / parameter memory	
24	" Adu " "Err.1"	Off	On	1.2 mA	Error A/D converter (sensor voltage)	Restart the device. If the error occurs again, the device needs to be replaced.
25	" Adu " "Err.2"	Off	On	1.2 mA	Error A/D converter (NTC)	
26	" Adu " "Err.3"	Off	On	1.2 mA	Error A/D converter (sensor voltage)	

Indications in measuring mode

No.	Display	green LED	yellow LED	Current output	Cause	Note / Remedy
30	" ---- " permanently	On	Flashes rapidly	≥21,6mA (type.22mA)	The gas concentration has exceeded the measuring range of the transmitter electronics. Ambiguity alarm!	Caution: Explosion hazard! Measures see p. 10 – 11 Latching alarm.
31	" ---- " flashing	On	Flashes rapidly	≥21,6mA (type.22mA)	The gas concentration has exceeded the measuring range considerably (>112,0%). Ambiguity alarm!	Caution: Explosion hazard! Measures see p. 10 – 11 Latching alarm.
32	Measured value alternating with " ---- "	On	Off	20–22mA	The gas concentration has exceeded the measuring range slightly (between 100.0 % and 112.0 %)	Caution: Explosion hazard!
33	Measured value alternating with " A2 "	On	Off	4–20mA	The gas concentration has reached or exceeded the 2nd alarm threshold.	Reduce gas concentration! Alarm latching by default
34	Measured value alternating with " A1 "	On	Off	4–20mA	The gas concentration has reached or exceeded the 1st alarm threshold.	Reduce gas concentration! Alarm not latching by default
35	Measured value alternating with "SCAL" " Err."	On	Off	4–20mA	Precautionary warning message: End of measuring range cannot be detected anymore due to hardware / sensor combination	Acknowledge with QUIT MENU a) Readjust sensor (SPAN) b) Adjust or reduce measuring range in service menu.
36	Measured value alternating with "CHnLi" "SEnS"	On	Single pulses	4–20mA	Precautionary warning message: The sensor's expected service life will be reached within the next months.	Replace sensor during next service.
37	Measured value	On	Off	4–20mA	Fault-free measuring mode	
38	Measured value	On	Off	2.8–4mA	Measured values fall short of measuring range from-7.5 % ... 0.0 %	
39	Measured value alternating with " ---- "	On	On	2.8 mA	Measured values fall short of measuring range between -25.0% ... -8.0%	This is considered a fault. Zero point adjustment is necessary
40	" ---- " permanently	On	On	2.8 mA	Measured values fall short of measuring range < -25.0 %	This is considered a fault. Zero point adjustment and sensitivity check are necessary.

41	" ---- " permanently	On	On	1.2 mA	The gas concentration falls short of the measuring range of the transmitter electronics.	This is considered a fault. Zero point adjustment and sensitivity check are necessary.

Indications in service mode and during adjustment

42	Menu item	On	Flashes	2.4 mA	Service menu has been activated via keyboard or RC2	Select menu item If no selection is made for more than a minute: automatic return to measuring mode
43	"ZEro"	On	Flashes	2.0 mA	AutoCal setting of the zero point has been activated via keyboard, RC2 or the AutoZero button	Automatic completion after successful adjustment.
44	"SPAn"	On	Flashes	2.0 mA	AutoCal setting of the sensitivity has been activated via keyboard or RC2	Automatic completion after successful adjustment.
45	" CAL " "Err.1"	On	Flashes rapidly	2.0 mA	No increase in the calibration gas concentration has been detected during the AutoCal setting of the sensitivity.	Acknowledge with QUIT MENU a) Check gas supply b) Do not supply gas before the adjustment process calls for it
46	" CAL " "Err.2"	On	Flashes rapidly	2.0 mA	No stable zero gas or calibration gas concentration has been detected during the AutoCal setting.	Acknowledge with QUIT MENU a) Stabilize gas supply
47	" CAL " "Err.3"	On	Flashes rapidly	2.0 mA	The zero point or the sensitivity is outside the permitted tolerance range.	Acknowledge with QUIT MENU a) Check zero or calibration gas and repeat process. b) If necessary, replace sensor.

In measuring mode, the notifications listed in the second column are displayed alternately with the measured value. The notifications described in no. 33 and 34 only occur on the CC28 DA. The notifications described in no. 35 and 36 are precautionary warning notifications. The transmitter will stay in measuring mode. There is no need for immediate action. The conditions described in No 32 and 38 apply to a de facto extension of the measuring range from 4-20mA to the range 2.8 - 22mA, to display measured values "close" to the actual measuring range. This is how a tolerance range around 4-20mA is generated before a special condition is assumed.

Conditions of the status LEDs and the current output

The following table contains a comparison of the indications of the status LEDs and the current output signals (and their meanings) for a transmitter without display.

On devices without display, a remote control RC2 is mandatory to adjust the zero point (if displayed value is > 25 % LEL) and access the service menu.

green LED	yellow LED	Current output	Description see section...
On	On	2.8 mA	P.21 "Indications in measuring mode" No. 39, 40
On	On	1.2 mA	P. 21 "Indications in measuring mode" No. 41, 40
On	On	0 mA	P. 20 "Indication of special conditions ..." No. 01
On	Flashes rapidly	≥21,6mA (type.22mA)	P. 21 „Indications in measuring mode" No. 30, 31
On	Flashes rapidly	2.0 mA	P. 21 „Indications in service mode ..." No. 45-47
On	Flashes slowly	2.4 mA	P. 21 „Indications in service mode ..." No. 42
On	Flashes slowly	2.0 mA	P. 21 "Indications in service mode ..." No. 43, 44
On	Single pulses	4–20mA	P. 21 "Indications in measuring mode" No. 36
On	Off	20–22mA	P. 21 "Indications in measuring mode" No. 32
On	Off	4–20mA	P. 21 "Indications in measuring mode" No. (33,34), 35, 37
On	Off	2.8–4mA	P.21 "Indications in measuring mode" No. 38
Flashes	On	1.6 mA	P. 20 "Indication of special conditions ..." No. 02, 03
Double pulses	On	1.2 mA	P. 20 "Indication of special conditions ..." No. 12, 13
Single pulses	On	1.2 mA	P. 20 "Indication of special conditions ..." No. 11
Off	On	1.2 mA	P. 20 "Indication of special conditions ..." No. 14-26

Flow rates above 22.0mA are considered faults.

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...
	Ambiguity	P. 21 "Indications in measuring mode" No. 30, 31
	A/D converter error	P. 20 "Indication of special conditions ..." No. 24-26
	Measured values exceed measuring range slightly	P. 21 "Indications in measuring mode" No. 32
	Alarm 2	P. 21 "Indications in measuring mode" No. 33
	Alarm1	P. 21 "Indications in measuring mode" No. 34
	Measured values fall below the measuring range	P. 21 "Indications in measuring mode" No. 38-40
	"SCAL-Error" (warning)	P. 21 "Indications in measuring mode" No. 35
	Sensor replacement (warning)	P. 21 „Indications in measuring mode" No. 36

System and sensor errors (p. 20 no. 11 and no. 14 - 23) will suppress the measuring mode with their respective notifications. If an ambiguity alarm was triggered previously, the status LEDs and the current output will continue to indicate it and the new special condition will only be indicated on the LCD display.

The notification with the highest priority is always displayed. Notifications with lower priority cannot be accessed.

Commissioning and maintenance

Adhere to the regulations of DIN EN 60079-29-2 „Gas detection devices - Selection, installation, use and maintenance of devices for measuring combustible gases and oxygen" as well as any national regulations. In Germany, that would be the "Explosion protections regulations", the informatory leaflet T 023 (BGI 518) "Gas detection systems for explosion protection - Use and operation".

During commissioning, gas detection systems must be tested for function by a trained specialist after they have been installed. (see DIN EN 60079-29-2 section 8.9) Perform a function test of the display and LEDs by briefly pressing the TEST / ZERO ▼ button after turning on the device. The CC28 DA will additionally briefly activate the alarm LEDs and buzzer during this test.

Maintenance includes inspection, service, calibration and adjustment as well as regular function checks and repairs.

Depending on the nature of the test, it will have to be performed either by a trained person or qualified professional / qualified person. The results of the test must be confirmed in writing.

Inspection, service, calibration and adjustment

Inspections should include visual checks of the gas detection device (For German regulations see informatory leaflet T 023, section 9).

- Mechanical damage
- Contaminations by dust
- Condensation caused by humidity
- Protective elements of the transmitters
- Diffusion inlets on the transmitters
- Gas sampling system, gas processing system (if applicable)

Service and adjustments encompass measures to keep the gas detection systems in their desired state. They should be performed in regular intervals. These intervals must not exceed four months. (see DIN EN 60079-29-2 section 11 and, in Germany, informatory leaflet T 023, section 9.2, 9.3).

- Zero point
- Sensitivity with test or calibration gas
- Triggering the alarm thresholds
- Stabilization time
- Signal functions (visual and acoustic)
- Error notifications

We highly recommend to entrust the GfG service team with these tasks.

Regular function checks

Gas detection systems can behave differently depending on the ambient conditions. For the first few days after they have been installed, it is therefore important to visually inspect them every day.
In addition to the maintenance work, regular function checks of the gas detection device are mandatory.

When in operation, the alarm function of the connected controller must be checked at least once a year by inserting test gas above the main alarm threshold. This is done mainly to ensure the current interface, as part of the safety system, is working as intended.

This interval may not exceed one year. (In Germany, see informatory leaflet T023, section 9.)

Depending on the nature of the test, it will have to be performed either by a qualified professional or trained person. The results of the test must be confirmed in writing.

Maintenance

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

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.

Function reduction while in differing oxygen concentrations

Please consider that the measurement of gas and / or vapor concentrations within the measurement range up to 100% LEL can no longer be performed accurately, if the concentration of oxygen falls below 10 vol %. In this case, the CC sensor would be missing the oxygen required for catalytic combustion.
The Ex certification does not apply to use of the device in oxygen-enriched atmospheres with concentrations of more than 21 vol % oxygen.

Sensor poisons falsifying the displayed information

Certain substances (called "sensor and catalyst poisons" in technical terminology) can impair the sensor and its signaling behavior. Its "sensitivity" or ability to emit signals is reduced. Substances in this category include compounds of sulphur, lead and silicone. "Normally" these substances are very rare and occur only in very low concentrations.
Also consider the interfering gases present at the measuring location, as they may impede the gas detection system's function permanently. Depending on the type, concentration and exposure time, these substances might cause faults ranging from more or less steady, long-term degradation to a sudden decline of the sensitivity (see also DIN EN 60079-29-2).

Particularities of sample gas supply in flow mode

In flow mode, the absolute pressure of the measured gas must be within the range of 80-110kPa. It may only deviate from the atmospheric pressure by ±5kPa.
The gas volume flow must be monitored using a suitable flow controller or flow meter located behind the flow adapter.
If the gas detection system consists of multiple connected single components (e.g. suction system, transmitter controller), as is the case here, the stabilization time of the entire system is determined by the sum of the individual components' stabilization times.

Fault - cause - remedy

Fault	Cause	Remedy
Zero point cannot be set anymore	Sensor is defective	Replace sensor
Sensitivity cannot be set anymore	Sensor is defective	Replace sensor
Output current has fallen to 0mA	Fuse defective Line is disrupted	Replace fuse Reestablish connection

Lower Explosion Limit (LEL) of the gases subject to function checks

Type of gas	Molecular formula	LEL as per EN60079-20-1 or data base Chemsafe	CAS number
Methane	CH_4	4.4 vol %	74-82-8
Propane	C_3H_8	1.7 vol %	74-98-6
Nonane	C_9H_{20}	0.7 vol %	111-84-2
Hydrogen	H_2	4.0 vol %	1333-74-0
Isopropanol	C_3H_8O (CH_3-CHOH-CH_3)	2.0 vol %	67-63-0
Ammonia	NH_3	15.0 vol %	7664-41-7

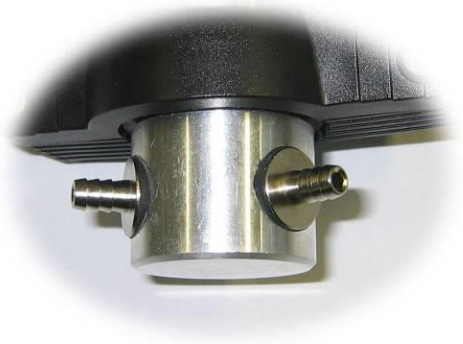
List of spare parts

	Part no.
Cover cap & minor parts for 5 devices	2800301
Screws for housing cover for 5 devices	2800302
Housing cover without window for CC28	2800303
Housing cover with window for CC28 D and CC28 DA	2800304
Housing base without buzzer for CC28 and CC28 D	2800305
Housing base with buzzer for CC28 DA	2800306
Main module without alarm (Um=45V) for CC28 and CC28 D	2800307
Main module without alarm (Um=250V) for CC28 and CC28 D	2800308
Main module with alarm (Um=45V) for CC28 DA	2800309
Main module with alarm (Um=250V) for CC28 DA	2800310
Display module without alarm for CC28 D	2800311
Display module with alarm (Um=250V) for CC28 DA	2800312
Replacement sensor MK208-1 for 0..100 % LEL combustible gases	2800750
Replacement sensor MK217-1 for 0..100 % LEL combustible gases	2800751
Replacement sensor MK219-1 for 0..50% LEL $H_2/CH_4/C_3H_8$ (#)	2800760

Accessories

	Part no.
Remote control RC2	2800201
Calibration adapter (flow rate 0.5l/min ± 0.1 l/min)	2800202
Wind shield	2800204
Weatherproof housing (#)	on request

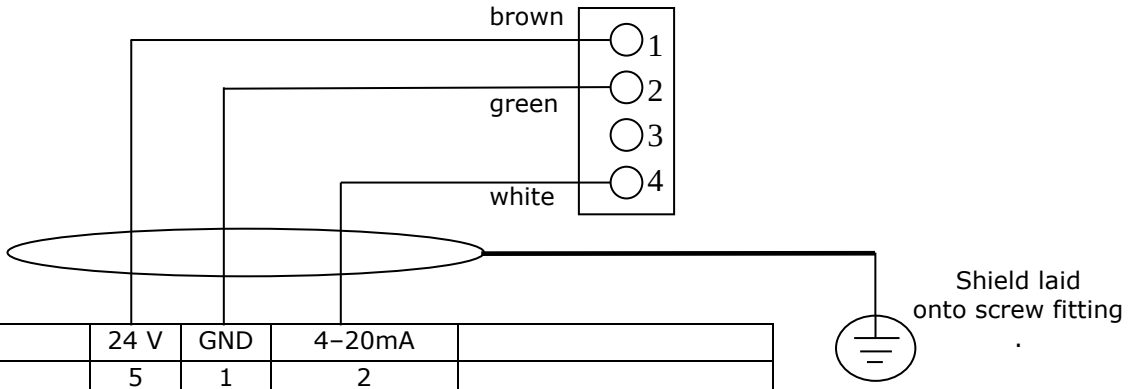
Any spare parts and accessories should be stored at temperatures between 0 and 30 °C and a humidity of 25 to 75 % RH. They should not be stored for more than five years. If you need to store replacement sensors, make sure the ambient atmosphere is not aggressive and free of sensor poisons.



Calibration adapter

Wind shield

Connection diagram CC28 with 20 mA output

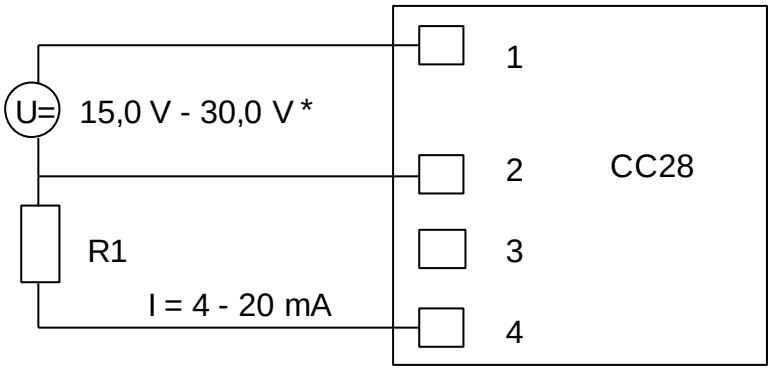


	24 V	GND	4–20mA	
GMA101	5	1	2	
GMA100	5	1	2	with bus circuit board (from 1997 onwards)
GMA104	55 58 61 64	53 56 59 62	54 57 60 63	Connection to 4-channel multiplexer
GMA200-MT6	22 : 38	23 : 39	21 : 37	can be connected to up to 6 transmitters
GMA200-MT16	on ext. NT.	on ext. NT.	21 : 38	can be connected to up to 16 transmitters
GMA200-MW4	22 : 32	23 : 33	21 : 31	can be connected to up to 4 transmitters
GMA200-MW16	21c : 38c	21d : 38d	21b : 38b	can be connected to up to 16 transmitters
GMA301	5	1	2	
GMA304	55 58 61 64	53 56 59 62	54 57 60 63	Connection to 4-channel multiplexer
GMA22-MW/MS	4	3	A2	
GMA41	28	29	30	
GMA81 (A)	1	2	3	
GMA43 and GMA83	19 22 25	20 23 26	21 24 27	can connect up to 3 transmitters
GMA44 und GMA84	19 22 25 28	20 23 26 29	21 24 27 30	can be connected to up to 4 transmitters
GMA88	19 : 40	20 : 41	21 : 42	can be connected to up to 8 transmitters

For instructions on connecting the GMA controllers, please refer to the operation manual of the individual GMAs.

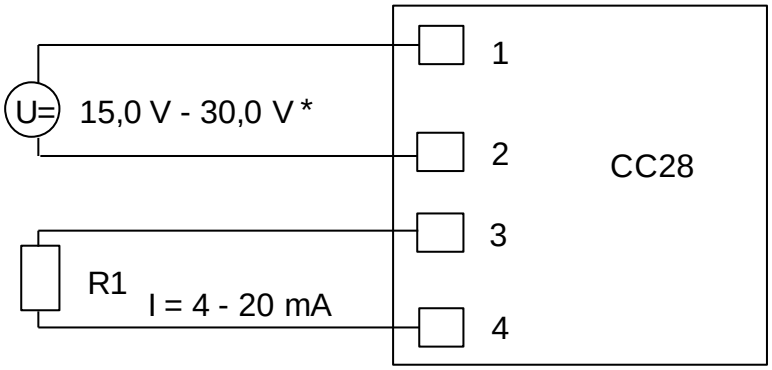
Terminal connection diagram MWG CC28

3-wire connection



Maximale Bürde 150 Ohm

4-wire connection



Maximale Bürde 150 Ohm

*** Exceeding the permitted maximum voltage of 30 V DC (even for short voltage peaks) will result in destruction of the protective fuse.**

Sensor specifications

MK208-1 Catalytic Combustion sensor for combustible gases and vapors (according to EN 60079-29-1)

Measuring range / resolution		0...100 % LEL / 0.5 % LEL		or 0...4 vol % NH_3 / 0.05 vol % NH_3			
Stabilizing time	t_{50}:	≤ 5s (CH_4), ≤ 5s (C_3H_8), ***1**		with wind shield: ≤ 8s (CH_4), ≤ 8s (C_3H_8), ***1**			
	t_{90}:	≤ 9s (CH_4), ≤10s (C_3H_8), ≤ 15s (C_3H_8O), ≤20s (C_9H_{20}), ≤ 10s (NH_3) ***1**		with wind shield: ≤15s (CH_4), ≤17s (C_3H_8), ***1**			
Flow rate	0...6 m/s:	max. ±3% of the measuring range or ±10% of the displayed value ***2, *4**					
Pressure	80...120kPa:	max. ±3 % of the measuring range or ±7 % of the displayed value (ref. to 100kPa) ***4**					
Humidity	5%...90% RH:	max. ±8% of the measuring range or±10% of the displayed value (ref. to 0% RH and 40°C) ***4**					
Temperature	-25...+55°C:	max. ±5 % of the measuring range or±15 % of the displayed value (ref. to 20 °C) ***4**					
Cross sensitivity factors		Methane – measuring range ***3**.		Propane – measuring range ***3**		Nonane – measuring range ***3**	
	at 50 % LEL:	2.20 vol % CH_4 :	**=100%**	0.85 vol % C_3H_8 :	**= 100 %**	0.35 vol % C_9H_{20}:	**= 100%**
		2.00 vol % H_2 :	approx. 131%(#)	2.00 vol % H_2 :	approx. 160%(#)	2.00 vol % H_2 :	approx. 328% (#)
		1.25 vol % C_3H_6O:	approx. 97% (#)	1.25 vol % C_3H_6O:	approx. 111 %	1.25 vol % C_3H_6O:	approx. 231% (#)
		1.15 vol .% C_2H_4 :	approx. 96% (#)	2.20 vol % CH_4 :	approx. 107%	2.20 vol % CH_4 :	approx. 224 %
		0.85 vol % C_3H_8 :	approx. 96%	1.15 vol % C_2H_4 :	approx. 101%(#)	1.15 vol % C_2H_4 :	approx. 213% (#)
		1.10 vol % $C_4H_8O_2$:	approx. 92% (#)	1.10 vol % $C_4H_8O_2$:	approx. 95% (#)	0.85 vol % C_3H_8 :	approx. 210 %
		1.00 vol % C_3H_8O:	approx. 87%	1.00 vol % C_3H_8O:	approx. 93%	1.10 vol % $C_4H_8O_2$:	approx.
	at 2 vol % NH3:	0.85 vol % $C_4H_{10}O$:	approx. 87% (#)	0.85 vol % $C_4H_{10}O$:	approx. 87% (#)	1.00 vol % C_3H_8O:	201% (#) approx.
		0.50 vol % C_6H_{14}:	approx. 74% (#)	0.50 vol % C_6H_{14}:	approx. 69% (#)	0.85 vol % $C_4H_{10}O$:	193% approx.
		0.55 vol % C_7H_8:	approx. 72% (#)	0.55 vol % C_7H_8:	approx. 67% (#)	0.50 vol % C_6H_{14}:	180% (#) approx.
		0.35 vol % C_9H_{20}:	approx. 57%	0.35 vol % C_9H_{20}:	approx. 49%	0.55 vol % C_7H_8:	143% (#) approx.
		2.00 vol % NH_3:	approx. 57 %	2.00 vol % NH_3:	approx. 49 %	2.00 vol % NH_3:	132% (#) approx. 100%
Particularities:		This sensor is not suitable for measuring hydrogen or for use in any environment containing hydrogen. While the sensor will of course react to hydrogen, it is only suitable for warning purposes. If the sensor is constantly exposed to hydrogen, an ever increasing signal is to be expected.					
Expected operating life:		5 years					

MK217-1 Catalytic combustion sensor for combustible gases and vapors (according to EN 60079-29-1)

Measuring range / resolution		0...100 % LEL / 0.5 % LEL					
Stabilizing time	t_{50}:	≤ 5 s (CH_4), ≤ 7 s (C_3H_8), ***1**		with wind shield: ≤ 9 s (CH_4), ≤ 9 s (C_3H_8), ***1**			
	t_{90}:	≤10 s (CH_4), ≤12 s (C_3H_8), ≤10 s (H_2) ***1**		with wind shield: ≤18 s (CH_4), ≤21 s (C_3H_8), ***1**			
Flow rate	0...6 m/s:	max. ±3% of the measuring range or ±10% of the displayed value ***2, *4**					
Pressure	80...120kPa:	max. ±3 % of the measuring range or ±7 % of the displayed value (ref. to 100kPa) ***4**					
Humidity	5%...90% RH:	max. ±5 % of the measuring range or ±15 % of the displayed value (ref. to 0 % RH and 40 °C) ***4**					
Temperature	-10...+40 °C:	max. ±5 % of the measuring range or±15 % of the displayed value (ref. to 20 °C) ***4**					
Cross sensitivity factors		Methane – measuring range ***3**		Propane – measuring range ***3**		Hydrogen – measuring range ***3**	
	at 50 % LEL:	2.20 vol % CH_4 :	**= 100 %**	0.85 vol % C_3H_8 :	**= 100%**	2.00 vol % H_2:	**= 100 %**
		2.00 vol % H_2 :	approx. 15%	2.00 vol % H_2 :	approx. 188%	2.20 vol % CH_4 :	approx. 86%
		0.85 vol % C_3H_8 :	approx. 65%	2.20 vol % CH_4 :	appr. 162 %	0.85 vol % C_3H_8 :	approx. 53%
Particularities:		If the sensor has been exposed to gas concentrations significantly higher than 100 % LEL, the zero point and the sensor's sensitivity will have to be checked when the concentration is back to regular levels.					
Expected operating life:		5 years					

MK219-1 Catalytic combustion sensor for combustible gases and vapors (#)

Measuring range / resolution		0...50 % LEL/ 0.2 % LEL					
Stabilizing time	t_{50}:	≤ 5 s (CH_4), ≤ 7 s (C_3H_8), ***1**		with wind shield: ≤ 9 s (CH_4), ≤ 9 s (C_3H_8), ***1**			
	t_{90}:	≤10 s (CH_4), ≤12 s (C_3H_8), ***1**		with wind shield: ≤18 s (CH_4), ≤21 s (C_3H_8), ***1**			
Flow rate	0...6 m/s:	max. ±5% of the measuring range or±10% of the displayed value***2, *4**					
Pressure	80...120kPa:	max. ±5% of the measuring range or±7% of the displayed value (ref. to 100kPa) ***4**					
Humidity	5%...90% RH:	max. ±5 % of the measuring range or ±15 % of the displayed value (ref. to 0 % RH and 40 °C) ***4**					
Temperature	-10...+40 °C:	max. ±5 % of the measuring range or±15 % of the displayed value (ref. to 20 °C) ***4**					
Cross sensitivity factors		Methane – measuring range ***3**		Propane – measuring range ***3**		Hydrogen – measuring range ***3**	
	at 50 % LEL:	2.20 vol % CH_4 :	**= 100%**	0.85 vol % C_3H_8 :	**= 100%**	2.00 vol % H_2:	**= 100%**
		2.00 vol % H_2 :	approx. 98%	2.00 vol % H_2 :	approx. 155%	2.20 vol % CH_4 :	approx. 103%
		0.85 vol % C_3H_8 :	approx. 63%	2.20 vol % CH_4 :	approx. 158%	0,85 vol % C_3H_8 :	approx. 60%
Particularities:		If the sensor has been exposed to gas concentrations significantly higher than 100 % LEL, the zero point and the sensor's sensitivity will have to be checked when the concentration is back to regular levels.					
Expected operating life:		5 years					

(#) This component was not part of the EC Examination certificate BVS 05 ATEX G 001 X

*1 The specified stabilization times apply for devices in diffusion mode as well as devices using a flow adapter. On the MK208-1, longer stabilization times apply to other gases, especially nonane.

*2 The specified deviations apply to the flow conditions on adjustments (thus usually close to 0m/s) Wind shields are mandatory for flow rates of > 3m/s. You should generally make sure that the transmitter is not supplied with gas from below (sensor side).

*3: Cross sensitivities may vary from sensor to sensor and depend on the gas concentration and the age of the sensor. A sensor being poisoned will also affect the cross sensitivities significantly. The specified cross sensitivities apply to new sensors and can vary by up to +/-30% during their service life. Other combustible gases, that are not listed here, may also cause increased displayed values.

*4 This specification applies to methane and propane.

Technical Specifications

Transmitter CC28	
Type of transmitter:	CC28, CC28 D and CC28 DA
Type of sensor:	MK208-1, MK217-1 and MK219-1(#)
Expected operating life:	5 years in normal industrial operation (see sensor specification)
Measured gas:	Combustible gases and vapors, such as methane, propane, hexane, nonane (see inspection protocol)
Measuring range:	e.g. 0...100 % LEL or 0...50 % LEL (see inspection protocol)
Measuring principle:	Catalytic combustion
Gas supply:	Diffusion or via flow adapter (flow rate 0.5±0.1 l/min)
Stabilization time:	see sensor specifications
Update rate:	1 s
Alarm:	only CC28 DA: visual and acoustic (90dB @ 10cm)
Preparation delay:	<120s (self-test and stabilization time of the sensors)
Supply voltage:	15...30V DC
Maximum supply current:	150mA
Maximum fault voltage:	250 VAC or 45VDC (see type label)
Output current:	4...20mA (max. load 150 Ohm)
Climatic conditions	
Short-term storage temperature:	-25...+60 °C
Recommended storage temperature:	0...+30 °C
Operating temperature (ambient):	-20...+50 °C for operation in potentially explosive areas -25...+55 °C for operation in non-EX areas (See sensor specifications when using MK217)
Humidity range:	5...90% RH for operation 25...75% RH recommended for storage
Pressure range:	80...110 kPa for operation in potentially explosive areas 80...120 kPa for operation in non-Ex areas
Flow rate:	0...6m/s (>3m/s with wind shield, mounting location see page 6)
Housing	
Stability:	The housing must be protected from very heavy impacts (>4J).
Housing material:	Antistatic plastic
Dimensions:	100 x 167,5 x 55mm (WxHxD) (H including sensor: 193mm)
Weight:	approximately 800 g (including Display)
Protection class:	IP64
Cable connections:	Screw fitting M16x1,5 max. cross-section 3 x 1,5mm^2
Cable type and length:	LIYCY 3x0,75mm^2 (up to 200m) or LIYCY 3x1,5mm^2 (up to 1000m)
Approvals and certifications	
Designation:	Ⓔx II 2G CE 0158
Ignition protection type:	Ex db eb mb [ib] IIC T4 Gb -20°C≤Ta≤+50°C
EU Type Examination Certificate:	BVS 04 ATEX E 132 X (electric explosion protection)
EU Type Examination Certificate:	BVS 05 ATEX G 001 X (measuring function)
EMC test:	DIN EN 50270 Interference emission: Type class I Interference resistance: Type class II

Annex

Internal memory CC28

Each transmitter comes with factory set, pre-programmed data of the most important gases and their additional parameters. In most cases, you will therefore not have to make any changes to the configuration. The following information is stored in the transmitter's memory:

Type of gas	**Molecular formula**	**Unit**	**CGAS** Calibration gas	**A1** Alarm 1	**A2** Alarm 2	**H1** Hyst. A1	**H2** Hyst. A2	**F1** Funct. A1	**F2** Funct. A2
Methane	CH_4	%LEL	45.5	20.0	40.0	1.0	1.0	NS	SC
Ethane	C_2H_6	%LEL	50.0	20.0	40.0	1.0	1.0	NS	SC
Propane	C_3H_8	%LEL	65.0	20.0	40.0	1.0	1.0	NS	SC
Butane	C_4H_{10}	%LEL	50.0	20.0	40.0	1.0	1.0	NS	SC
Pentane	C_5H_{12}	%LEL	50.0	20.0	40.0	1.0	1.0	NS	SC
Hexane	C_6H_{14}	%LEL	50.0	20.0	40.0	1.0	1.0	NS	SC
Heptane	C_7H_{16}	%LEL	50.0	20.0	40.0	1.0	1.0	NS	SC
Octane	C_8H_{18}	%LEL	50.0	20.0	40.0	1.0	1.0	NS	SC
Nonane	C_9H_{20}	%LEL	50.0	20.0	40.0	1.0	1.0	NS	SC
Iso-Butane	$(CH_3)_3CH$	%LEL	50.0	20.0	40.0	1.0	1.0	NS	SC
Cyclohexane	C_6H_{12}	%LEL	50.0	20.0	40.0	1.0	1.0	NS	SC
Ethylene (Ethene)	$H_2C=CH_2$	%LEL	50.0	20.0	40.0	1.0	1.0	NS	SC
Propylene (Propene)	$H_2C=CH-CH_3$	%LEL	50.0	20.0	40.0	1.0	1.0	NS	SC
Acetylene (Ethyne)	$HC\equiv CH$	%LEL	50.0	20.0	40.0	1.0	1.0	NS	SC
Propyne	$HC\equiv C-CH_3$	%LEL	50.0	20.0	40.0	1.0	1.0	NS	SC
Hydrogen	H_2	%LEL	50.0	20.0	40.0	1.0	1.0	NS	SC
Benzene	C_6H_6	%LEL	50.0	20.0	40.0	1.0	1.0	NS	SC
Toluol	C_6H_5-CH_3	%LEL	50.0	20.0	40.0	1.0	1.0	NS	SC
Xylene	C_6H_4-$(CH_3)_2$	%LEL	50.0	20.0	40.0	1.0	1.0	NS	SC
Methanol	CH_3OH	%LEL	50.0	20.0	40.0	1.0	1.0	NS	SC
Ethanol	C_2H_5OH	%LEL	50.0	20.0	40.0	1.0	1.0	NS	SC
Isopropanol (2-Propanol)	CH_3-$CHOH$-CH_3	%LEL	50.0	20.0	40.0	1.0	1.0	NS	SC
2-Butanone	CH_3-$CHOH$-C_2H_5	%LEL	50.0	20.0	40.0	1.0	1.0	NS	SC
Dimethyl ether	CH_3-O-CH_3	%LEL	50.0	20.0	40.0	1.0	1.0	NS	SC
Diethyl ether	C_2H_5-O-C_2H_5	%LEL	50.0	20.0	40.0	1.0	1.0	NS	SC
Acetone	CH_3-CO-CH_3	%LEL	50.0	20.0	40.0	1.0	1.0	NS	SC
2-Butanone (MEK)	CH_3-CO-C_2H_5	%LEL	50.0	20.0	40.0	1.0	1.0	NS	SC
Methyl acetate	CH_3-COO-CH_3	%LEL	50.0	20.0	40.0	1.0	1.0	NS	SC
Ethyl acetate	CH_3-COO-C_2H_5	%LEL	50.0	20.0	40.0	1.0	1.0	NS	SC
Methyl isobutyl ketone (MIBK)	CH_3-CO-$CH(CH_3)_3$	%LEL	50.0	20.0	40.0	1.0	1.0	NS	SC
Ammonia (0–4 vol %)	NH_3	Vol %	3.0	1.0	3.0	0.1	0.1	NS	SC

F1 / F2: NS = not saving (not latching), **SC** = saving (latching)

If the transmitter is operated using a sensor whose data has not yet been added to the list, it will use pre-defined settings.
You can individually adapt and save these settings on the transmitter.

EU Declaration of Conformity

CC28
CC28 D
CC28 DA

Edited: 11.08.2004 Amended: 07.11.2022

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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 **CC28 (D, DA)** complies with directive **2014/34/EU** (ATEX) for devices and protective systems for proper use in potentially explosive atmospheres, directive **2014/30/EU** for electromagnetic compatibility and with directive **2011/65/EU** (RoHS) on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

For electrical explosion protection	BVS 04 ATEX E 132 X
For the measurement function	BVS 05 ATEX G 001 X
Labelling	II 2G Ex db eb mb [ib] IIC T4 Gb

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

- General requirements	EN 60079-0 : 2018
- Flameproof enclosures "d"	EN 60079-1 : 2014
- Increased safety "e"	EN 60079-7 : 2015 + A1: 2018
- Intrinsic safety "i"	EN 60079-11 : 2012
- Encapsulation "m"	EN 60079-18 : 2015 / A1: 2017
- Gas detectors - Performance requirements of detectors for flammable gases	EN 60079-29-1 : 2016
- Electrical apparatus for the detection and measurement of combustible gases, toxic gases or oxygen - Requirements and tests for apparatus using software and/or digital technologies.	EN 50271 : 2018

The EU-Type Examination Certificate was issued by the notified body with ID number 0158 (DEKRA Testing and Certification, Dinnendahlstraße 9, D-44809 Bochum).

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

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

The EMC test laboratory AMETEK CTS Europe 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, 07 November 2022

i.V.

.....

B. Siebrecht
QMB

ATEX EU-Kon17-1.2/Siebrecht

Translation

EU-Type Examination Certificate Supplement 04

1 **Translation**

2 **Device with a measuring function for explosion protection Directive 2014/34/EU**

3 EU-Type Examination Certificate Number: **BVS 05 ATEX G 001 X**

4 Product: **CC28, CC28 D, CC28 DA**

5 Manufacturer: **GfG Gesellschaft für Gerätebau mbH**

6 Address: **Klönnestr. 99, 44143 Dortmund, Germany**

7 This supplementary certificate extends EU-Type Examination Certificate No. BVS 05 ATEX G 001 X to apply to products designed and constructed in accordance with the specification set out in the Annex of the said certificate but having any variations specified in the Annex attached to this certificate and the documents therein referred to.

8 DEKRA Testing and Certification GmbH, Notified Body number 0158, in accordance with Article 17 of Directive 2014/34/EU of the European Parliament and of the Council, dated 26 February 2014, certifies that this product has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of products intended for use in potentially explosive atmospheres given in Annex II to the Directive.
The examination and test results are recorded in the confidential test report PFG-no. 41300105P NIV.

9 The Essential Health and Safety Requirements with respect to the measuring function for explosion protection are assured in consideration of:

EN 60079-29-1:2016
EN 50271:2018

10 If the sign "X" is placed after the certificate number, it indicates that the product is subject to the Special Conditions for Use specified in the appendix to this certificate.

11 This EU-Type Examination Certificate relates only to the design and construction of the specified product. Further requirements of the Directive apply to the manufacturing process and supply of this product. These are not covered by this certificate.

12 The marking of the product shall include the following:

see BVS 04 ATEX E 132 X

DEKRA Testing and Certification GmbH
Bochum, 2022-10-26

Signed: Dr. Krökel
Managing Director

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13 **Appendix**

14 **EU-Type Examination Certificate**

BVS 05 ATEX G 001 X
Supplement 04

15 **Product description**

15.1 **Subject and type**

Gas transmitter types CC28, CC28 D and CC28 DA

15.2 **Description**

Reason for the supplement:
Modifications of the hardware and retesting according to EN 60079-29-1:2016 and EN 50271:2018

Description of Product
The gas transmitter types CC28, CC28 D and CC28 DA are fixed equipment for the measurement of flammable gases and vapours mixed with air. The gas transmitters are connected to a control unit by a 4-20 mA interface (3-wire). The measurement of the gas concentration is done with a catalytic combustion sensor.

15.3 **Parameters**

see EU-type examination certificate BVS 04 ATEX E 132 X

15.4 **Measuring function for explosion protection**

This EU-type examination certificate covers:

- transmitter types CC28, CC28 D and CC28 DA with software versions 2.7.0 and 2.8.0
- when operated with sensor type MK 208-1 the measurement of methane, propane, 2-propanol and n-nonane mixed with air in the measuring range 0 % LEL to 100 % LEL and ammonia mixed with air in the measuring range 0 %(v/v) to 4 %(v/v)
- when operated with sensor type MK 217-1 the measurement of methane, propane and hydrogen mixed with air in the measuring range 0 % LEL to 100 % LEL
- use of the following outputs for safety relevant purposes:
  - display
  - 4-20 mA output
- use of the following accessories:
  - Control Panel RC2 (part no. 2800201)
  - Flow through adapter (part no. 2800202)
  - Wind protection (part no. 2800204)

The EU-type examination includes the following deviations from the operating conditions required by EN 60079-29-1:
- Reduced range of temperature at operation (MK217-1 only): -10 °C to +40 °C
- Extended range of humidity of the measured gas: 5 % RH to 90 % RH

16 **Test report**

PFG-no. 41300105P NIV of 2022-10-26

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17 **Special Conditions for Use**

- See EU-type examination certificate BVS 04 ATEX E 132 X.
- Set alarm 2 latching.
- Incident air flows from the bottom shall be avoided.
- The wind protection shall be used at air velocities of 3 m/s or above.
- Check zero and span of the sensor after reset of an ambiguity alarm caused by a high gas concentration. Take into consideration that zero and span may vary significantly within the next days.
- Test the alarm activation of the connected control unit by applying test gas above the main alarm set point in normal measuring operation at least once a year. The purpose is to test the current interface of the transmitter as part of the safety function.
- Perform the test of the display and the visible and audible alarm devices when putting the transmitter into service.

18 **Essential Health and Safety Requirements**

The Essential Health and Safety Requirements with respect to the measuring function for explosion protection are covered by the standards listed under item 9.

19 **Drawings and Documents**

Drawings and documents are listed in the confidential test report.

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

DEKRA Testing and Certification GmbH
Bochum, dated 2022-10-26

Managing Director

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Translation

1 EU-Type Examination Certificate Supplement 5

Change to Directive 2014/34/EU

2 **Equipment intended for use in potentially explosive atmospheres Directive 2014/34/EU**

3 EU-Type Examination Certificate Number: **BVS 04 ATEX E 132 X**

4 Product: **Transmitter type CC28 * and type EC28 ***

5 Manufacturer: **GfG Gesellschaft für Gerätebau mbH**

6 Address: **Klönnestr. 99, 44143 Dortmund, Germany**

7 This supplementary certificate extends EC-Type Examination Certificate No. BVS 04 ATEX E 132 X to apply to products designed and constructed in accordance with the specification set out in the appendix of the said certificate but having any acceptable variations specified in the appendix to this certificate and the documents referred to therein.

8 DEKRA Testing and Certification GmbH, Notified Body number 0158, in accordance with Article 17 of Directive 2014/34/EU of the European Parliament and of the Council, dated 26 February 2014, certifies that this product has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of products intended for use in potentially explosive atmospheres given in Annex II to the Directive.
The examination and test results are recorded in the confidential Report No. BVS PP 04.2119 EU.

9 The Essential Health and Safety Requirements are assured in consideration of:

EN IEC 60079-0:2018	**General requirements**
EN 60079-1:2014	**Flameproof enclosure "d"**
EN IEC 60079-7:2015 + A1:2018	**Increased Safety "e"**
EN 60079-11:2012	**Intrinsic Safety "i"**
EN 60079-18:2015/A1:2017	**Encapsulation "m"**

10 If the sign "X" is placed after the certificate number, it indicates that the product is subject to the Special Conditions for Use specified in the appendix to this certificate.

11 This EU-Type Examination Certificate relates only to the design and construction of the specified product. Further requirements of the Directive apply to the manufacturing process and supply of this product. These are not covered by this certificate.

12 The marking of the product shall include the following:

II 2G Ex db eb mb [ib] IIC T4 Gb or
II 2G Ex eb mb [ib] IIC T4 Gb or
II 1G Ex ia IIC T4 Ga

Details see next page

DEKRA Testing and Certification GmbH
Bochum, 2021-03-16

Signed: Jörg-Timm Kilisch
Managing Director

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13 **Appendix**

14 **EU-Type Examination Certificate**

BVS 04 ATEX E 132 X
Supplement 5

15 **Product description**

15.1 **Subject and type**

Transmitter

Type	Connection type / Functionality	Marking
CC28	without display	**II 2G Ex db eb mb [ib] IIC T4 Gb**
CC28 D	with Display	
CC28 DA	with display and alarm	
EC28	4-20 mA, 1-wire bus	**II 2G Ex eb mb [ib] IIC T4 Gb**
EC28 D	4-20 mA, 1-wire bus, display	
EC28 DA	4-20 mA, 1-wire bus, display, alarm-LED and buzzer	
EC28 B	RS485, 2-wire bus	
EC28 DB	RS485, 2-wire bus, display	
EC28 DAB	RS485, 2-wire bus, display, alarm-LED and buzzer	
EC28 R	4-20 mA, 1-wire bus, relay	
EC28 DR	4-20 mA, 1-wire bus, relay, display	
EC28 DAR	4-20 mA, 1-wire bus, relay, display, alarm-LED and buzzer	
EC28 i	4-20 mA (intrinsically safe)	**II 1G Ex ia IIC T4 Ga**
EC28 Di	4-20 mA (intrinsically safe), display	

15.2 **Description**

With this supplement the certificate is changed to Directive 2014/34/EU.
(Annotation: In accordance with Article 41 of Directive 2014/34/EU, EC-Type Examination Certificates referring to 94/9/EC that were in existence prior to the date of application of 2014/34/EU (20 April 2016) may be referenced as if they were issued in accordance with Directive 2014/34/EU. Supplementary Certificates to such EC-Type Examination Certificates, and new issues of such certificates, may continue to bear the original certificate number issued prior to 20 April 2016.)

Reason for the supplement:

Change to Directive 2014/34/EU

The transmitters were tested in accordance to the standards listed on page1.
The marking was modified in accordance to the standards.

The mechanical construction and the internal electronics was slightly modified.

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Description of Product:

The transmitters type CC28 * and type EC28 * serve the purpose of detecting gases in a stationary mode in atmospheric conditions.
For types CC28 *, EC28, EC28 D, EC28 DA, EC28 B, EC28 DB, EC28 DAB, EC28 R, EC28 DR and EC28 DAR, the transmitter enclosure is manufactured to meet the requirements of protection type "e", Increased Safety. The transmitter is equipped with non-intrinsically safe terminals for the supply and the output signal circuits; furthermore, it comes with a module designed to meet the requirements of both protection types, Intrinsic Safety "i" and Encapsulation "m", and, depending on the type, with intrinsically safe interfaces, display units and buzzers.

The transmitter type CC28 * has a sensor attached to it which meets the requirements of protection type Flameproof Enclosure "d".

The transmitter type EC28 * has a sensor attached to it which meets the requirements of protection type Intrinsic Safety "i".

The maximum default voltage U_m for transmitters of type CC28 *, EC28, EC28 D, EC28 DA, EC28 B, EC28 DB, EC28 DAB, EC28 R, EC28 DR and EC28 DAR is 45 V AC or 250 V AC when connected to the non-intrinsically safe terminals, depending on the variant.

The appropriate U_m is stated on the type label.

The intrinsically safe transmitters type EC28 i and type EC28 Di are manufactured with the same enclosure. Additionally, the transmitter is connected to the intrinsically safe supply and output signal circuits (4-20 mA) by terminals.

The transmitters are suitable for an ambient temperature range of -20 °C up to +50 °C.

15.3 **Parameters**

15.3.1 Electrical data for the transmitter type CC28 *, EC28, EC28 D, EC28 DA, EC28 B, EC28 DB, EC28 DAB, EC28 R, EC28 DR and EC28 DAR

15.3.1.1 Non-intrinsically safe supply circuit
type CC28 *, EC28, EC28 D, EC28 DA, EC28 R, EC28 DR, EC28 DAR
connected via terminals X1 and X2

type EC28 B, EC28 DB, EC28 DAB
connected via terminals X1, X2, X5 and X6

Rated supply voltage	up to		30	VDC
Maximum voltage	U_m	DC 45 or AC 250		V

The maximum voltage U_m is stated on the label.

15.3.1.2 Non-intrinsically safe signal circuit (4 up to 20 mA)
type CC28 *
connected via terminals X3, X4

type EC28, EC28 D, EC28 DA, EC28 R, EC28 DR, EC28 DAR
connected via terminals X4 and X2

type EC28 B, EC28 DB, EC28 DAB
connected via terminals X3, X4, X7 and X8

Rated signal voltage	up to		30	VDC
Maximum voltage	U_m	DC 45 or AC 250		V

The maximum voltage U_m is stated on the label.

15.3.1.3 Non-intrinsically safe relay contact circuit (change-over contact)
type EC28 R, EC28 DR, EC28 DAR
connected via X6 up to X8

Rated switch voltage	up to		30	VDC
Maximum switch voltage	U_m	DC 45 or AC 250		V
The maximum voltage U_m is stated on the label.				
Maximum short circuit current of power source			1	A

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15.3.1.4 Intrinsically safe potential-free opto-coupling interface, connected by four-pole plug-in connector type CC28 *, type EC28, EC28 D, EC28 DA, EC28 B, EC28 DB, EC28 DAB, EC28 R, EC28 DR and EC28 DAR

Only for connection of the control set type RC2 (BVS 04 ATEX E 212)

15.3.2 Electrical data for transmitter type EC28 i and type EC28 Di

15.3.2.1 Intrinsically safe supply and signal circuit, connected via terminals X1 and X2

Maximum input voltage	U_i	DC 30	V
Maximum internal capacitance	C_i	negligible	
Maximum internal inductance	L_i	negligible	

15.3.2.2 Intrinsically safe potential-free opto-coupling interface, connected by four-pole plug-in connector

Only for connection of the control set type RC2 (BVS 04 ATEX E 212)

15.3.3 Thermal parameters

Ambient temperature range -20 °C up to +50 °C

16 **Report Number**

BVS PP 04.2119 EU, as of 16.03.2021

17 **Special Conditions for Use**

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

The enclosure of the transmitters type CC 28 *, EC28, EC28 D, EC28 DA, EC28 B, EC28 DB, EC28 DAB, EC28 R, EC28 DR and EC28 DAR meets the requirements for the low degree of mechanical hazards according to EN IEC 60079-0:2018 paragraph 26.4.2; thus it may only be used in such low-hazard areas or in areas where it is protected against mechanical hazards.

18 **Essential Health and Safety Requirements**

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

19 **Drawings and Documents**

Drawings and documents are listed in the confidential report.

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

DEKRA Testing and Certification GmbH
Bochum, 2021-03-16
BVS-Rip/Mu A20170239

Managing Director

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SIL–Declaration of Conformity

CC28
CC28D
CC28DA

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www.gasmessung.de
www.gfg.biz

Issued: 2009-12-16 Changed: 2016-02-08

The transmitter **CC 28 (D, DA)** complies with the following European Standards for Functional Safety:

Functional safety of electrical/electronic/programmable electronic safety-related systems
EN 61508-1:2011

The following parameters for single channel and dual channel use of **transmitter CC28 (D, DA)** have been determined:

	Single channel use	**Redundant use**
Safety function	Explosion protection	
Metering range	0 – 100 % LEL	
SIL level hardware	2	3
Device type	B	
SFF	93.54	
HFT	0	1
β factor	—	10 %
PFD	3.01×10^{-4} (per year)	3.02×10^{-5} (per year)
λ_{du}	6.31×10^{-8} (per h)	
λ_{dd}	2.77×10^{-7} (per h)	
λ_{su}	6.10×10^{-7} (per h)	
λ_{sd}	2.80×10^{-6} (per h)	
Proof Test Interval	1 year	
MTTR	72 h	

The calculation of the parameters was done by GWW GasWarn Dr. Wenker GmbH, and the accuracy of the statement is confirmed by the conformity statement of GWW GasWarn Dr. Wenker GmbH as independent expert.

Always consider the following Operational conditions and safety notes of the operation manual 197-000.12.

Dortmund, 08 February 2016

H.J. Huba
President

SIL–Declaration of Conformity

CC28
CC28D
CC28DA

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www.gasmessung.de
www.gfg.biz

Issued: 2009-12-16 Changed:

Operational Conditions

The SIL level of the transmitter in combination with the determined error rate is only valid, if the following operational conditions are adhered:

The transmitter must be mounted in a position which is suitable for the detection task, must be properly connected to a controller and must be put into operation by the manufacturer GfG or by an authorised representative.

Error reports of 2.8 mA as "fault low" and 22 mA as "fault high" must be recognized as transmitter failure by the used controller. This is automatically made sure when controllers are used which are produced by GfG Gesellschaft für Gerätebau mbH.

The ambient conditions e.g. referring temperature, humidity and pressure, which are stated in the manufacturer's documentation, have to be observed.

According to the manufacture's statements the transmitter has to be regularly serviced by an expert and must be calibrated with a certified test gas.

It must be made sure that the transmitter does not come into contact with traces of one of the following catalyst poisons:

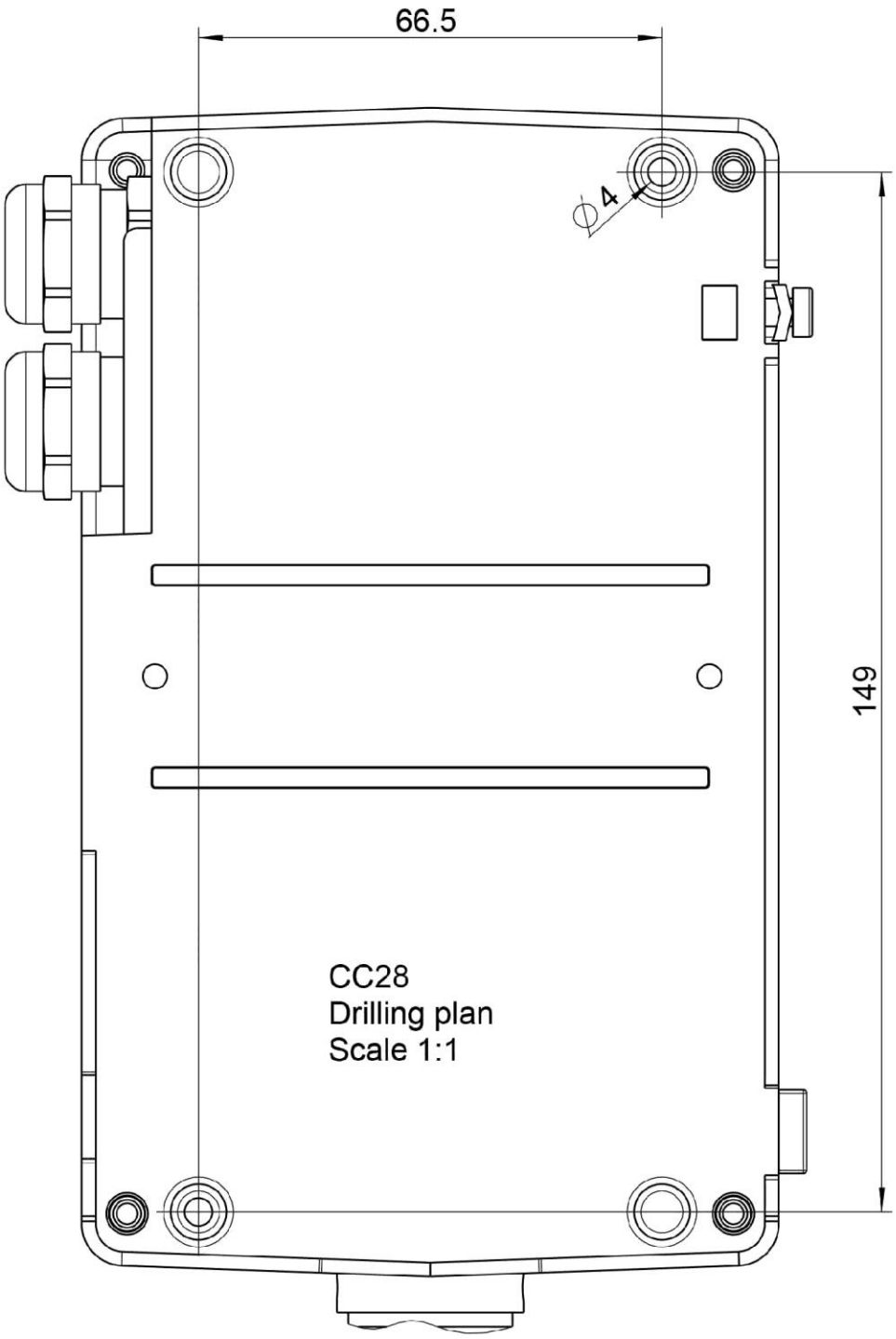
- Silicone vapours (e.g. in polishing or impregnation agents, silicone greases, softeners)
- organic phosphorous compounds (e.g. herbicides or insecticides), halogen compounds (e.g. anorganic or organic chlorine or fluorine compounds)
- Sulphur compounds (e.g. hydrogen sulfide or sulphur-organic compounds)

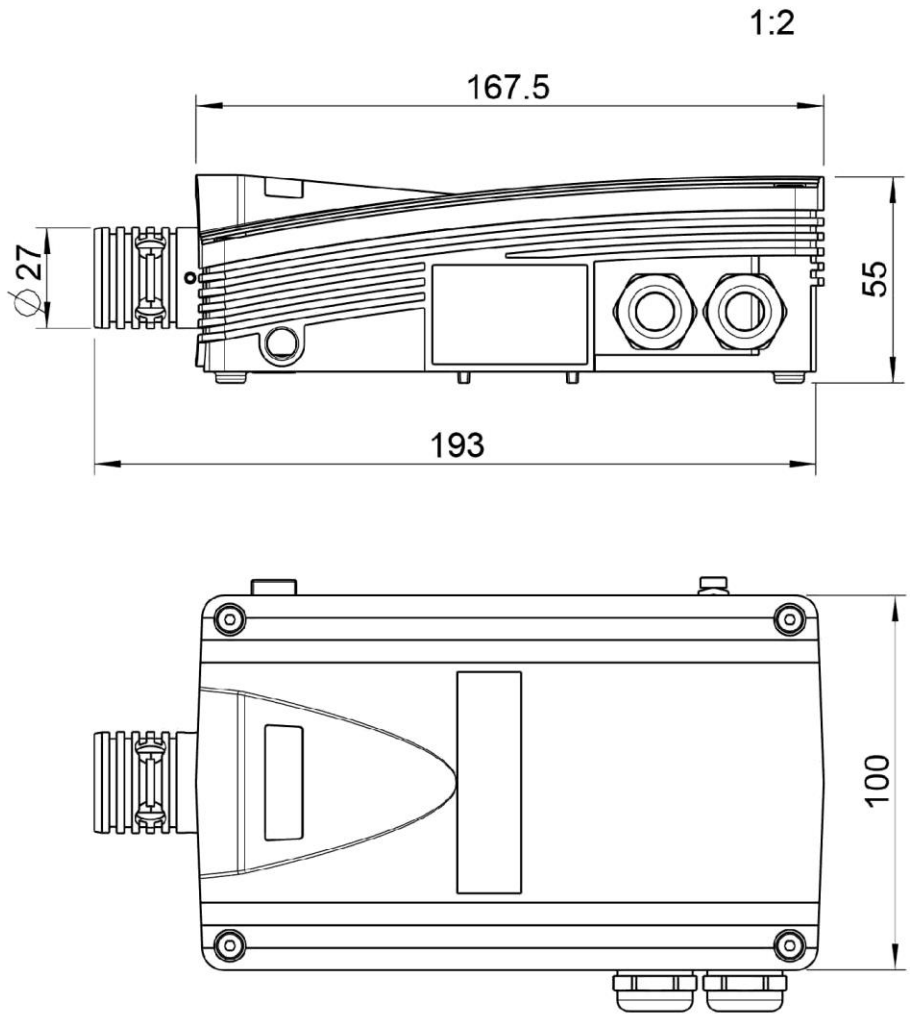
If one of the mentioned catalyst poisons is expected to be present, a different detection principle, e.g. an infrared detector, should be used.

If none of the mentioned catalyst poisons is expected in the environment but cannot be excluded expressively, a new installed system has to be calibrated with test gas in very short time intervals. The intervals may then be prolonged according to bulletin BGI 518 of the Association of Workers' Compensation Insurance Carriers (= bulletin T 023 of BG-Chemie).

Annual Proof Test

At least once a year a Proof Test of the complete safety chain has to be effected. For the transmitter the Proof Test is equivalent to a system check according to the Ordinance on Industrial Safety and Health and includes the regular calibration / adjustment without additional requirements.


66.5
ϕ4
149
CC28
Drilling plan
Scale 1:1


1:2
167.5
ϕ27
55
193
100