

Worldwide Supplier of Safety Solutions



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Gas Transmitter

EC35

Operation Manual



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General Description

The Gas Transmitter EC35 is an "intelligent" measuring system in a pressure-proof enclosure for continuous detection of gas concentrations and for warning from toxic gases and oxygen deficiency in ambient air. The comprehensive electronics takes over many tasks which facilitate operation and service and considerably increase operational safety and measuring accuracy. Its special features are:

- Plug-in Smart Sensors
- Scalable detection ranges
- Big display
- Easy 3 button operation
- Handling even in Ex area
- AutoCal function
- Remote Control / Display
- Compatible with U.S. Conduit System

A 2-wire interface with 4-20mA output is the connection of the transmitter to the outer world. The EC35 provides an additional „Remote Interface“, which allows to handle and operate the unit over a distance of up to 10m even in Ex areas.

The EC35 permanently indicates the measured gas concentrations and operational status. In addition to this, the EC35 provides the measurement value as an analog output signal for further processing.

The EC35 is easy to operate and maintenance-free. Should there be any faults or system failure, the comprehensive fault recognition of the EC35 allows a specific and quick service.



Detection Principle

The sensors used in the GasTransmitter EC35 are electrochemical cells. Electrochemical cells consist of an electrolyte, a working electrode (anode), a counter electrode (cathode) and a reference electrode. The cells are adapted to the gas to be monitored by specific electrodes and a suitable electrolyte. The electrochemical reaction generates an electrical signal, which is proportional to the gas concentration. This signal is amplified by the EC35 and used for display resp. transmission. The sensor cells are using the capillary diffusion barrier technology, which, in combination with an additional temperature compensation, avoids effects caused by changing atmospheric pressure and temperature. Some sensor cells are available with a pre-filter to improve their selectivity.

For Your Safety

This manual must be carefully read by all individuals who have or will have the responsibility for using and servicing this product. This product can only do the job designed to do, if it is used and serviced in accordance with the manufacturer's instructions. The warranties made by GfG with respect to the product are voided, if the adjustment of functions or parameters is changed without permission from GfG. They are also voided, if the product is not used and serviced in accordance with the instructions in this manual. Please protect yourself and your employees by following them. The above does not alter statements regarding warranties and conditions of sale and delivery offered by GfG.



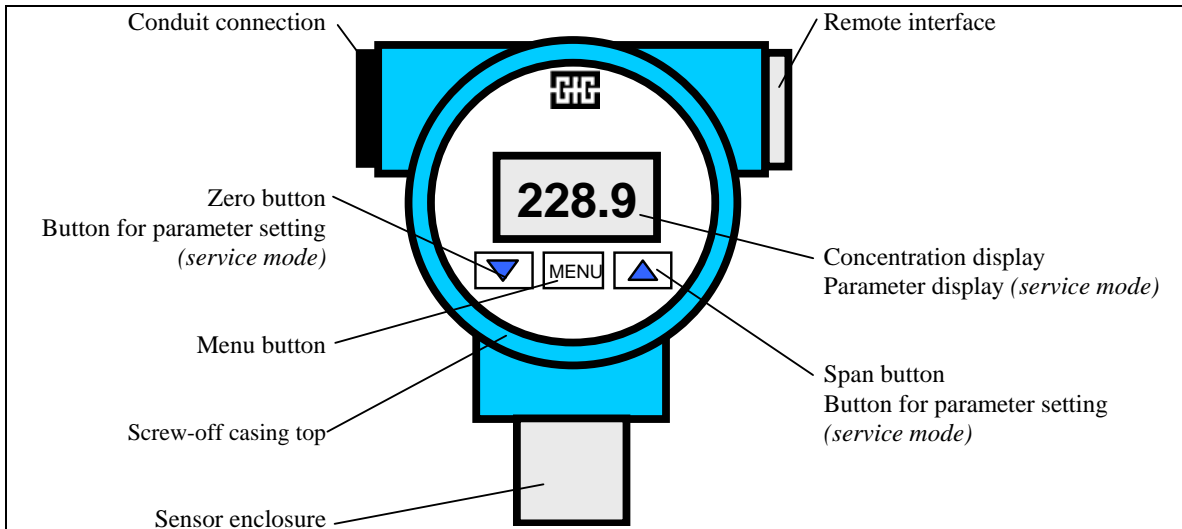
For the set parameters please refer to the test report. Changing functions or parameters may affect the approval. Please contact your GfG service for adapting the detection system to your specific needs.

Design

The design of the EC35 is shown below. The type label indicates the type of transmitter. The sensor cell is built into the sensor holder.

The enclosure includes the main unit, consisting of display and main board, and the supply board. The electronics of the main unit converts the measurement signal for the display and the output. The supply board carries the connections for the voltage supply, the output and the relays.

For operating the buttons of the EC35 you must screw the casing top off.. This results in the loss of the explosion protection..



Mounting

Mounting Position of EC35

It is essential to exactly know the ambient conditions, which have to be taken into consideration before deciding on the mounting position. To achieve representative measurement results, take care of

- the **room ventilation** and
- the **gas density**.

Install the EC35 at a place where the gases pass the sensor even in case of bad ventilation. If necessary, use a smoke cartridge to check.

Furthermore, take the following into consideration as well:

- **Rain water, hose water, dripping water, condensate** and
- **dust in the atmosphere**.

The EC35 is to a great extent protected against the entering of water and dust (IP 66).



Warranty may be voided, if the sensor is exposed to ambient conditions, which were unknown to GfG during planning, production or delivery.

When deciding on the position make sure that the transmitter is always accessible for service and maintenance. It is recommended to mount the EC35 with the sensor showing to the floor. Different installation, however, does not affect the measurement accuracy.

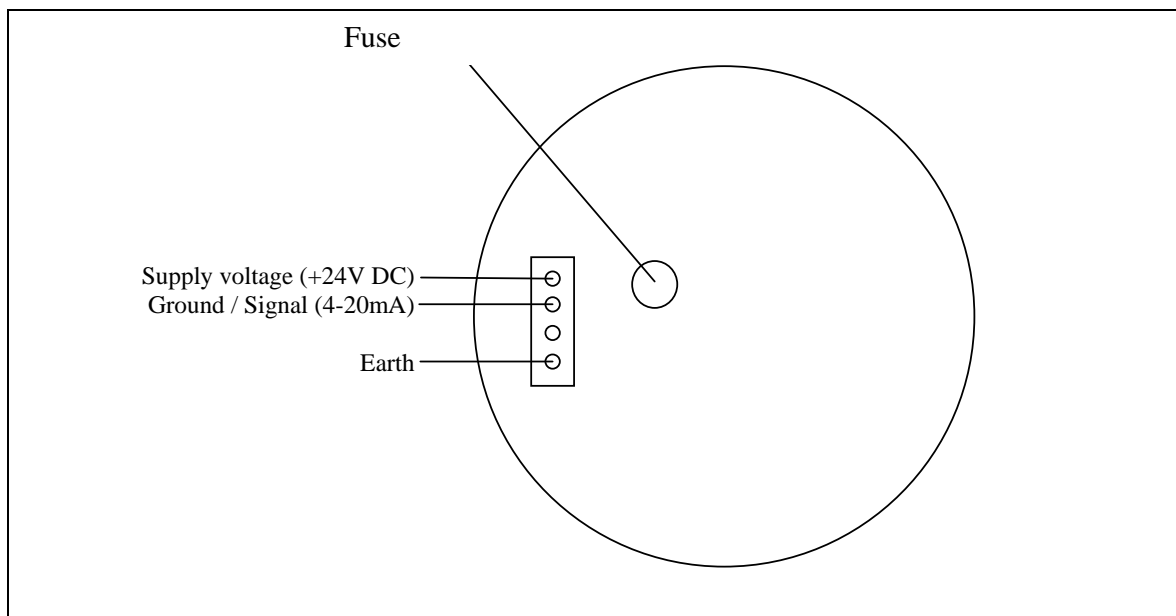
Installation of Electrical Connections

Procurement of cable and electrical connections must be done by a specialist only, obeying the applicable regulations.

Depending on the model or the operation of the EC35, a shielded 2-core or multi-core cable has to be used (e.g. LIYCY 2 x 1.5 mm²). The cross section of the cable depends on the cable length. For short distances (max. 200 m) it may be sufficient to use 0.75 mm² instead of 1.5 mm².

To install the connections, screw the casing top off and pull the main unit off the supply board.

Connection Diagram of Supply Board



You can connect the EC35 directly to an evaluation unit by means of a 2-pole lead. The current consumption of the unit is approx. 25mA at an operating voltage of 24V DC.

	Way of procurement
U.S.A.	The leads are procured inside a tubing system (conduit), which is mechanically connected to the enclosure. In regular distances there are ignition interlocks (seal) to prevent the extension of a possible explosion inside the conduit.
Europe	The lead is made in ignition classification „increased safety“. Inside the EC35 enclosure is a terminal box. This box and the enclosure are connected by means of a pressure-proof gland.

Once the installation is completed, plug the main unit back to the supply board and screw the casing top on again.

The Gas Transmitter EC35 can be connected to an evaluation unit according to the terminal diagram.

Putting in Operation

The Standalone EC35 is tested for function and indication before shipment. Calibration was done with the proper test gases. Certain deviations, however, are possible due to transport, mounting ambient conditions.

A gas warning system must be put in operation and tested by the manufacturer or by an authorized, skilled person.

After turning on, allow several minutes for:

- the self-check, which tests functions, memory (ROM and RAM) and parameter memory (approx. 10 seconds),
- the warm-up of the sensor.

During the warm-up time the EC35 indicates unit of measurement, kind of gas, detection range and the calibration gas concentration one after the other. Then the EC35 turns automatically to detection mode. Allow a warm-up time of 30 minutes before checking the zeropoint. After this time the display should have stabilized to read „000“. Depending on detection range and sensor the display may also read 20.9 (O₂) or 0.00 (Cl₂).

Detection Mode

In detection mode the digital display indicates the present gas concentration. Measurement is done continuously.



Every minute the display shortly reads the unit of measurement and the kind of gas as operational signal.

Check of Display and Parameter




During these checks the measuring and warning functions are not active!

Display Test

In detection mode shortly press  to start a display test. The display reads all segments ○.○.○.○.○.

Indication of Detection Range

For indication of detection range press . The display reads the parameters below, one after the other:

	Display, i.e.	Description of display
1	UEG, LEL, VOL, PPM	Unit of measurement
2	CH ₄ , NH ₃ , O TM	Gas
3	SCAL / i ° °, • °, i °	Detection range
4	CGAS / • ° (value within range)	Calibration gas concentration

Once the display is finished, the EC35 returns to detection mode automatically.

This display sequence is also shown after turning on and in connection with the different remote control systems.

Fault

A fault is indicated by the fault signal over the 4-20mA loop. Fault is signaled, if:

- the sensor or the transmitter electronics is faulty
- no sensor is fit
- the sensor life has expired
- the self monitoring function detects a failure


Sensor Life


The lifetime of the electrochemical sensors depends on the gas to be measured. The EC35 indicates the expired lifetime by reading **CHNG SENS** and measurement value alternately. The sensor should be replaced as soon as possible.


Check and Autocal Adjustment of Zeropoint

This check for TOX sensors is subject to the presence of atmospheric air without interfering gas components. Otherwise you have to supply synthetic air to the sensor. An oxygen sensor has to be exposed to 100 Vol.-% nitrogen (N₂) to check and adjust.

Fix a calibration adapter on the sensor holder. Supply synthetic air (or 100% N₂) without pressure at a flow rate of approx. 0.5 l/min. Look at the display. If it is different from 0, you have to adjust the zeropoint. When the display value is constant, the zeropoint adjustment can be done by means of the Autocal program. The AutoCal program provides the automatic setting of the zero signal to the zero gas.


1. Press  for min. 3 seconds to activate the AutoCal program.
2. The display shows alternately the present measurement value and the indication **ZERO**. If the measurement value remains constant during a defined period, it is overwritten by the zero value. The AutoCal program then stops automatically.

The AutoCal program can be shortened by long-term pressing of . The display shortly reads **SAVE** and the measurement value is overwritten by the zero value.



Should you want to leave the AutoCal without zeropoint adjustment, just press  shortly. The display shortly reads **ESC**.

During adjustment, the following error messages may be reported:

Display	Remark
CAL ERR. 1	No test gas recognized
CAL ERR. 2	Test gas signal is unstable
CAL ERR. 3	Calibration data does not make sense

Error messages during adjustment procedure have to be acknowledged by pressing .

Check and Autocal Adjustment of Sensitivity


First check the calibration gas concentration: Refer to the test report or shortly press  to read the parameter from the display. The test gas concentration should be at least 20 % above the 2. alarm threshold. The alarm settings can also be seen from the parameter display after shortly pressing .





Dealing with toxic gases requires special safety measures. TLVs give hints in regard to hazards caused by toxic gases.

Fix a calibration adapter on the sensor holder.

Supply the test gas (fresh air or synthetic air for adjustment of an oxygen sensor) without pressure at a flow rate of approx. 0.5 l/min. Look at the display. If the display value is different from the test gas concentration, a sensitivity is necessary. When the display value remains constant, the sensitivity adjustment can be done by means of the Autocal program. The AutoCal program provides the automatic setting of the measurement signal to the test gas.


1. Press  for min. 3 seconds to activate the AutoCal program.
2. The display shows alternately the present measurement value and the indication **SPAN**. If the measurement value remains constant during a defined time interval, it is overwritten by the test gas value. The AutoCal program then stops automatically.

The AutoCal program can be shortened by long-term pressing of . The display shortly reads **SAVE** and the measurement value is overwritten by the value of the test gas concentration.

Should you want to leave the AutoCal without sensitivity adjustment, just press  shortly. The display shortly reads **ESC**.

During adjustment, the following error messages may be reported:

Display	Remark
CAL ERR. 1	No test gas recognized
CAL ERR. 2	Test gas signal is unstable
CAL ERR. 3	Calibration data does not make sense


Error messages during adjustment procedure have to be acknowledged by pressing .

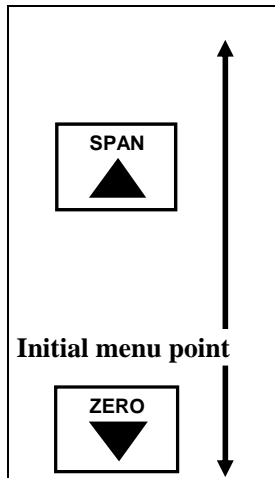
Service





Activation of Service Menu

The service menu allows to select and to change all important parameters of the EC35.

Here is how to reach the menu:

1. Press  for at least 3 seconds. The display reads **CGAS**. Use the navigation keys to select the different menu points.





	Menu Display	Description
	INFO	Display of software version and serial number
	SCAL	Changing of detection range
	CGAS	Changing of calibration gas concentration
	SAVE	Leaving detector settings with storing of changed parameters
	ESC	Changing of detector settings without storing of changed parameters

Shortly press  to activate the requested menu point once you have selected it. For adjusting the parameters use  and . Shortly press  again to leave the menu point.

In the service mode the threshold alarms are blocked. The EC35 turns to fault. The LEDs “ON“ and „F“ are lit, the fault relay is activated.

Adjustments in Service Mode

Check and Adjustment of Calibration Gas Concentration CGAS





1. Shortly press  to activate menu point **CGAS**.
2. The display shows the currently set value for the calibration gas concentration.
3. Use  and  to adjust the parameter.
4. Shortly press  to leave menu point **CGAS**.
5. Store the parameter (see page 12)

Check and Adjustment of Detection Range SCAL



The scaling function of the EC35 allows to use one single sensor of the EC30 system for different detection ranges. This means that most applications are covered by max. 2 different sensors for one gas.

CO 500 ppm	0 .. 500 ppm	400 ppm	300 ppm	250 ppm	200 ppm	100 ppm
CO 2000 ppm	0 .. 2000 ppm	1000 ppm	500 ppm	400 ppm		
NH ₃ 2000 ppm	0 .. 2000 ppm	1000 ppm	500 ppm	400 ppm		
NH ₃ 1000 ppm	0 .. 1000 ppm	500 ppm	400 ppm	300 ppm	250 ppm	200 ppm

The max. detection range of the individual sensors can be scaled down to one sixth. This is based on the following raster: 10, 20, 25, 30, 40, 50, 100 ...etc.

1. Press  shortly to activate the menu point SCAL.
2. The display shows the currently set value for full scale.
3. Use  and  to set the parameter.
4. Press  shortly to leave menu point SCAL.
5. Store the parameter (see below)


Display of Software Version and Serial Number INFO

1. Press  shortly to activate menu point INFO.
2. The display shows the software version and the serial number.
3. Press  shortly to leave menu point INFO.


Leaving the Service Mode

You can leave the service mode either with or without storing the changed parameter:

With storing:

Press  shortly to activate menu point SAVE.

Without storing:

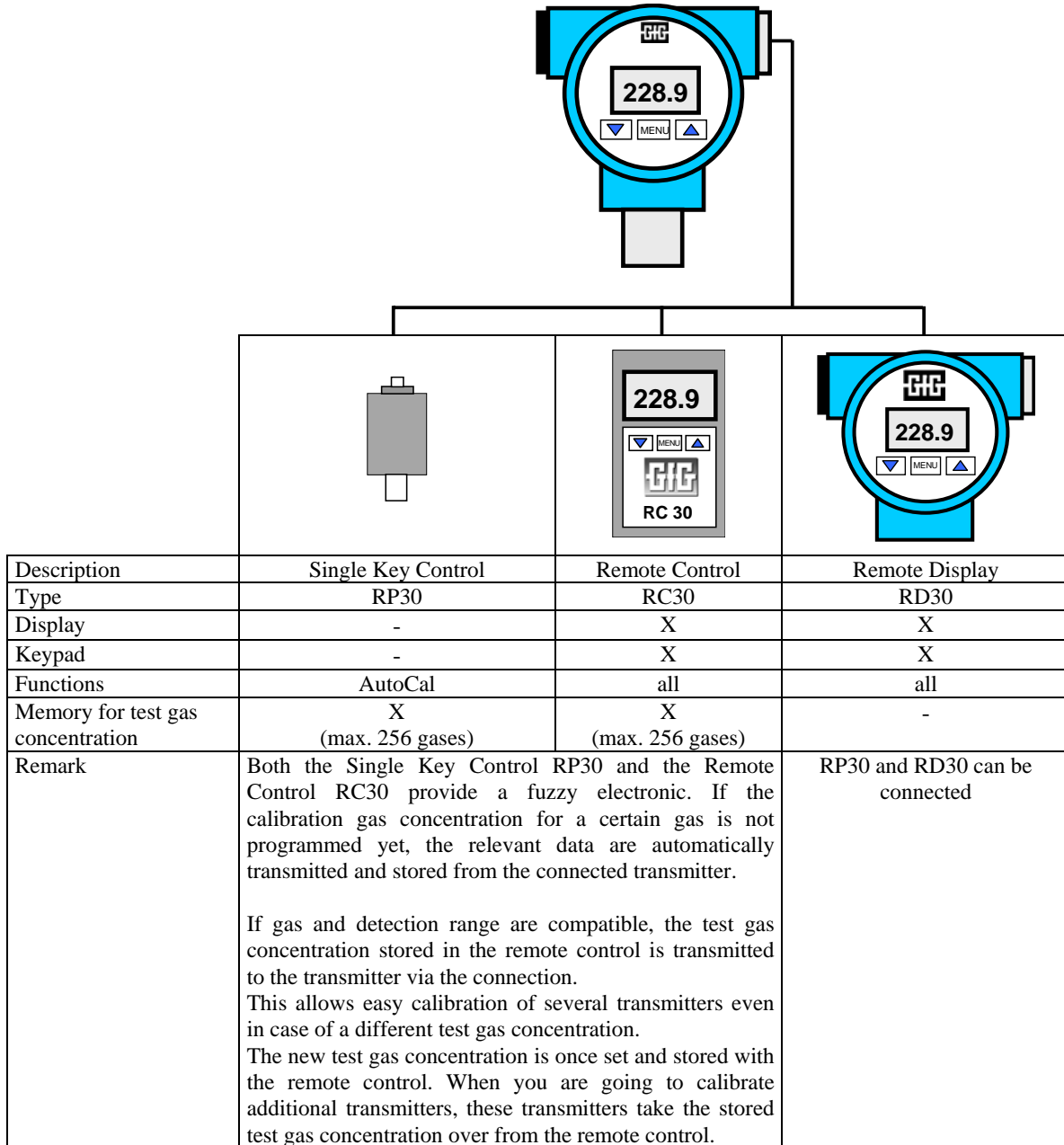
Press  shortly to activate menu point ESC.



You can change several parameters one after the other without storing them individually. One collective storing process once your settings are complete, is sufficient to store all parameters in the previously selected menu point.

Remote Controls

Remote control of the EC35 can be effected by different systems. This allows handling, e.g. calibration, even in hazardous areas. The remote control systems are defined by their function possibilities.



Once these remote control systems are connected to the EC35, the display shows measurement unit, gas, detection range, alarm thresholds AL1 and AL2 and the calibration gas concentration one after the other.

Single Key Control RP30

The single key control RP30 provides all functions for the calibration of the transmitter. The single key control includes an internal parameter memory, which stores calibration gas concentrations for different gases. When connected, the relevant value is transmitted to and stored in the transmitter. If the calibration gas concentration is changed, the new value is stored both in the transmitter and in the single key control.

The points mentioned in chapter „Check and AutoCal Adjustment Zeropoint / Sensitivity“ are also valid for the operation of the single key control RP30.

Zeropoint Adjustment

1. Press the key shortly to activate the AutoCal program zeropoint adjustment.
2. The display shows alternately the current measurement value and **ZERO**. If the measurement value remains constant during a defined time interval, it is overwritten by the zero value.

Long-term pressing of the key shortens the AutoCal program.

Press the key **shortly** to stop AutoCal without zeropoint adjustment.

Sensitivity Adjustment

1. **Long-term pressing** of the key activates the AutoCal program sensitivity adjustment.
2. The display reads alternately the current measurement value and **SPAN**. If the measurement value remains constant during a defined time interval, it is overwritten by the value of the test gas concentration.

Long-term pressing of the key shortens the AutoCal program.

Press the key **shortly** to stop AutoCal without sensitivity adjustment.

Remote Control RC30

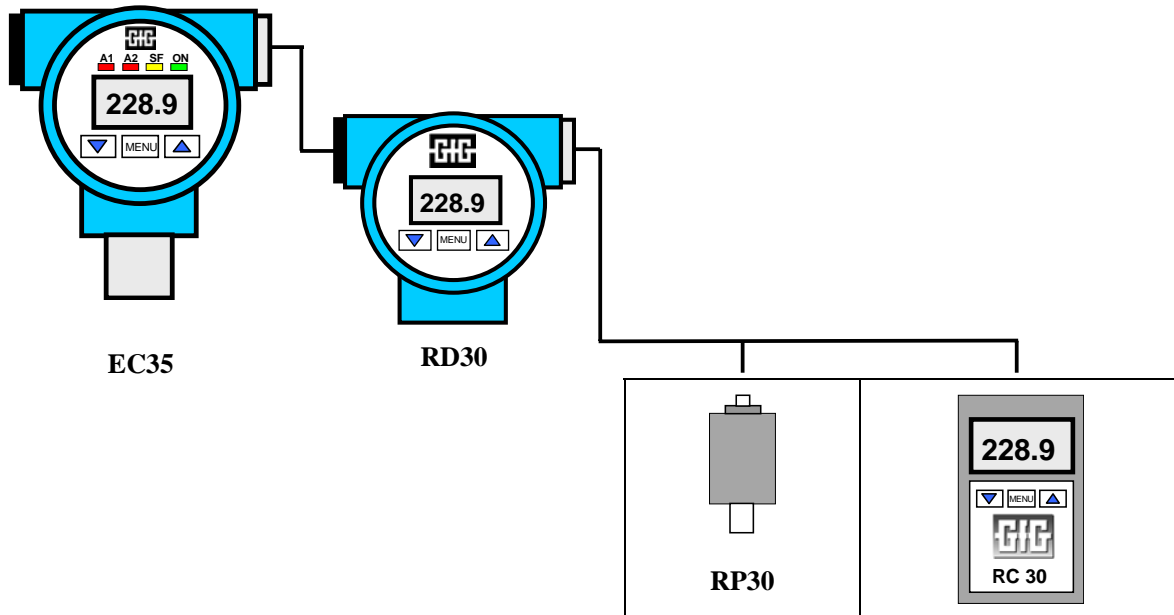
The remote control RC30 provides all functions and adjustments, which can be done with the keys at the EC35.

As the single key control RP30, the remote control RC30 includes an internal parameter memory, which stores calibration gas concentrations for different gases. When you plug the connection cable in, the relevant value is transmitted to and stored in the transmitter. If the calibration gas concentration is changed, the new value is stored both in the EC35 and in the remote control.

Remote Display RD30

The remote display RD30 is a remote display for the EC35. Remote controlling of the EC35 is allowed either by means of the RD30 keypad or by connecting the single key control RP30 or the remote control RC30 to the RD30. All functions and adjustments which can be done by means of the keys at the EC35, can also be effected with the remote display RD30.

The RD30 does not need its own power supply.



Maintenance

According to the „Guidelines for Explosion Protection“, „UVV Gases“ and DIN 31051, „maintenance“ stands for maintenance, inspection and repair of gas warning equipment. Appropriate measures are described in the information sheet T 023 of BG Chemie, e.g. a regular function test. The function test includes the check with alarm test gas and, if necessary:

- the check of zeropoint and sensitivity (calibration)
- the check of the response time
- the check of the gas sampling and gas processing system
- the check of the alarm signal activation
- the check of the fault alarm

This test has to be done by an expert, and a written result must be filed. The calibration intervals should not exceed 16 weeks. The function test has to be done before putting into operation and at least once a year.

Service and Inspection

Maintenance and inspection mean measures which ensure the planned status of the gas monitoring system.

The EC35 does not require a special maintenance, you should, however, take care of some points.

- Depending on the ambient conditions, gas monitoring systems may show a different behavior. It is important, therefore, to do a visual check every day.
- Check of gas processing system and filters (if any).
- Check of gas supply for soiling or obstacles (for correct measurement the gas supply to the sensor must not be blocked).
- Electrochemical sensors are subject to ageing and exhausting. In general they need to be replaced after a period of 24 months. A sensitivity check can only be done with a suitable test gas. The sensitivity calibration is an expert calibration and is usually done by GfG's service or by authorized persons.

Trouble Shooting

Failure	Reason	Solution
Zeropoint cannot be adjusted	Faulty sensor	Replace sensor
Full scale cannot be adjusted	Faulty sensor	Replace sensor

Gases and Detection Ranges

Gas	Range	MK Type
Ammonia (NH ₃) for deep freezing applications	0...40 to 200 ppm 0...40 to 200 ppm	MK311-7 MK394-7
Ammonia (NH ₃) for deep freezing applications	0...200 to 1000 ppm 0...200 to 1000 ppm	MK399-7 MK400-7
Carbon monoxide (CO) (sensitive for H ₂ S)	0...100 to 500 ppm 0...400 to 2000 ppm	MK174-7 MK174-4
Carbon monoxide (CO) (not sensitive for H ₂ S)	0...100 to 500 ppm 0...400 to 2000 ppm	MK175-7 MK175-4
Chlorine (Cl ₂)	0...10 to 50 ppm 0...50 to 250 ppm	MK390-7 MK304-4
Chlorine dioxide (ClO ₂)	0...0.2 to 1 ppm	MK391-7
Ethylene oxide (C ₂ H ₄ O)	0...20 to 100 ppm	MK340-7
Hydrogen (H ₂)	0...400 to 2000 ppm 0...0.2 to 1 Vol.-% 0...1 to 4 Vol.-%	MK305-7 MK402-7 MK406-7
Hydrogen chloride (HCL)	0...40 to 200 ppm	MK309-7
Hydrogen cyanide (HCN)	0...10 to 50 ppm 0...40 to 200 ppm	MK409-7 MK336-7
Hydrogen sulfide (H ₂ S)	0...40 to 200 ppm 0...200 to 1000 ppm	MK176-7 MK177-7
Nitrogen dioxide (NO ₂)	0...10 to 50 ppm 0...40 to 200 ppm	MK310-7 MK310-4
Nitrogen monoxide (NO)	0...50 to 300 ppm 0...300 to 1500 ppm	MK179-7 MK179-4
Oxygen (O ₂)	0...5 to 25 Vol.-%	MK398-7
Ozone (O ₃)	0...1 to 5 ppm	MK397-7
Sulfur dioxide (SO ₂)	0...10 to 50 ppm 0...100 to 500 ppm	MK306-7 MK307-7
Silane (SiH ₄)	0...10 to 50 ppm	MK404-7

Spare Part List

	Part No.
EC35 NA Set	2360300
EC35 Ground Board	2360311
EC35 Main and Supply Electronic	2360312
RD30 Remote Display Board	2350330

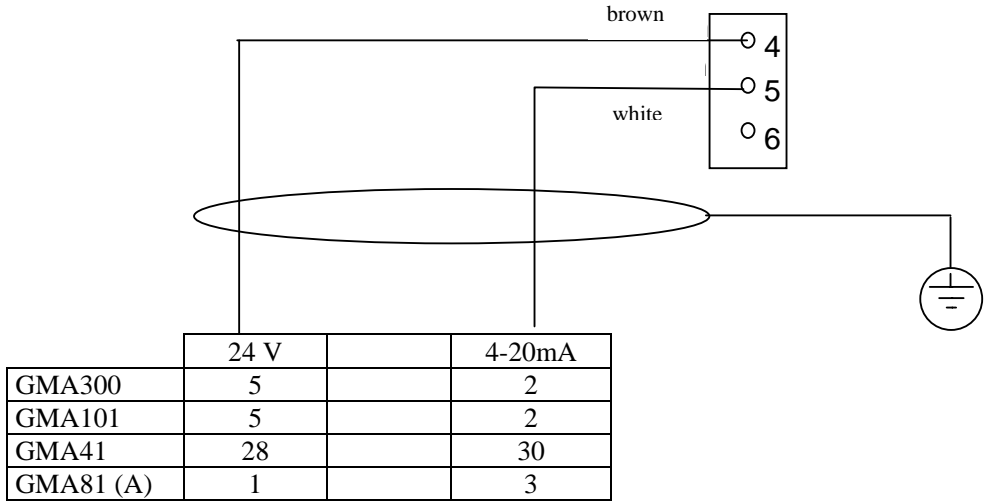
Accessories

	Part No.
Calibration adapter	2400209
Single Key Control RP30	2350230
Remote Control RC30	2350231
Remote Display RD30	

When replacing spare parts or using accessories please take the following effects on the detector characteristics into consideration:

Spare Part, Accessory	Effect of ambient temperature
Spare sensor	Zeropoint and full scale adjustment
Screw-in calibration adapter	None, if flow rate is 0.5 l/min
Plug-on calibration adapter	None, if flow rate is 0.5 l/min

Connection Diagram EC35 with 4 .. 20 mA Output



Technical Data

StandAlone EC35

Type: EC35

Gas: Toxic gases and vapors, e.g. chlorine, ammonia or oxygen (see test report)

Range: see test report

Gas supply: Diffusion

Detection principle: Electrochemical sensor cell

Response time T₉₀: < 5 s (depending on gas)

Sensor life: Toxic gases and oxygen > 2 years

Power Supply

Supply voltage: 24 V DC

Current consumption: 25 mA

Primary fuse:

Secondary fuse:

Output current: 4 .. 20 mA

Climate Conditions

Operational temperature: -15 .. +45 °C, 15 .. 96 % r. h., 920 .. 1080 hPa

Recommended storage conditions for EC35, accessories and spare parts:

Outputs

Analog output for measurement value: 4 .. 20 mA, max. load 300 Ω

Remote Interface

Max. length of remote control cable: 10 m

Enclosure

Material: Aluminum alloy

Material sensor holder: Stainless steel

Diffusion surface: Stainless steel, sintered

Cable gland: Screwing PG 9 max. cross section 3 x 1.5 mm²

Dimensions: 115 x 125 x 95 mm (WxHxD)

Weight: 1500 g

Safety

Ingress protection: DIN 40050 – IP 66

Explosion protection: EEX de [ia]IIC T4 (CENELEC)

(pending) Class I, Division 1, Group B, C, D (UL)

Protective insulation: As per EN 61010 up to overvoltage category III and soiling degree 2

Manufacturer certificate: The EC35 complies to the requirements of the EMC Regulation 89/336/EWG and to the Low Voltage Regulation 73/23/EWG

Annex

Internal Memory EC35

Every transmitter has been programmed with the data of the most important gases and their additional parameters. This means, that in most cases the user does not need to change the configuration. The information below is stored in the internal memory of the transmitter:

Gas	Unit	CGAS						
CO	ppm	300						
H ₂ S	ppm	100						
Cl ₂	ppm	20.0						
HCN	ppm	200						
HCl	ppm	100						
NO	ppm	500						
NO ₂	ppm	100.0						
SO ₂	ppm	50						
NH ₃	ppm	200						
C ₂ H ₄ O	ppm	100						
O ₃	ppm	5.0						
O ₂	vol	20.9						

If the transmitter is operated with a sensor, for which there are no data stored yet, it runs on the following basic settings:

CGAS						
Maximum						

The user can adjust these settings individually and store them. If the transmitter is operated with another sensor, which is unknown to the system, these data are overwritten.

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