

**Worldwide Supplier of Gas
Detection Solutions**



GfG Instrumentation
1194 Oak Valley Drive, Suite 20
Ann Arbor, MI 48108
Tel: 734-769-0573
Fax: 734-769-1888
Web: www.gfg-inc.com Email: info@gfg-inc.com

GMA 88

GMA 88 A

Operation Manual



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Introduction

Each detection point of your fixed gas monitoring system consists of up to 8 transmitters of the same type (or 2 x 4 transmitters of the same type) and a GMA 88 controller. Transmitters and GMA 88 are connected by means of a shielded cable. The GMA 88 provides the power supply for the connected transmitters and receives and processes the sensor signals. Depending on the transmitter type the GMA 88 monitors the ambient air for the presence of toxic or combustible gases and vapors or for its oxygen content.

The GMA 88 offers a variety of features for safe and comfortable operations. Special settings allow for adapting the gas monitoring system to your specific requirements:

- 3-digit display of the linearized measurement values of all channels.
- Menu display.
- 3 variably adjustable alarm thresholds.
- Adjustable relay functions: NC/NO contacts, closed circuit or open circuit operation.
- Alarm hysteresis prevents „relay fluttering“.

The GMA 88 continuously provides information on the measured gas concentration, exceeded alarm thresholds and operational status. As soon as the gas concentration at one of the connected transmitters exceeds one of the three pre-set levels, the GMA 88 gives a warning by means of the LED displays and controls the relevant alarm relays.

The GMA 88 is easy to operate and maintenance-free. Should unexpected failures or system faults occur, the automatic failure recognition of the GMA 88 allows a quick and specific service.

Application

In combination with up to eight transmitters the GMA 88 forms a fixed gas warning system for continuous monitoring of gas concentrations in ambient air and warning from combustible gases and vapors in the LEL range, toxic gases and oxygen.

GMA 88 A

The GMA 88 A provides an integrated alarm buzzer and an alarm lamp for a collective alarm. In this manual the type GMA 88 stands as a reference for both models.

For your Safety

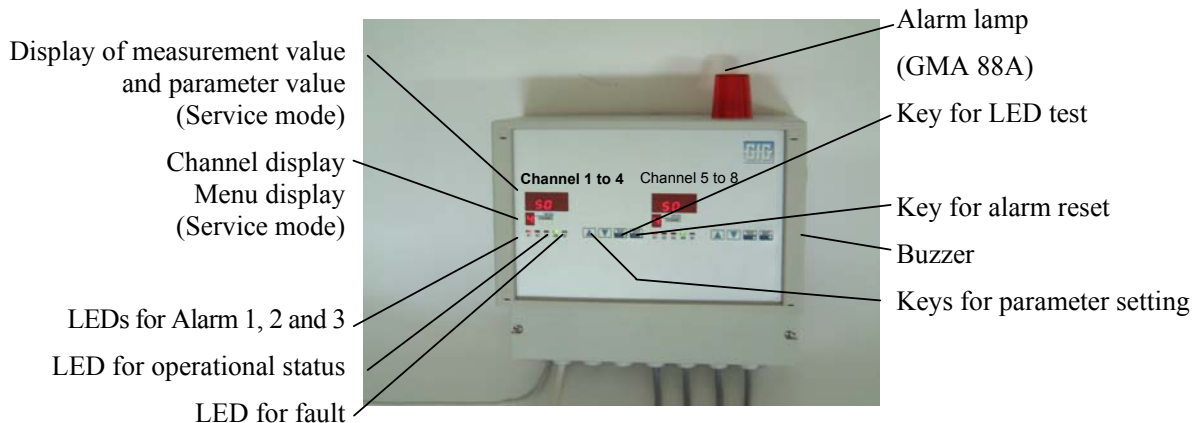
According to § 3 of the law about technical working media, this manual points out the proper use of the product and serves to prevent dangers. This manual must be carefully read by all individuals who have or will have the responsibility for using, controlling and servicing this product. The warranties made by GfG with respect to the product are voided, if the product is not used and serviced in accordance with the instructions laid down in this manual. The warranty is also voided, if the adjustment of functions or parameters is changed without GfG's permission. The above does not alter statements regarding GfG's warranties and conditions of sale and delivery.



For the parameter setting of the supplied GMA 88 please refer to the test report. Modification of functions or parameters may affect the approval. GfG service is always at your disposal for adapting the monitoring system to your specific requirements.

Detection Mode

Front View GMA 88



Function Description

Turning On

The GMA 88 has to be put into operation by the manufacturer or an expert authorized by the manufacturer. After having turned the system on, allow a few minutes for:

- the self test, which checks functions, memory (ROM and RAM) and parameter memory (approx. 10 seconds),
- the warm-up of the connected transmitters (for detailed information please refer to the operation manual of your transmitter).

During the warm-up period the GMA 88 displays the detection range, the detection unit and the alarm thresholds one after the other. The LED „ON“ blinks and the LED „S F“ is lit, i.e. the fault alarm is active. Alarm thresholds are not activated during the warm-up period. When the GMA 88 re-starts after a mains failure, the gas alarms are only evaluated once the warm-up is completed. The GMA 88 automatically turns to detection mode once the warm-up is completed.

Detection Mode


During the detection mode the 3 digit LED display shows the current gas concentrations of the individual transmitters one after the other (alternatively the display of the current gas concentration can be deactivated. Please call GfG Service). The channel display indicates, which transmitter currently is displayed. Channels are continuously monitored. Exceeded thresholds are recognized and reported immediately. Electronic functions, like parameter memory and transmitters, are continuously monitored. In trouble-free detection mode the green LED „ON“ is lit and the yellow LED „S F“ is out.

Check of Display, Parameters and Relays




During this check the measurement and warning function is **not** activated!

LED Test

In detection mode, press key  shortly to activate the self-test of the GMA 88 controller.

Display of Detection Range and Alarm Thresholds

Keep key  pressed for approx. 5 seconds. The LED „ON“ blinks and the display reads the below mentioned parameters one after the other:


	Display, e.g.	LED ON - blinks, additionally lit:	Description of Display
1	100		Detection range
2	UEG, LEL, ppm, ppb		Detection unit
3	CH4, NH3, O2 GfG-Gas No.		Gas
4	20 (value in detect. range)	A1	1. Threshold alarm
5	40 (value in detect. range)	A2	2. Threshold alarm
6	40 (value in detect. range)	A3	3. Threshold alarm


Once these readings are complete, the GMA 88 automatically turns to detection mode.

Alarm configuration

The GMA 88 provides 3 threshold alarms.

Max. number of channels	Kind of alarm	Alarm per channel	Assignment
8 (2 x 4 channels)	Collective alarm	3	Alarm 1 { Channel 1 { Channel 2 { Channel 3 { Channel 4 { Channel 5 { Channel 6 { Channel 7 { Channel 8 Alarm 2 { Channel 1 { Channel 2 { Channel 3 { Channel 4 { Channel 5 { Channel 6 { Channel 7 { Channel 8 Alarm 3 { Channel 1 { Channel 2 { Channel 3 { Channel 4 { Channel 5 { Channel 6 { Channel 7 { Channel 8


The GMA 88 provides 3 threshold alarms, which are collective ones for all connected transmitters. An alarm is activated as soon as the gas concentration exceeds or falls below a pre-set alarm level. An alarm is indicated by means of the relevant alarm LED. By pressing the key  or the external reset the activated alarm is, after having passed all activated channels, acknowledged. During this time newly activated alarms get acknowledged too.

Alarm	Relevant Alarm LED
has been activated	flashes
has been activated and acknowledged by pressing key 	lights permanently

Together with the alarm LEDs the GMA 88 activates the relevant alarm relay. The GMA 88 A provides an additional audible and visual warning by means of the buzzer and the alarm lamp. The standard setting for the switching functions is shown below:

Alarm	Function	Resettable during Alarm	Resettable after Alarm	GMA 88 A Alarm lamp / Buzzer	Remark
1	non-latching	no	self-reset	flashes / -	
2	latching	no	yes	permanent light / -	
3	latching	yes	yes	permanent light / sounds	Same threshold as alarm 2



The switching functions of the three alarms can be individually set. Alarm thresholds and switch function are the same for all 8 channels. For settings that are different from the standard adjustment, please refer to the test report.

By pressing key  during an alarm, the status of the corresponding channel can be seen from the LEDs.



During this check the measurement and warning function is not activated!

Overrange Memory

In case the detection range is exceeded by more than 10 %, the GMA 88 activates the fault indication in addition to the 3 gas alarms. The display reads . If the GMA is operated with transmitters in the detection range of 0-100 % LEL all alarms and the overrange fault alarm are latching ones. Only if the gas concentration has fallen below the overrange value, the alarm can be acknowledged by pressing key .



The switching functions of the three alarms can be set individually. For settings that are different from the standard adjustment, please refer to the test report.

Remarks concerning Alarm Functions:

Exceeding / Deviating Alarm

If the reduction of the measured gas concentration means a hazardous situation, e.g. oxygen deficiency, the alarm is a deviating one. Exceeding alarms indicate a dangerous situation caused by rising gas concentrations, e.g. toxic and combustible gases.

Latching / Non-latching Alarm

A latching alarm remains valid until it is reset manually, e.g. by pressing key  at the GMA 88. By pressing key  an activated alarm gets acknowledged after having passed all activated channels. During this time newly activated alarms get acknowledged too. A non-latching alarm resets automatically, when the gas concentration falls below or exceeds the preset threshold.

Fault

In case of failure the yellow LED „S F“ lights up and the fault relay is activated. A fault is signaled:

- if the cable between transmitter and GMA 88 is cut;
- if the sensor or the circuit of the transmitter is faulty;
- if the zero point is deviated;
- if the detection range is exceeded (together with alarm activation);
- if the CPU self-monitoring is faulty.

As soon as the failure is over, the yellow LED “S F” goes out, the fault relay switches back and the controller turns to detection mode.







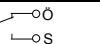







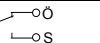







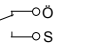







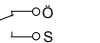

Relays

The GMA 88 provides 5 relays:

- 3 alarm relays or 2 x 2 alarm relays for controlling external alarm devices, valves etc.
- 1 fault relay for signaling of failures.

The on- and off-switching behavior of the relays is the same as for alarm or fault signals. Every relay can be operated as NC or NO contact in closed or open circuit systems. For the switching functions as NC and NO relays you will find contact clamps. The alarm relays are standard operated as open circuit system, the fault relay is a closed circuit.

In the standard setting the switching functions of the relays are as follows:

Relay for:	The relay switches:							
	in detection mode (no gas)	during gas alarm not reset	during gas alarm reset	after gas alarm not reset	after gas alarm reset	in case of mains failure	in case of failure	in case of gas alarm and failure
Alarm 1								
Alarm 2								
Alarm 3								
Fault								





It is essential to take note of the switching behavior of the relays when connecting external devices. In the standard setting alarm 3 (buzzer relay) can be reset even during gas alarm!

For special settings of the relay switching functions please contact your GfG service.

Service

Display of Sensor Signal

Press key  for approx. 2 seconds, and the GMA 88 display reads the signal coming from the transmitter in mA (0.2 .. 1 mA for transmitter with 0.2 – 1 mA output and 4 .. 20 for transmitters with 4 – 20 mA output). Only the channel, which was displayed when you pressed the key, will be displayed. This channel is kept until you release key . This function allows to check the zero point of the connected transmitters quickly and easily at the GMA 88.

Recognition of the service mode of a transmitter







This function is only supported by the transmitters CC 24 EX (type MWG 243x II), CS 24 EX (type MWG 247xII) and EC 25 (type MWG 250x).

The transmitter CC 24 EX, CS 24 EX, EC 25 all have a service switch. If this switch is pressed for service operations (see manual of the transmitter), the GMA 88 displays a fault alarm. No alarms are passed on.



Activation of Service Mode

The service menu allows for displaying and changing of all important parameters of the GMA 88.

A security code protects the service modes A and B from accidental maladjustment and unauthorized access. Adhere to the following procedure to enter the service mode:



1. Press key , then key  and keep both keys pressed, until „SER“ is read in the display.
2. Use keys  and  to enter the security code.

	Security Code	Adjustments
Menu A	11	Alarm thresholds and adjustment
Menu B	222	Deactivation points of alarm thresholds Activation / Deactivation of channels





3. Press key  to confirm the entered security code.
The GMA 88 turns to service mode
or
Press key  to return to detection mode.

In the service mode active alarms stay active and new alarms cannot be activated. The GMA 88 switches to fault. The LEDs „ON“ and „S F“ light up, the fault relay is activated.









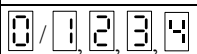
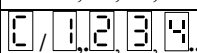


The service mode switches into operation mode, if the keys  and  are simultaneously pressed and the service mode is left with storage or non-storage (see storage of changed parameters and leaving the service mode).






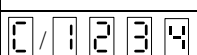

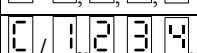

Adjustments in Service Mode

The display of the GMA 88 reads the set parameters. The menu display indicates the menu point, where the displayed parameter value can be found. Use keys  and  to scroll forward and back. For changing of parameters use keys  and .



Survey of Menu Points

Menu A				
Menus display	Channel	Description	Parameter display	Parameter Setting
		Relay test	r l	
The menu starts with „G 1“				
	all	Measurement units	LEL, ppm	Display only
	all	Gas	CH4, NH3, O2 or GfG-Gas No.	
	all	Threshold alarm 1	Value in detection range	Adjustment with  and 
	all	Threshold alarm 2	Value in detection range	
	all	Threshold alarm 3	Value in detection range	
	1 to 4	Zero point adjustment	0 *	
	1 to 4	Sensitivity adjustment	Value in detection range *	

* Parameter display --- if channels are activated. Adjustment of parameters is not possible.








Menu B				
Menus display	Channel	Description	Display, e.g.	Parameter Setting
	all	Point of deactivation for alarm 1	Value in detection range	Adjustment with  and 
	all	Point of deactivation for alarm 2	Value in detection range	
	all	Point of deactivation for alarm 3	Value in detection range	
	1 to 4	Activation of channel	on	
	1 to 4	Deactivation of channel	off	

Test of relays, alarm lamp and buzzer

The display of the GMA 88 reads “rl”. By pressing keys  and  the relays and logic outputs get switched one after the other. The corresponding LEDs for alarm show, which relay has been switched. When entering this service mode all activated alarms are cancelled and newly set when the service mode is left.


Adjustments in service menu A





Adjustment of Alarm Thresholds

1. Activate the **service mode A**.
2. Use keys  and  to select menu point ,  or  for the alarm threshold to be set.
3. Set the new alarm threshold by means of keys  and .
4. Store the parameters. (see page 12)

Adjustable alarms	
Highest alarm	Lowest alarm
End of detection range	Begin of detection range + Hysteresis


Check and Adjustment of Zero-point

1. Supply zero gas to the transmitter or make sure, that the ambient air is free from interfering gases.
Zero gas is a test gas, which is free from combustibile or any other interfering components.
For details about the gas supply please refer to the operation manual of your transmitter.
2. Wait until the display value is stable.
Then press key  for 2 seconds to check the sensor signal of the transmitter. An adjustment of the zero point is only possible, if the sensor signal is within a tolerance band:
For a transmitter with 0.2 - 1 mA: Tolerance of 0.15 - 0.34 mA
For a transmitter with 0.4 - 20 mA: Tolerance of 3 - 6.8 mA
(Slightly different tolerances are possible depending on the transmitters).

If the signal is out of tolerance, the zero-point has to be adjusted at the transmitter first. Please read the manual of the transmitter.
3. Activate the **service mode A**.
4. Use keys  and  to select menu point  of the current channel.
5. Press  key for 3 seconds to adjust the zero point. The adjustment of the zero point was successful, when the value „0“ is flashing in the display. If the display is not flashing, the sensor signal was out of tolerance and has to be adjusted at the transmitter first. Please refer to the operation manual of your transmitter.
6. Disconnect the zero gas from the transmitter. In case of transmitters for oxygen wait until the displayed gas concentration exceeds the threshold alarm.
7. Store the parameter (see page 12)

Check and Adjustment of Sensitivity

Note: Before checking the sensitivity, make sure that the zero point is correctly set.

The GMA 88 allows for the check and adjustment of sensitivity with the help of the peak value memory. The memory activates itself, after the menu setting  of the respective channel has been activated for at least 2.5 minutes. The GMA 88 displays the activated peak value memory by a flashing display.

Sensitivity check and adjustment without peak value memory

1. Activate the service mode A.
2. Use keys **TEST MENU** and **QUIT MENU** to select menu point **[]** of the current channel.
3. Supply test gas to the transmitter. For details about the gas supply please refer to the operation manual of your transmitter.
4. Wait until the display value is stable.
5. Use keys **[▲]** and **[▼]** to set the parameter value to the concentration of your test gas.
6. Disconnect the test gas supply from the transmitter. In case of transmitters for toxic or combustible gases wait until the displayed gas concentration falls below the threshold alarm.
7. Store the parameter (see page 12)

Check and adjustment of the sensitivity with peak value memory

This adjustment method uses the possibility of the GMA 88, to store the highest signal value, which has been measured during the test gas supply. The stored maximum values can be used as sensitivity point. Figure 2 shows this procedure:

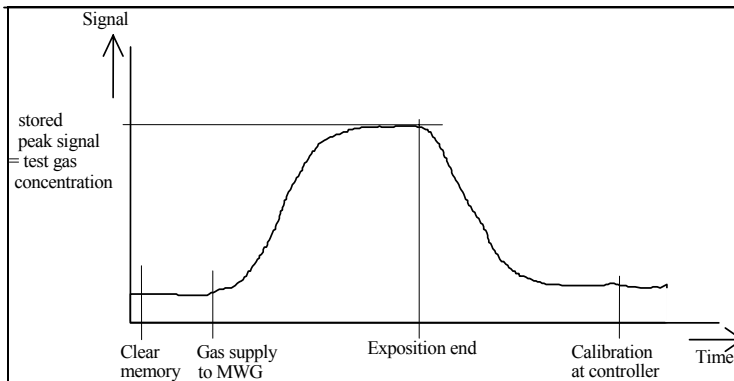


Figure 2

1. Activate service **menu A**.
2. Use keys **TEST MENU** and **QUIT MENU** to select menu point **[]** of the respective channel.
3. After 1.5 minutes supply test gas to the transmitter and make sure that the gas is supplied constantly for at least 3 minutes.



The test gas supply needs to be done timely before the starting the storage. Thereby wrong measurement values through the increase in pressure when opening the pressure gauge of the test gas bottle are avoided. For further detail concerning the gas supply of the transmitter please refer to the manual of the connected transmitter.

4. Disconnect the test gas source from the transmitter.
5. Use keys **[▲]** and **[▼]** to set the parameter value to the test gas concentration.
6. Store the parameter (see page 12).

Adjustments in service menu B

Alarm threshold hysteresis








This function allows for adjusting the hysteresis (point of deactivation) of the alarm thresholds. For exceeding alarms this point can be set from the start of the detection range up to two digits below the alarm threshold. For deviating alarms the deactivation point can be set from two digits above the alarm threshold up to the end of the detection range. The parameter setting is done in the unit of the gas to be measured.

Example:

The hysteresis of a controller, which monitors gas in the LEL range, was set to 18 % LEL for alarm 1, 36 % LEL for alarm 2 and 54 % LEL for alarm 3. This results in the alarm activation below:

	Alarm 1	Alarm 2	Alarm 3
Alarm threshold	= 20 % LEL	= 40 % LEL	= 60 % LEL
Alarm activation	≥ 20 % LEL	≥ 40 % LEL	≥ 60 % LEL
Alarm deactivation	≤ 18 % LEL	≤ 36 % LEL	≤ 54 % LEL










Adjustment of deactivation point:

1. Activate service **menu B**.
2. Use keys  and  to select menu point ,  or  for the alarm deactivation point to be set.
3. Use keys  and  to adjust the new deactivation point.
4. Store the parameter (see below).

Activation / Deactivation of different channels

With this function different channels can be activated or deactivated. This makes sense, if a defect transmitter needs to be taken out of the monitoring system for inspection or if, for the time being, only 2 measurement points shall be established and only later further measurement points shall be activated.

Activation / Deactivation

1. Activate **service menu B**.
2. Use keys  and  to select menu point  for the respective channel , ,  or .
3. The desired channel gets activated with key  and deactivated with key .






A deactivation of all channels is not possible. At least one channel is always active.

4. Store the parameter (see below).


Storing of Changed Parameters and Leaving the Service Mode


All changes done in the service mode have to be stored:

1. Press keys  and  simultaneously to activate the memory function.
The display reads „**Sto**“.
2. **Confirm storage:** Press key  to confirm the storage of the parameter.
The GMA 88 stores all changed parameters and returns to detection mode.



When you leave menu B with storing of the changes, all activated alarms and fault reports are deleted.

Or No storage: Press key  and the GMA 88 returns to detection mode without storing the changed parameters.

 You can change several parameters one after the other, without storing them individually. Once you have set all parameters, one storage confirmation is sufficient to store all changed parameters.

Maintenance

A function test should be done before putting into operation and at least once a year, and checks:

- the zero point and the sensitivity (calibration)
- the response time
- the activation of gas and fault alarms

This test has to be carry out by GfG or by a person authorized by GfG, and a written results must be filed.

Service, Inspection, Calibration and Adjustment

During the inspection visual checks shall be carried out (see information sheet T 023, section 8.1)

- Pollution by dust
- Condensation by humidity
- Protective casing of transmitters
- Diffusion inlets of transmitters

Service and inspection describe those measures, which retain the nominal status of the gas warning system. Those measures shall be carried out on a regular basis, an interval of 4 months shall not be exceeded (see information sheet T 023, section 8.2, 8.3 and DIN EN 50073, section 6.4.3).

- Zero point
- Sensitivity
- Alarm activation
- Response time
- Audible and visible output
- Fault report

Regular Function Test

In addition to the maintenance the functioning of the controller has to be tested on a regular basis. Intervals of 1 year may not be exceeded. (See information sheet T 023, section 8.5 and UVV gases § 56)

Repair

Repair describe all repair works and exchange of parts. They may only be carried out by the manufacturer or persons who have been authorized by him. Only those original spare parts that have been tested and have been allowed to be used by the manufacturer may be used.



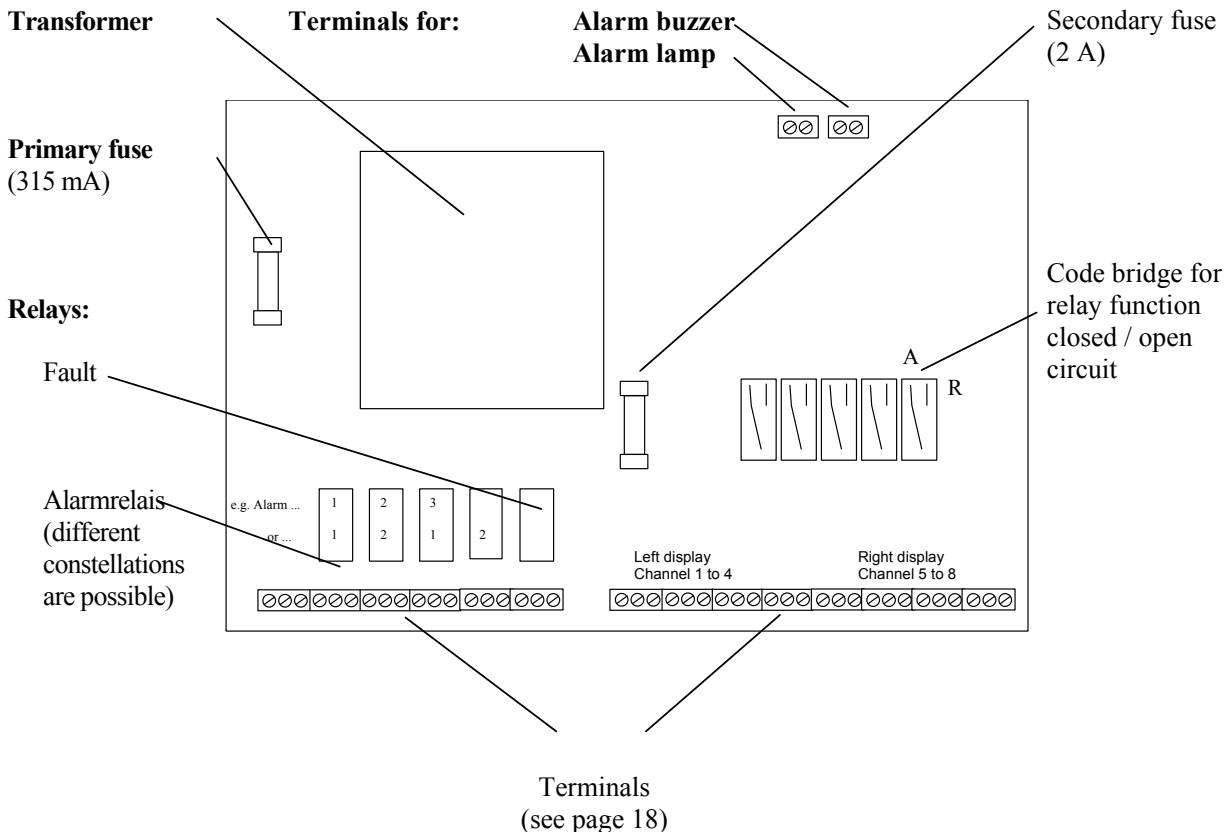
If these measures are neglected, the safety of the product cannot be guaranteed, the type approval is lapsed.

We recommend to regularly carry out function tests and repairs through GfG service.

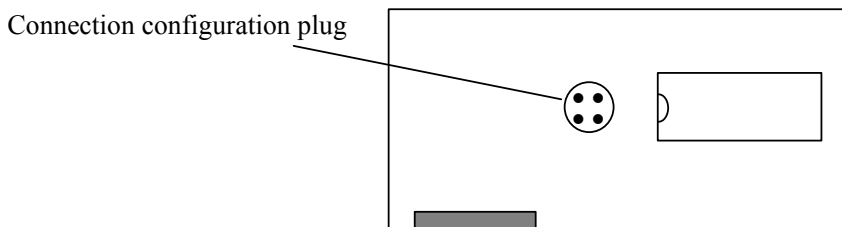
P.C.Boards of GMA 88

The GMA 88 controller contains 2 cards:

1. Main Card



2. Display Card



Changing of Relay Contacts

On the main card of the GMA 88 you find a code bridge for the adjustment of the relay functions. The position of the code bridge determines whether the relays are working in open or closed circuits. The fault relay can only be operated in closed circuits.

Influence of Interfering Gases and Oxygen

Interfering gases, oxygen surplus and oxygen deficiency can also affect the measurement of gases at the transmitter. Please adhere to the operation manual of your transmitter.

Instructions for Installation and Putting into Operation

The GMA 88 controller must not be installed in hazardous areas. The transmitter and the mains supply are connected according to the terminal diagram. Make sure that the shield of the transmitter cable is grounded on the p.c.boards. Once the GMA 88 is mounted to a wall, all transmitters, control groups and the mains supply are connected, an expert can put the system into operation. For installation and putting into operation of the transmitters please refer to the operation manual of your transmitter. **Only experts who are authorized by GfG may put the GMA 88 and the transmitters into operation.**

Transmitter Cable

The GMA 88 controller and the transmitter are connected by means of a shielded transmitter (data) cable (LIYCY). The cross section of the cable cores depends on the current consumption of the transmitter and on the cable length. For detailed information please refer to the operation manual of your transmitter.

Remarks concerning the Technical Safety of the GMA 88

Contact Protection

Mains supply and relay contacts of the **GMA 88** provide insulation distances of 3 mm, i.e. they are designed for 250 V operational insulation. In case a contact is operated on a contact-critical potential, the contacts close to it are also considered as contact-critical. According to contact protection the contacts are not considered to be separated safely. Resulting from this, the same applies to the relay contacts of a **GMA 88** operated on 115 V. Here an operational insulation has been provided as well. The insulation of the secondary circuit from the primary circuit and the relay contacts complies with the requirements for contact protection. Distances of 6.5 mm ensure a safe separation. The secondary circuit operates on extra-low safety voltage.

Trouble Shooting

Failure	Cause	Solution
LED "S F" lights up, display „EEP“	- System error, fault in parameter memory	- Re-start of system - Call GfG service
LED "S F" lights up, LED „ON“ flashes	- System is in warm-up period, alarm suppression is still active	- Wait until warm-up period is over
LEDs do not light up	- Faulty voltage supply, defective fuse or mains unit	- Ensure proper voltage supply
Sensor signal, but gas-free atmosphere	- Incorrect calibration, incorrect zero point adjustment	- Adjust the zero point, calibrate
Display <input type="text"/> <input type="text"/> <input type="text"/> LED „S F“ lights up	- Display overrange (> 999) - ADC overrange - overrange memory	- If there is a gas-free atmosphere at the transmitter, you can reset the stored measurement value
Display <input type="text"/> <input type="text"/> <input type="text"/> LED „S F“ lights up	- Display deviation (< -99) - ADC range deviation - Cable cut	- Check calibration of transmitter and controller - Check cable

Spare parts

	Description	Part no.
1.	Primary fuse T 0,315 A (pack of 5)	
2.	Secondary fuse T 2 A (pack of 5)	

Service Address

For additional questions on the product or in case of failure and problems please contact:

GfG Instrumentation

1194 Oak Valley Drive, Suite 20

Phone: 734-769-0573

Fax: 734-769-1888

E-Mail: info@gfg-inc.com

GMA 88 - Gas List

Gas Nr.	Gas	Chemical Formula	GMA Nr
1	Aceton	CH ₆ O	1
2	Acetonitrile	C ₂ H ₃ N	2
3	Acetylene	C ₂ H ₂	3
4	Acrylnitrile	C ₃ H ₃ N	4
5	Aminopropane	C ₃ H ₉ N	5
6	Ammonia	NH ₃	nh3
7	Amyl alcohol	C ₅ H ₁₂ O	7
8	Benzine 60/95	Mixture	8
9	Benzine 80/110	Mixture	9
10	Benzine (fuel)	Mixture	10
11	Benzene	C ₆ H ₆	11
12	Comb. gases and vapors	Mixture	12
13	Bromtrifluoromethane (Halon)	C Br F ₃	13
14	Butadien - 1.3	C ₄ H ₆	14
15	n-Butane	C ₄ H ₁₀	but.
16	i-Butane	(CH ₃) ₃ CH	16
17	Butanol - 1	C ₄ H ₁₀ O	17
18	Butanon - 2	C ₄ H ₈ O	18
19	n-Butylacetate	C ₆ H ₁₂ O ₂	19
20	i-Butylacetate	C ₆ H ₁₂ O ₂	20
21	n-Butyl alcohol	C ₄ H ₁₀ O	21
22	1-Butylene	C ₄ H ₈	22
23	Chlorine	Cl ₂	CL2
24	Chloromethane	CH ₃ Cl	24
25	Hydrogen chloride	HCl	HCL
26	Hydrogen cyanide	HCN	hcn
27	Cyclohexane	C ₆ H ₁₂	27
28	Cyclopentan	C ₅ H ₁₀	28
29	Cyclopropane	C ₃ H ₆	29
30	Dichlordifluoromethane (R12)	C Cl ₂ F ₂	30
31	1.1 Dichlorethane	C ₂ H ₄ Cl ₂	31
32	Dichlorfluoromethane (R21)	CH Cl ₂ F	32
33	Dichloromethaen	CH ₂ Cl ₂	33
34	1.2 Dichloropropane	C ₃ H ₆ Cl ₂	34
35	Diethylamine	C ₄ H ₁₁ N	35
36	Dimethylether	C ₂ H ₆ O	36
37	Epichlorhydrin	C ₃ H ₅ Cl O	37
38	Natural gas (H+L)	C _n H _m , N ₂	38
39	Ethane	C ₂ H ₆	39
40	Ethanol	C ₂ H ₅ OH	Eol.
41	Ethyl acetate	C ₄ H ₈ O ₂	41
42	Ethyl alcohol	C ₂ H ₆ O	42
43	Ethylen	C ₂ H ₄	43
44	Ethylen oxide	C ₂ H ₄ O	44
45	FAM-Benzine	Mixture	45
46	Jet fuel 40/180	Mixture	46
47	Formaldehyde	CH ₂ O	47
48	Frigen 22	CH Cl F ₂	r22
49	Helium	He	49
50	Heptane	C ₇ H ₁₆	50
51	n-Hexane	C ₆ H ₁₄	51
52	i-Hexane	C ₆ H ₁₄	52
53	Hexanon-2	C ₆ H ₁₂ O	53
54	Isobutyl acetate	C ₆ H ₁₂ O ₂	54

Gas Nr.	Gas	Chemical Formula	GMA Nr
55	Carbon dioxide	CO ₂	CO2
56	Carbon monoxide	CO	CO
57	Coke gas	CO, CH ₄ , H ₂	57
58	Air	N ₂ , O ₂ , CO ₂	58
59	Methane	CH ₄	CH4
60	Methanol	CH ₄ O	60
61	Methyl acetate	C ₃ H ₆ O ₂	61
62	Methyl alcohol	CH ₃ OH	62
63	Methylbutylketone	C ₆ H ₁₂ O	63
64	Methyl chloride	CH ₃ Cl	64
65	Methylene chloride	CH ₂ Cl ₂	65
66	Methyl-i-butylketone	C ₆ H ₁₂ O	66
67	Methylethylketone	C ₄ H ₈ O	67
68	Methylglycol	C ₃ H ₈ O ₂	68
69	Methylmethacrylate	C ₅ H ₈ O ₂	69
70	Methylpropanol	C ₄ H ₁₀ O	70
71	Monochlordifluoromonobrom.	C Br Cl F ₂	71
72	n-Nonane	C ₉ H ₂₀	non.
73	i-Octane	C ₈ H ₁₈	73
74	n-Octane	C ₈ H ₁₈	74
75	i-Pentane	C ₅ H ₁₂	75
76	n-Pentane	C ₅ H ₁₂	76
77	Pentanon-2	C ₅ H ₁₀ O	77
78	Penten-1	C ₅ H ₁₀	78
79	Pentyl acetate	C ₇ H ₁₄ O ₂	79
80	Perchloroethylene	C ₂ Cl ₄	80
81	Propane	C ₃ H ₈	Pro.
82	Propanol-2	C ₃ H ₈ O	82
83	i-Propyl acetate	C ₅ H ₁₀ O ₂	83
84	n-Propyl acetate	C ₅ H ₁₀ O ₂	84
85	n-Propyl alcohol	C ₃ H ₈ O	85
86	i-Propyl alcohol	C ₃ H ₈ O	86
87	Propylene	C ₃ H ₆	87
88	Propylenedichloride-1.2	C ₃ H ₆ Cl ₂	88
89	Oxygen	O ₂	O2
90	Sulfur dioxide	SO ₂	SO2
91	Sulfurhexafluoride	SF ₆	91
92	Hydrogen sulfide	H ₂ S	H2S
93	Town gas	CO, CH ₄ , H ₂	93
94	Nitrogen dioxide	NO ₂	no2
95	Nitrogen monoxide	NO	no
96	Styrene	C ₈ H ₈	96
97	Tetrachloroethane	C ₂ Cl ₄	97
98	Toluene	C ₇ H ₈	98
99	1.1.1-Trichloroethane	C ₂ H ₃ Cl ₃	99
100	Trichloroethylene	C ₂ HCl ₃	100
101	Trifluoromethane (R23)	CH F ₃	101
102	Vinyl acetate	C ₄ H ₆ O ₂	102
103	Vinyl chloride	C ₂ H ₃ Cl	103
104	Hydrogen	H ₂	H2
105	Water gas	H ₂ , CO, CH ₄	105
106	Xylene	C ₈ H ₁₀	106
107	Ozone	O ₃	107

Chart 1 - GfG-Gas List

Annex

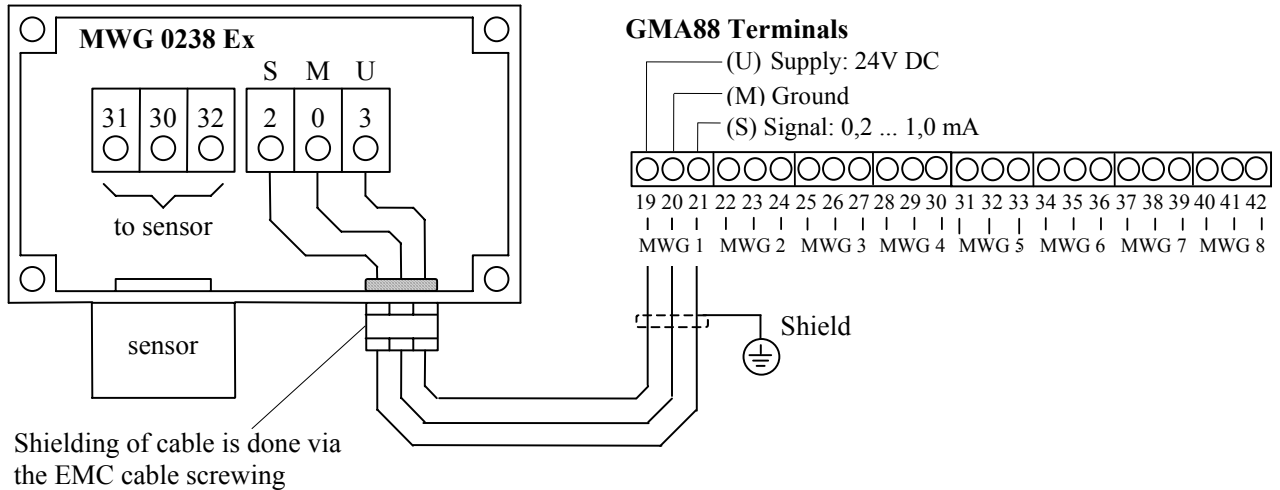
Terminal Diagram of Transmitter

CC 0238 EX (Type MWG 0238 EX)

The CC sensor is designed as 3-wire transmitter. The supply voltage and the 0.2 - 1 mA output signal use the same ground line.

Cable type: 18/3 shielded or Belden #8770 equal (up to 200m)

For connection of transmitters 2 to 8 repeat the steps for transmitter 1 (see picture below).



Transmitters CS21 and CI21

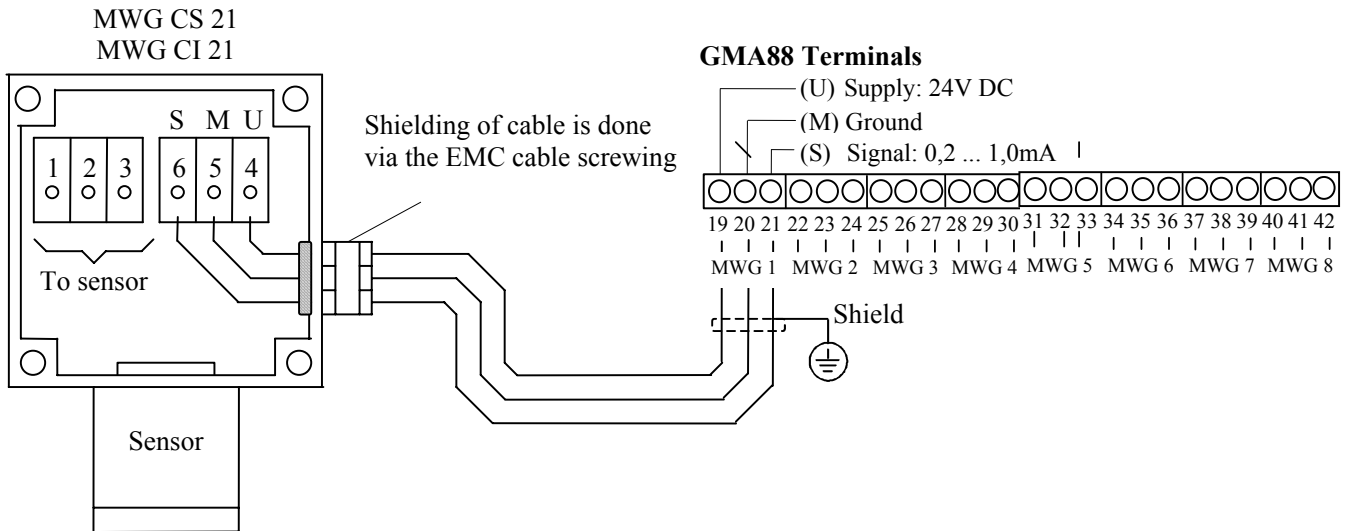
These sensors are designed as 3-wire transmitters.

0.2 – 1 mA

The supply voltage and the 0.2 – 1 mA output signal use the same ground line.

Cable type: 18/3 shielded or Belden #8770 equal (up to 200m)

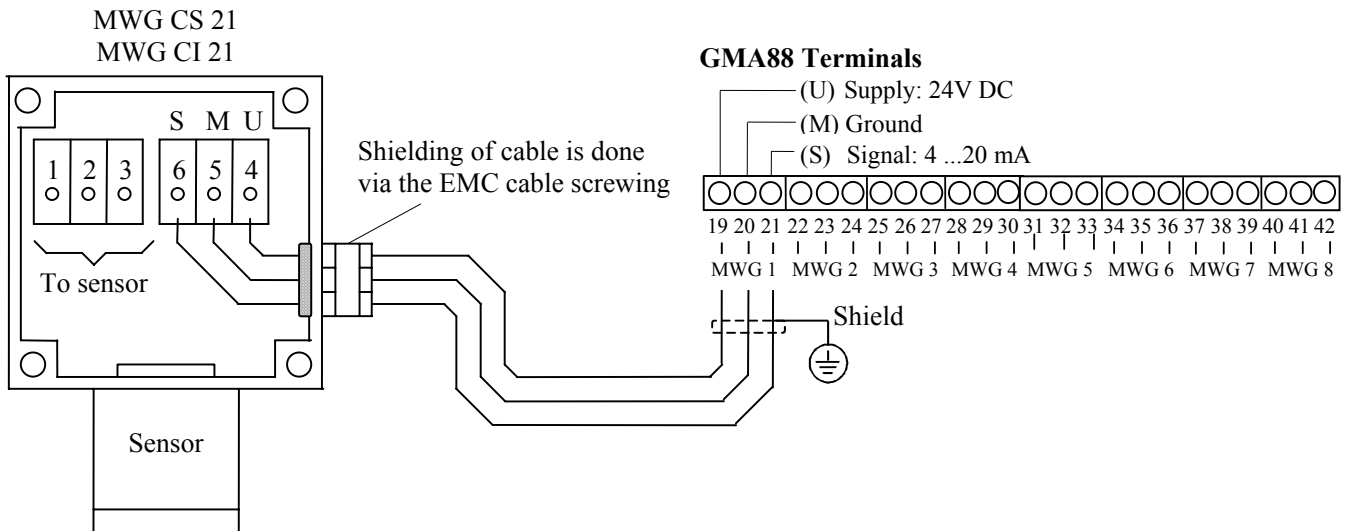
For connection of transmitters 2 to 8 repeat the steps for transmitter 1 (see picture below).



4 – 20 mA output signal

The supply voltage and the 4 – 20 mA output signal use the same ground line.

For connection of transmitters 2 to 4 repeat the steps for transmitter 1 (see picture below).

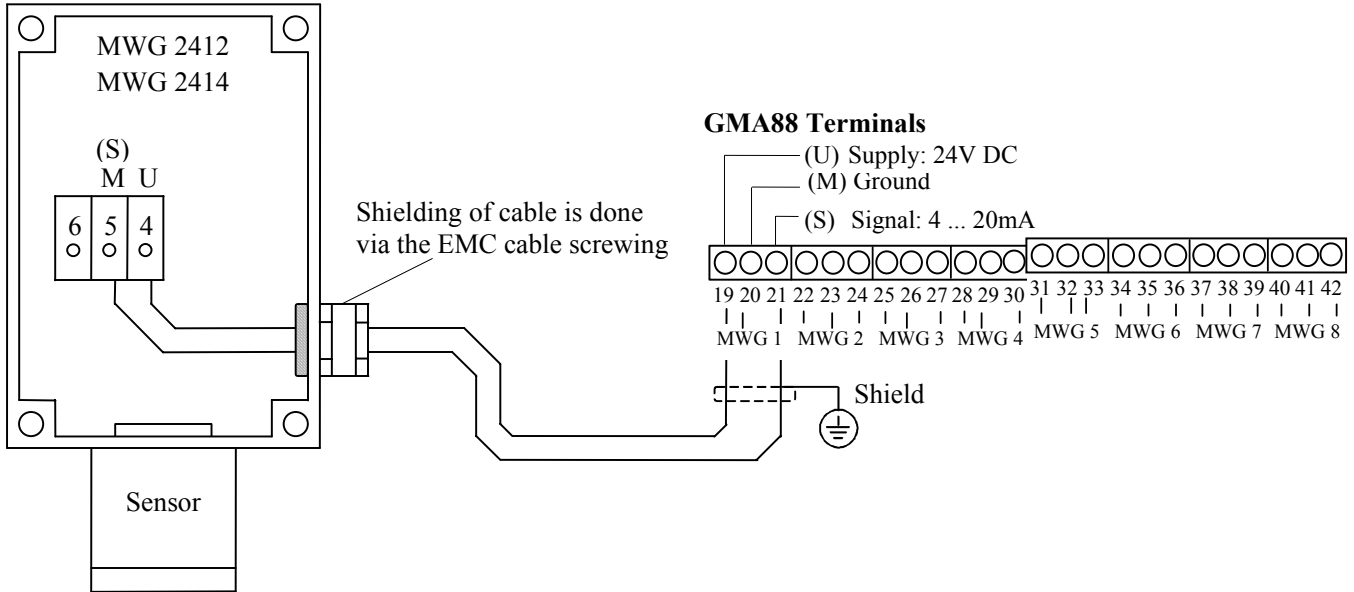


Transmitter EC24 (models MWG 2412, 2414, 2411 and 2413)

4 – 20 mA output signal

The EC models MWG 2412 and MWG 2414 are designed as 2-wire transmitters. The 4 - 20mA output signal is provided via the supply line.

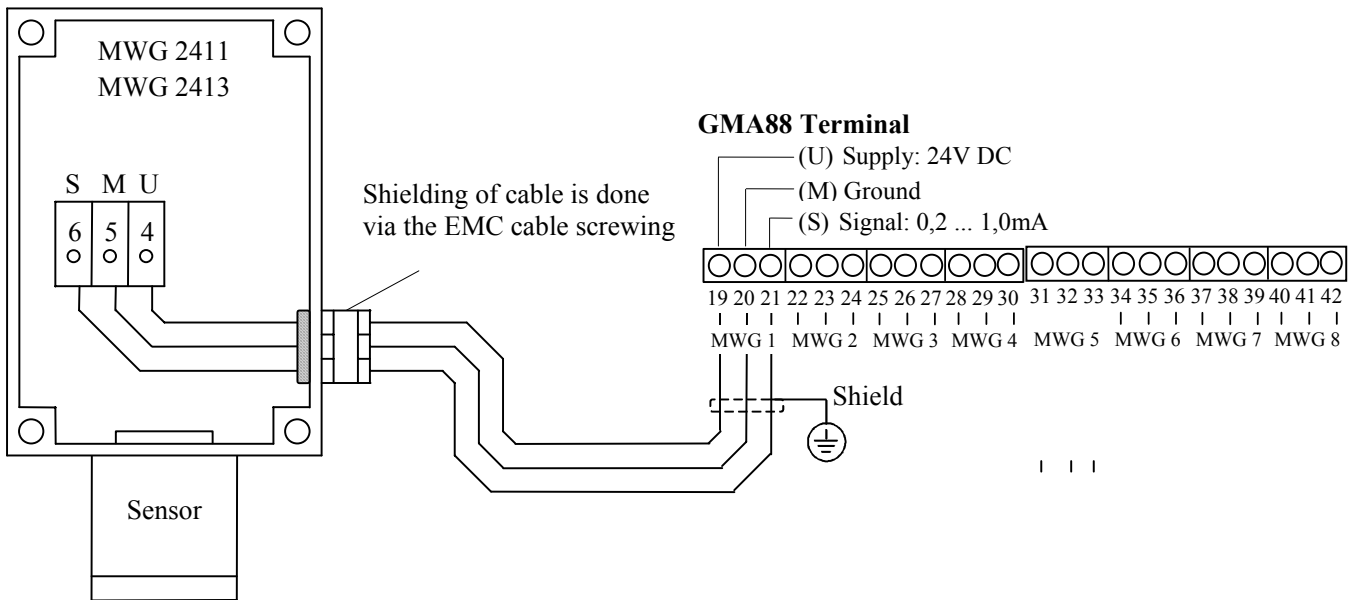
For connection of transmitters 2 to 8 repeat the steps for transmitter 1 (see picture below).



0.2 – 1 mA output signal

The EC models MWG 2411 and MWG 2413 are designed as 3-wire transmitters. The supply voltage and the 0.2 - 1mA output signal use the same ground line.

For connection of transmitters 2 to 8 repeat the steps for transmitter 1 (see picture below).



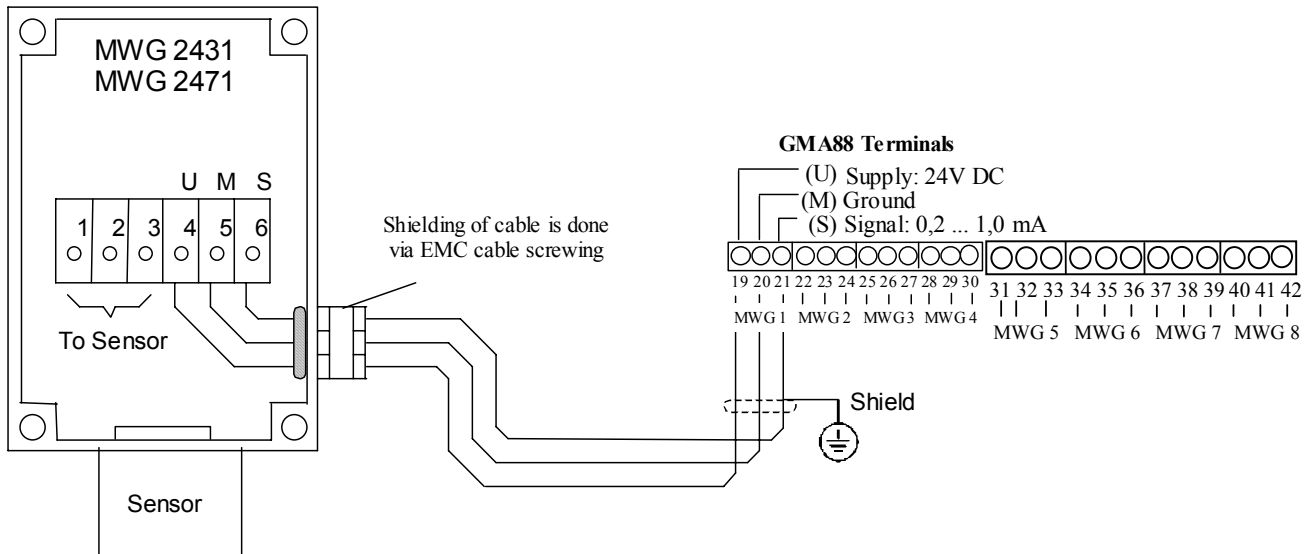
Transmitter CC 24 EX (models MWG 2431 II and MWG 2432 II),

Transmitter CS 24 EX (models MWG 2471 II and MWG 2472 II)

0.2 – 1 mA output signal

The CC sensor MWG 2431 II, the CS sensor MWG 2471 II are designed as 3-wire transmitters. The supply voltage and the 0.2 - 1mA output signal use the same ground line.

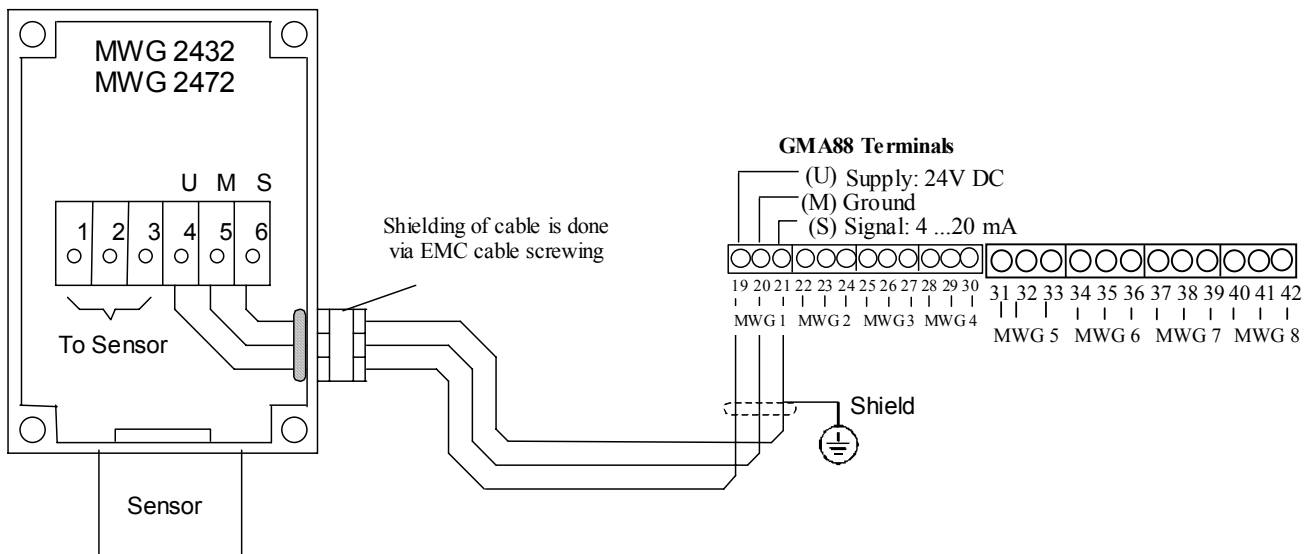
For connection of transmitters 2 to 8 repeat the steps for transmitter 1 (see picture below).



4 – 20 mA output signal

The CC sensor MWG 2432 II, the CS sensor MWG 2472 II are designed as 3-wire transmitters. The supply voltage and the 4 - 20mA output signal use the same ground line.

For connection of transmitters 2 to 8 repeat the steps for transmitter 1 (see picture below).



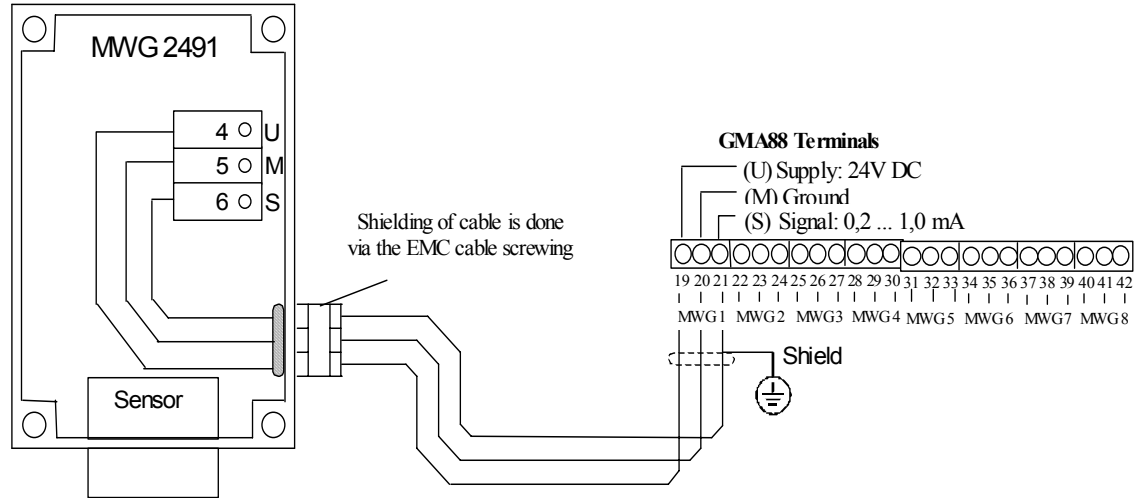
Transmitter IR 24 (Type MWG 2491 and type MWG 2492)

0.2 – 1 mA output signal

The IR sensor MWG 2491 is designed as 3-wire transmitters.

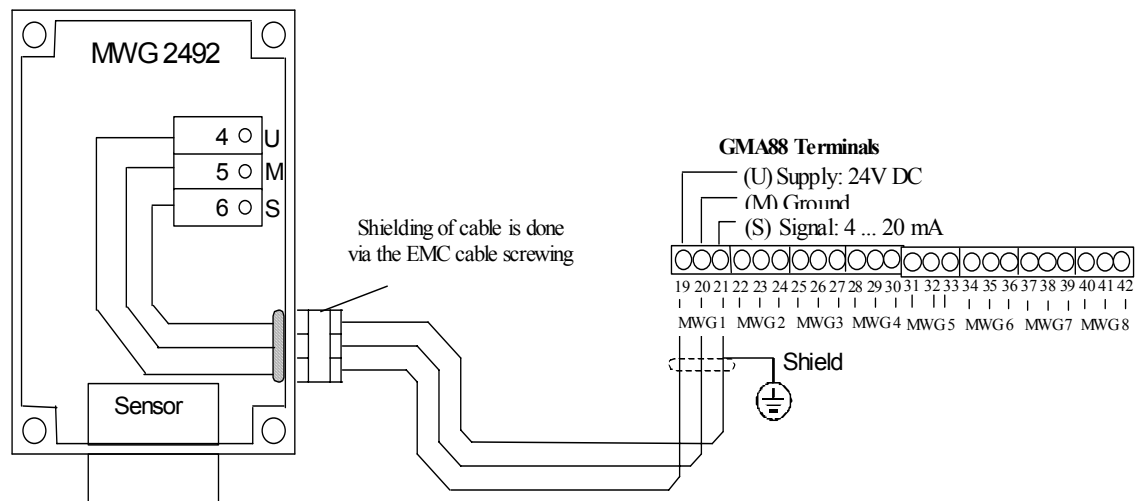
The supply voltage and the 0.2 - 1mA output signal use the same ground line.

For connection of transmitters 2 to 8 repeat the steps for transmitter 1 (see picture below).



4 – 20 mA output signal

The IR sensor MWG 2492 is designed as 3-wire transmitters. The supply voltage and the 4 - 20mA output signal use the same ground line. For connection transmitters 2 to 8 repeat the steps for transmitter 1 (see picture below).

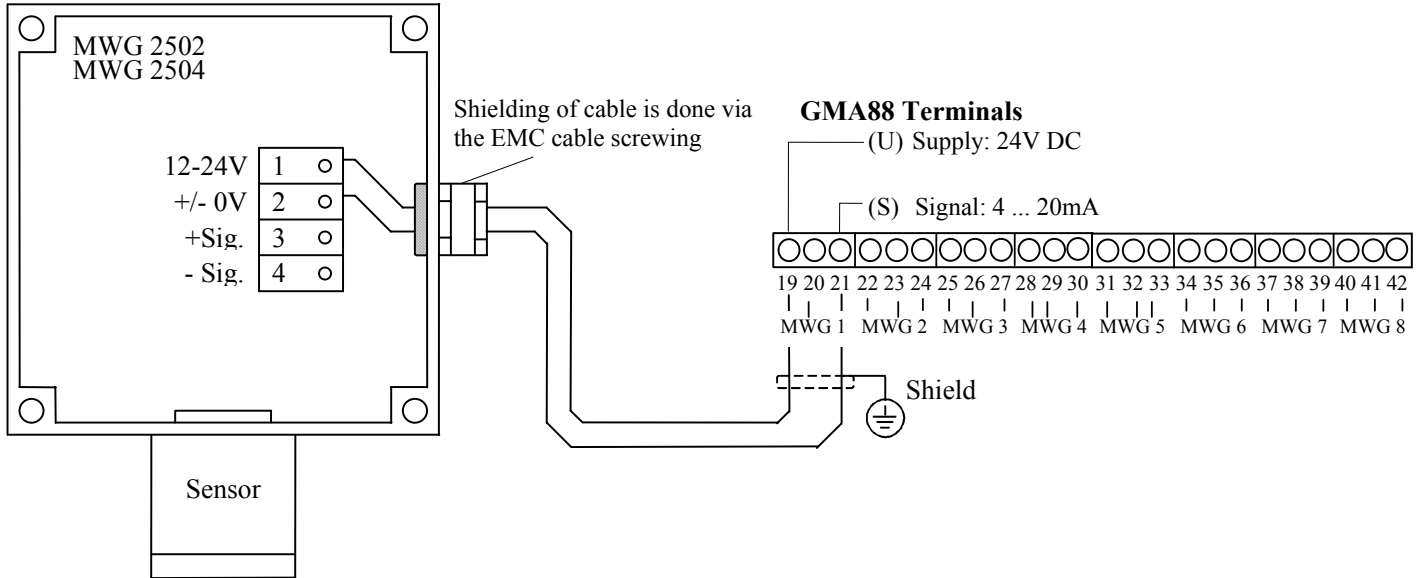


Transmitter EC25 (models MWG 2502, 2504, 2501 and 2503) without Ex-barrier

4 – 20 mA output signal

The EC sensors MWG 2502 and MWG 2504 are designed as 2-wire transmitters. The 4 - 20mA output signal is provided via the supply line.

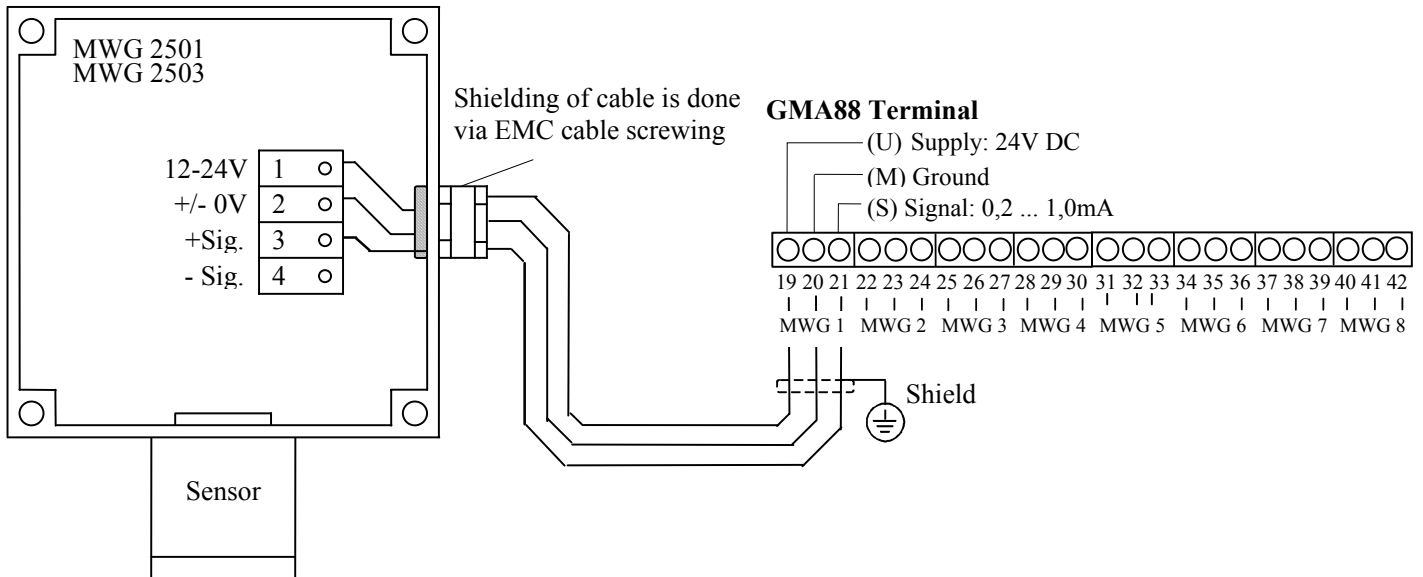
For connection of transmitters 2 to 8 repeat the steps for transmitter 1 (see picture below).



0.2 – 1mA output signal

The EC sensors MWG 2501 and MWG 2503 are designed as 3-wire transmitters. The supply voltage and the 0.2 - 1mA output signal use the same ground line.

For connection of transmitters 2 to 8 repeat the steps for transmitter 1 (see picture below).

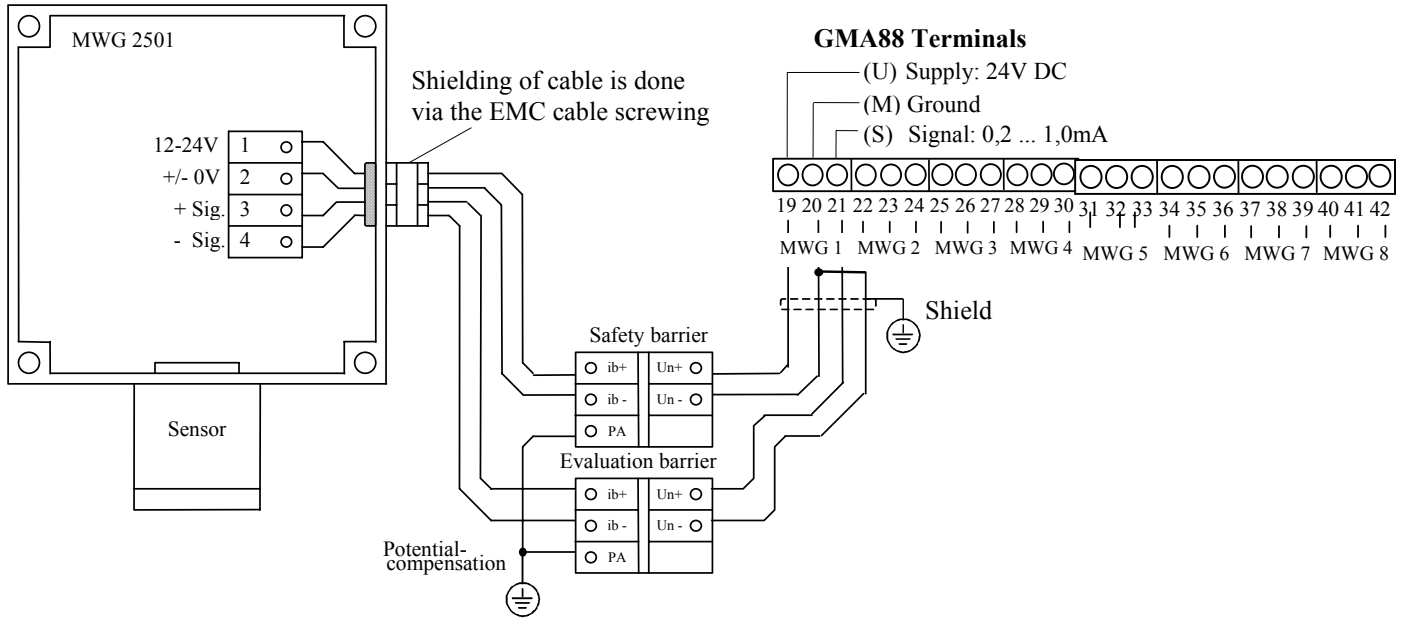


Transmitter EC25 EX (model MWG 2501) with Ex-barrier

0.2 – 1 mA output signal

The EC sensor MWG 2501 is designed as 4-wire transmitter. Supply and signal lines are separated. The transmitter is considered as 4-pole. For reasons of explosion protection, Ex-barriers are linked between transmitter and GMA88 both in the supply lines and in the signal lines.

For connection of transmitters 2 to 8 repeat the steps for transmitter 1 (see picture below).



**Worldwide Supplier of Gas
Detection Solutions**



GfG Instrumentation
1194 Oak Valley Drive, Suite 20
Ann Arbor, MI 48108
Tel: 734-769-0573
Fax: 734-769-1888
Web: www.gfg-inc.com Email: info@gfg-inc.com

18900013doc Edition July 17, 2001, Software Version 2.02
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