Operation Manual

GMA41

Controller for mounting on DIN rail

GfG GESELLSCHAFT FÜR GERÄTEBAU MBH ▌KLÖNNESTRASSE 99 ▌D-44143 DORTMUND ▌TELEPHONE +49 / (0) 2 31 / 5 64 00 – 0 ▌FAX +49 / (0) 2 31 / 51 63 13
INFO@GFG-MBH.COM ▌ WWW.GASDETECTION.BIZ ▌ AMTSGERICHT DORTMUND HR B 2742 ▌ CERTIFIED AS PER DIN EN ISO 9001:2000 ▌ ATEX QM CERTIFICATE

Content

Introduction

Each detection point of your fixed gas monitoring system consists of a transmitter and a control module GMA41, which are connected by means of a transmitter cable. The GMA41 provides the power supply for the connected transmitter and receives and processes the sensor signals. Depending on the transmitter type, it monitors the ambient air for the presence of toxic or combustible gases and vapors or for its oxygen content.

The GMA41 offers a variety of features, which allow adapting the gas monitoring system to your specific requirements:

- Reading of linear measurement values in a 3-digit display
- Menu display
- 3 variably adjustable alarm thresholds
- Peak value memory
- Adjustable relay functions: NC / NO contact, open-circuit / closed circuit
- Alarm hystereses prevents "flickering" of relays
- 4 - 20 mA analog output signal.

The GMA41 continuously provides information on the measured gas concentration, exceeded alarm thresholds and its operational status. As soon as the gas concentration exceeds one of the three pre-set levels, the GMA41 gives a warning by means of the LED displays and controls the relevant alarm relays. In addition to this, the GMA41 provides the measurement value as an analog output signal for further evaluation. The GMA41 is easy to operate and maintenance-free. Should unexpected failures or system faults occur, the comprehensive failure recognition allows a quick and specific service.

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. As any piece of complex equipment, the GfG GMA41 will do the job designed to do, only, if it is used and serviced in accordance with the manufacturer's instructions. All individuals who have or will have the responsibility for using and servicing this product must carefully read this manual.

The warranties made by GfG with respect to the product are voided, if the adjustment of functions or parameters is changed without GfG's permission. 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 GfG's warranties and conditions of sale and delivery.

Essential Notice:

For the parameter setting of the supplied GMA41 please refer to the test report. Modification of functions or parameters may result in deletion of the type test approval. GfG service is always at your disposal for adapting the monitoring system to your specific requirements.

Application and Purpose

In combination with the connected transmitter, the GMA41 forms a fixed gas monitoring system for continuous measurement of the gas concentration and for the warning from combustible gases and vapors in the range below the LEL, toxic gases in ambient air and oxygen.

The type examination of the GMA41 was done by „DEKRA-EXAM" for the use as warning of explosible gas mixtures. This examination was based on the standard DIN En 60079-29-1 "Gas

dectection instruments – General requirements for the operational behavior of devices for the detection of combustible gases" and DIN EN 50271 "Electrical devices for detection and measurement of combustible gases, toxic gases or oxygen – Requirements and testing for warning instruments using software and/or digital technology".

The test refers to the combination of the GMA41 with any tested 4 – 20 mA or 0.2 – 1 mA transmitter with linear output signal.

In addition to this the GMA41 was tested in combination with the following transmitters with non-linear output signal for the range 0 – 100 %LEL (see also page 6):

MWG CC 24 EX (type MWG 243x II) for the gases methane and propane
MWG 0238 for the gases methane, propane, nonane und ethanol.

The functions marked (#) have not been part of the type examination.

Type approval: PFG-Nr. 41300500

With connected Ex-transmitters (for detection in explosion endangered areas), the GMA41 is subject to the regulation 94/9/EG (ATEX 100a) as „Safety, Monitor and Control Device" outside of explosion endangered areas and will be labelled, therefore, as follows:

II (2)G CE 0158
BVS 03 ATEX G 005 X

The EC type approval is based on the type approval PFG-Nr. 41300500. It does not include the operation with the transmitters MWG 0238.

Monitoring of Combustible Gases in the range 0 – 100 % LEL

The lower explosion limits are to be used according to the national regulations. In Germany the values fixed in the data base CHEMSAFE of DECHEMA e.V. in Frankfurt a.M. are valid.

If you use catalytic combustion (CC) transmitters for monitoring combustible gases below the LEL, and if a suitable detection range 0…100 % LEL has been adjusted on your controller, please note the following: Due to the detection principle you cannot differ between sensor signals within the detection range and signals for very high concentrations (e.g. >20Vol%CH4). This is why the GMA41 keeps an overrange signal stored, even if the transmitter sends lower signals in the meantime. This status is characterized by all gas and failure alarms being activated and by the display indicating the overrange situation (see page 7).

Do not press the QUIT button to reset the stored alarm status, before you have made sure that the gas concentration at the transmitter does no longer exceed the LEL range. Use a portable or fixed detector, for example, with a range from 0 to 100 Vol.-% to check.

Distinguishing the Types of GMA41

GMA Type	Transmitter Type	Built-in 230V mains unit	Supply voltage	Bus system
GMA41	All	no	24 V DC	no
GMA41 EC (#)	EC 24, EC 25 (0.2 .. 1mA)	yes	230 V AC / 24 V DC	no
GMA41 B	All	no	24 V DC	yes
GMA41 ECB (#)	EC 24, EC 25 (0.2 .. 1mA)	yes	230 V AC / 24 V DC	yes

The voltage supply of the controllers GMA41 EC and GMA41 ECB is specially designed for operating an electrochemical sensor. For all other transmitters you have to use the controllers GMA41 or GMA41 B.

The pluggable bus system of the controllers GMA41 B and GMA41 EC B allows for easy interlinking up to 6 GMAs. The following signals are fed in the bus system:

- 24 V supply voltage
- Signal for alarm 1, alarm 2, alarm 3, fault over logical outputs

The key-operated switch can only be operated in combination with the GMA41 B or GMA41 ECB.

Detection Mode

Front View GMA41

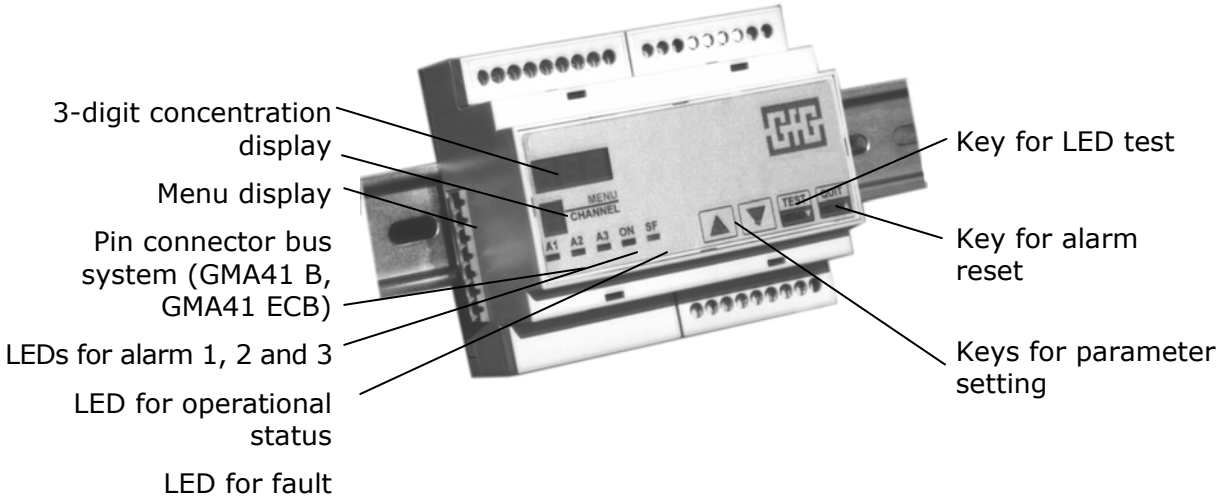


Fig. 1

Function Description

Turning On

Note: Information for putting into operation, see page 17!

After having turned the system on, the GMA 41 needs a warm-up time of a few minutes for:

- the self test, which checks functions, memory (ROM and RAM) and parameter memory (approx. 15 seconds),
- the warm-up of the transmitter connected
  (for detailed information please refer to the operation manual of your transmitter).

During the warm-up period the GMA41 displays the detection range, the detection unit, measurement gas and the alarm thresholds one after the other. The LED „**ON**" flashes alternately with the measurement display 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 GMA41 re-starts after a mains failure, the gas alarms are only evaluated, once the warm-up is completed. After the warm-up the GMA41 automatically turns to detection mode.

Detection Mode

In detection mode, the green LED „**ON**" is lit. If the 3-digit display is activated, it reads the currently measured gas concentration. All gases are measured continuously, and exceeded limit values are noticed and signalized immediately. Electronic functions like parameter memory and transmitters are monitored permanently and the transmitter cable is checked for short circuit and parting of the cable.
When operating transmitters with a standard output 4..20 mA or 0.2..1 mA and linear output signal, the following display values of the transmission curve "standard" occur.

The transmitters MWG CC 24 EX (type MWG 243x II) and MWG 0238 are covered by a type examination for the gases methane and propane as well as nonane and ethanol (see table Standard Detection Ranges).

The following standard ranges have been tested:

Gas	Formula	Detection range	MWG CC 24 EX Ex and Function	MWG 0238 Function only
Methane	CH_4	0 – 100 %LEL	Curve Methane	Set at GMA41
Propane	C_3H_8	0 – 100 %LEL	Curve Propane	Set at GMA41
n-Nonane	C_9H_{20}	0 – 100 %LEL	linear	Set at GMA41
Ethanol	C_2H_5OH	0 – 100 %LEL	linear	Set at GMA41

Transmission characteristics of transmitters which have been tested during the type examination

Input signal			Display in % LEL		
Current			linear transmitters	Linearisation for MWG CC 24 EX	
0.2 – 1.0 mA	4 – 20 mA		Standard	Methane	Propane
0.20	4.0		0	0	0
0.24	4.8		5	9	5
0.28	5.6		10	18	9
0.32	6.4		15	25	14
0.36	7.2		20	31	19
0.40	8.0		25	36	24
0.44	8.8		30	41	29
0.48	9.6		35	46	34
0.52	10.4		40	50	38
0.56	11.2		45	54	43
0.60	12.0		50	58	48
0.64	12.8		55	62	53
0.68	13.6		60	66	58
0.72	14.4		65	70	63
0.76	15.2		70	74	69
0.80	16.0		75	79	74
0.84	16.8		80	83	79
0.88	17.6		85	87	84
0.92	18.4		90	91	89
0.96	19.2		95	96	95
1.00	20.0		100	100	100

For transmitter MWG 0238 no transmission characteristics are shown, as for this type there is no durable reference to the input values. For re-adjustment the setting of the amplification is not done on the transmitter but on the GMA41.

Transmitter CC28 and the transmitters with electrochemical sensors, e.g. types EC28 or EC24 provide a linear output signal. For these transmitters the GMA 41 uses the transmission characteristic „Standard". As the only exception a linearisation is used for the electrochemical detection of oxygen with transmitters EC24 and EC25.

For transmitters with sensors using different detection principles, like infrared or chemosrption, there are specific adaptations of the signal curve. This refers to e.g. transmitters MWG IR24, MWG CS24, MWG CS21 and MWG CI21. The relevant transmission characteristics are shown in the operation manuals of these transmitters.

Please refer to the test report of the GMA to see the type of transmitter for which a transmission characteristic has been programmed in the GMA41. The transmission characteristic can only be changed by a GfG service engineer.

Peak Value Memory

The controller GMA41 provides a peak value memory. Depending on the gas measured by the connected transmitter it stores either the maximum or the minimum value.
The peak value memory is not activated during the warm-up time.

Gas	Peak Value Memory
Oxygen	Minimum value
Comb. gases	Maximum value
Toxic gases	Maximum value

Press key [△] to indicate the peak value in the display. Measuring and warning functions are still working while the peak value is indicated. Press keys [△] and [QUIT MENU▼] simultaneously to reset the memory to the present measurement value. Once you release key [△], the controller returns to the standard display.

Check of Display and Parameter

During the test the measurement and warning functions are <u>not</u> activated!

LED Test

In detection mode, shortly press key [TEST MENU▲] to activate the LED test of the GMA41 controller.

Fault LED is not tested → only in service menu!

Display of Detection Range and Alarm Thresholds

For the display of the detection range and the alarm threshold, keep key [TEST MENU▲] pressed for approx. 5 seconds. The LED „**ON**" flashes and the display reads the below mentioned parameters one after the other:

	Display, e.g.	**LED ON** – flashes, 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 det. range)	**A1**	1. Threshold alarm
5	40 (value in det. range)	**A2**	2. Threshold alarm
6	40 (value in det. range)	**A3**	3. Threshold alarm

Once these readings are complete, the GMA41 automatically turns to detection mode.

Alarm

The GMA41 provides 3 threshold alarms, which are activated as soon as the gas concentration exceeds or falls below the alarm threshold. An activated alarm is indicated by means of the relevant alarm LED. Press key [QUIT MENU▼] or activate the external reset (see Technical Data) to acknowledge the alarm.

Alarm	Relevant Alarm LED
has been activated	Flashes

has been activated and acknowledged by pressing key QUIT MENU▼	lights permanently

Together with the alarm LEDs the GMA41 activates the relevant alarm relay and, for the models with bus system, the logical outputs. The standard setting for the switching functions is shown below:

Alarm	Function	Resettable during Alarm	Resettable after Alarm	Remark
1	Non-latching	No	selfresetting	
2	Latching	No	yes	
3	Latching	Yes	yes	Same threshold as alarm 2, meant as horn alarm

Overrange
In case the detection range is exceeded by more than 10 %, the GMA41 activates the fault indication in addition to the 3 gas alarms. The display reads (– – –). When operating transmitters for the monitoring of 0..100%LEL, all alarms and the fault indication are latching, i.e. the overrange can only be reset, by pressing key QUIT MENU▼, when the gas concentration has fallen below the full scale value.

Please notice:
"Monitoring of Combustible Gases in the Range 0-100 % LEL", page 5

You can set the switching functions of the three alarms individually. For other settings than the standard ones 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 externally, e.g. by pressing key QUIT MENU▼ at the GMA41. A non-latching alarm resets automatically, when the gas concentration falls below or exceeds the pre-set threshold.

Early Recognition of Gas Alarm – Delta Alarm (Catalytic Combustion Transmitter)

This function is only standard available for the use of catalytic combustion transmitters. Should you wish to activate this function for other transmitters as well, please call your GfG service.

The delta alarm is meant for early recognizing of hazards caused by sudden gas concentrations. The alarm activation is defined by the rise of gas concentration within a certain time. As soon as the gas concentration rises by 25 % of the full-scale deflection within 1.6 seconds (see fig. 2), the GMA41 indicates **overrange**.
key QUIT MENU▼, when the gas concentration has fallen below the full scale value.

Please notice:
"Monitoring of Combustible Gases in the Range 0-100 % LEL", page 5

For the activation of the delta alarm the gas concentration does not need to reach the pre-set alarm threshold. The Delta Alarm is an additional warning to the three thresholds for alarm 1, alarm 2 and alarm 3, which keep their standard functions.

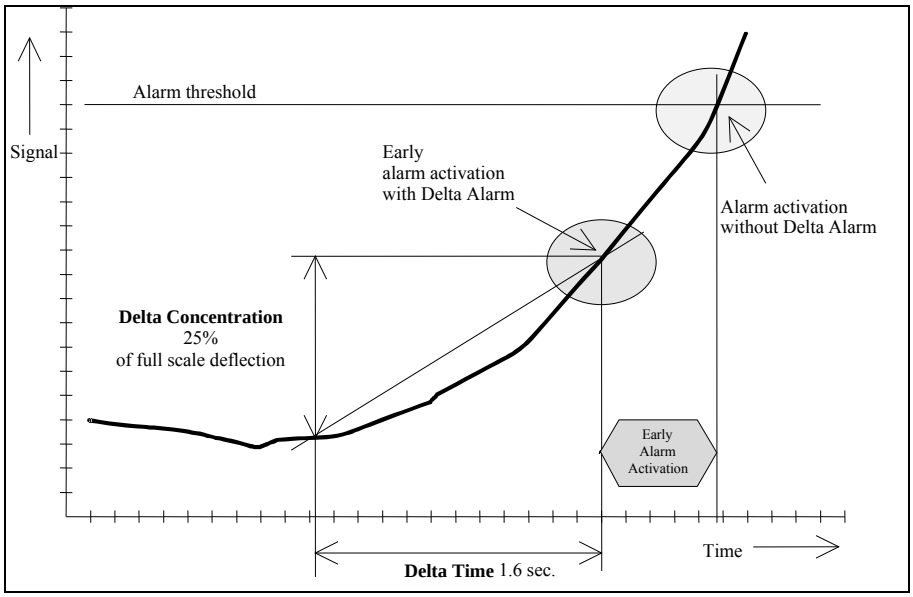


Fig. 2

Time Delay of Alarms (#)

This function, which is not activated in the standard setting, allows delaying the activation of the alarm (fig. 3). Should you wish to activate this function, please call your GfG service.

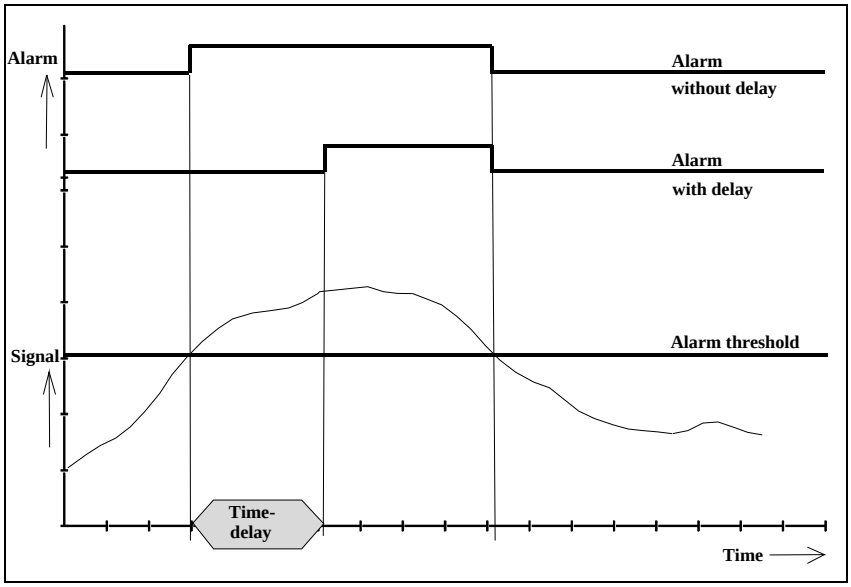


Fig. 3

The time delay prevents a warning from gas concentrations only exceeding the threshold for a very short time. It can be set from 0 to 2 minutes. For safety reasons the time delay should be kept as short as possible, and must not be activated in case of time-critical monitoring tasks.

Fault

In case of failure the yellow LED „**S F**" lights up and the fault relay and the logic output are activated. A fault is signalized, if:

- the cable between Transmitter and GMA41 is cut;
- the sensor or the circuit of the transmitter is faulty;
- the zeropoint is deviated;
- the detection range is exceeded (together with alarm activation);
- the CPU self-monitoring is faulty.

As soon as the fault is repaired, the yellow LED **"S F"** goes out, the fault relay and the logic output deactivate and the GMA41 returns to standard detection mode.

Relays

The GMA41 provides 4 relays:

- 3 alarm relays for controlling external alarm devices,
- 1 fault relay for signalizing of failures.

The 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. In the standard setting all 4 relays are NO contacts. The alarm relays are standard operated as open circuit system; the fault relay is a closed circuit. This results in the below mentioned switching functions:

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

	The relay switches:							
	in	during gas alarm		after gas alarm		in case of	in case of	in case of
Relays for:	detection mode (no gas)	not reset	reset	not reset	reset	mains failure	failure	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 Transmitter Signal

Press key [▽] and after approx. 2 seconds the GMA41 displays the signal received from the transmitter in mA (0.2 .. 1 mA for transmitters with 0.2-1 mA output and 4 .. 20 mA for transmitters with 4-20 mA output). This function allows checking the zeropoint of the transmitter at the GMA41 (see page 14).

Indication of Transmitter in Service Mode

This function is only available for Transmitter CC24 EX (type 243x I I), CS24 EX, EC25, CC28 and EC28.

The transmitters CC24 EX, CS24 EX, EC25 provide a service switch. When this is activated during maintenance (see operation manual for the transmitter), the GMA41 automatically turns to fault indication. Alarm signals are being suppressed. With transmitters CC28 and EC28 this is effected automatically when the transmitter service menu is activated.

Activation of Service Menus

The 4..20 mA voltage output continuously reads the actual measurement value!

The service menus allow to select and to change all important parameters of the GMA41.

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

1. Press key QUIT MENU▼, then key TEST MENU▲ 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

3. Press key QUIT MENU▼ to confirm the entered security code.
   The GMA41 turns to the selected service menu
   or
   Press key TEST MENU▲ to return to detection mode.

In the service mode the gas alarms are locked. The LEDs "**ON**" and „**S F**" light up, the fault relay is activated.

Adjustments in Service Mode

The display of the GMA41 reads the set parameters. The menu display indicates the menu point, where the displayed parameter value can be found. Use keys TEST MENU▲ and QUIT MENU▼ to scroll forward and back. For changing of parameters use keys △ and ▽.

Survey of Menu Points

Menu A (TEST MENU▲ / QUIT MENU▼)	Description	Display, e.g.	Parameter Setting
r 1	**Relay test**	**r l**	
The menu starts with "G 1"			
G 1	Detection unit	LEL, ppm	Display only
G 2	Gas	CH4, NH3, O2 or GfG-Gas No.	
A 1	Threshold Alarm 1	Value in detection range	Adjustment with △ and ▽
A 2	Threshold Alarm 2	Value in detection range	
A 3	Threshold Alarm 3	Value in detection range	
0	Zeropoint adjustment	0	
C	Sensitivity adjustment	Value in detection range	

Menu B (TEST MENU▲ / QUIT MENU▼)	Description	Display, e.g.	Parameter Setting
A 1	Threshold Alarm 1	Value in detection range	Adjustment with △ and ▽
A 2	Threshold Alarm 2	Value in detection range	
A 3	Threshold Alarm 3	Value in detection range	

Check of Relays and Logical Outputs

The display of the GMA41 reads **"rL".** The relays and logic outputs can be switched, one after the other, by pressing the keys △ and ▽ The relevant LEDs for alarm and fault indicate, which relay (and which logical output) was activated. When you set up this menu all alarms are deleted and afterwards newly set.

Setting of Alarm Thresholds

1. Activate service **menu A**.
2. Use keys TEST MENU▲ and QUIT MENU▼ to select menu point A 1, A 2 or A 3 for the alarm threshold to be set.
3. Set the new alarm threshold by means of keys △ and ▽.
4. Store the parameters (see page 16).

Which adjustment as the lowest alarm threshold makes sense, depends on the detection task and on the transmitter. For measuring combustible gases in the range 0 – 100 % LEL the alarm should not be set below 10 % LEL; for most applications the alarm should not be set to less than 5 % of full scale.

Adjustable alarms	
Highest alarm	**Lowest alarm**
End of measurement range	Begin of measurement range + Hysteresis

Check and Adjustment of Zeropoint

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 combustible 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. The zeropoint must be adjusted, if the display is different from "0".
   Use key [▽] to check the transmitter signal. An adjustment of the zeropoint is only possible, if the transmitter 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 4 … 20 mA: Tolerance of 3 … 6.8 mA
   (Depending on the transmitter, slightly different tolerances are possible.)

If the transmitter signal is out of the tolerance band, the zeropoint has to be adjusted at the transmitter first! For details please read the operation manual of the transmitter!

3. Activate service **menu A**.
4. Use keys [TEST MENU▲] and [QUIT MENU▼] to select menu point [0].
5. Press [▽] key for 3 seconds to adjust the zeropoint
   The adjustment of the zero point was successful, when the value „0" is flashing in the display.
   If the display is not flashing, the transmitter signal is out of tolerance and has to be adjusted at the transmitter first. Please adhere to the operation manual of your transmitter.
6. Disconnect the zero gas from the transmitter. In case of an oxygen transmitters wait until the displayed gas concentration exceeds the threshold alarm.
7. Store the parameter.

After the zeropoint adjustment, the sensitivity needs to be checked and eventually adjusted.

Check and Adjustment of Sensitivity

Note: **Before checking the sensitivity, make sure that the zeropoint is set correctly.**

The GMA41 allows checking and adjusting the sensitivity by means of the peak value memory. This memory is activating automatically, when the menu point [C] is turned on for 2.5 minutes. The GMA41 indicates the activated peak memory by a flashing display.

Check and Adjustment of Sensitivity without Peak Memory

1. Activate service **menu A**.
2. Use keys [TEST MENU▲] and [QUIT MENU▼] to select menu point [C].
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. The sensitivity must be adjusted, if the displayed value is different from your test gas concentration.
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.

Check and Adjustment of Sensitivity with Peak Memory

This adjustment uses the possibility of the GMA41 to store the peak signal value measured during the duration of the test gas supply. The store peak values can be used as sensitivity point. Fig. 4 below shows this procedure.

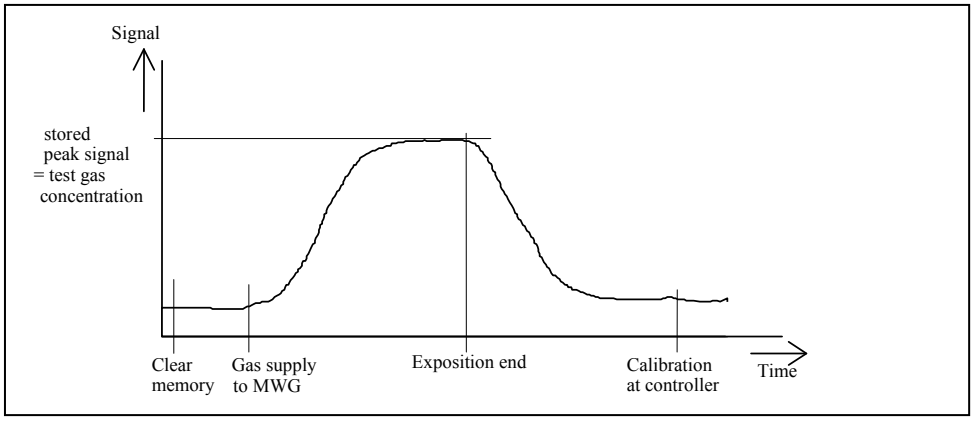


Fig. 4

1. Activate service **menu A**.
2. Use keys TEST MENU and QUIT MENU to select menu point C.
3. After 1.5 minutes supply test gas to the transmitter and make sure that the gas is constantly supplied for at least 3 minutes For details about the gas supply please refer to the operation manual of your 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.

Alarm Threshold Hysteresis

This function allows 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 resolution units 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 following alarm activations:

	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 TEST MENU and QUIT MENU to select menu point A1, A2 or A3 for the alarm deactivation point to be set.
3. Use keys △ and ▽ to adjust the new deactivation point.
4. Store the parameter.

Storing of Changed Parameters and Leaving the Service Mode

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

1. Press keys TEST MENU▲ and QUIT MENU▼ simultaneously to activate the memory function. The display reads „**Sto**".
2. **Confirm storage:** Press key QUIT MENU▼ to confirm the storage of the parameter. The GMA41 stores all changed parameters and returns to detection mode.

or

No storage: Press key TEST MENU▲, and the GMA41 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

After the installation of a gas warning system and before putting it into operation, a function test must be carried out.
DIN EN 60079-29-2 „Gas detection instruments - Selection, installation, use and maintenance of devices for detection and measurement of combustible gases or oxygen" as well as the relevant national directives are to be obeyed. In Germany this means the „Explosion protection regulations", the guideline T 023 (BGI 518) „Gas warning devices for explosion protection – Use and operation" and „BGR 500 part 2 chapter 2.33, 4.4 Test of gas warning devices".
After installation and at the initial putting into operation, an expert has to do a function test of the gas warning system (see DIN EN 60079-29-2 chapter 8.9).
The maintenance of a gas warning system includes inspection, service, calibration and adjustment, the regular function test and repair.
Tests must be done by an expert, who has to report the result in writing.

Inspection, maintenance, calibration and adjustment

During the inspection examinations of the gas measurement systems shall be carried out (for Germany see information sheet T023, section 9).

- Pollution by dust
- Condensation by humidity
- Protective equipment for transmitters
- Diffusion inlet for the transmitter

Maintenance and adjustment describe those measures, which retain the nominal status of the gas warning system. They shall be checked in regular inspection intervals. Inspection intervals should not exceed 4 months (for Germany see information sheet T023, section 9.2, 9.3 and DIN EN 60079-29-2, Section 11).

- Zeropoint
- Sensitivity
- Activation of alarm thresholds
- Response time
- Alarm output visible and audible
- Fault report

Regular function tests

Additionally to the maintenance the function of the gas warning system has to be examined regularly. The function tests may not exceed a period of one year (for Germany see information sheet T023, section 9 and BGR500, part 2, chapter 2.33, 4.4)

Overhaul

Overhaul describes all repairs and exchange of components. This has to be done by the manufacturer or persons authorized by him. Only those spare parts and structural components that have been tested and approved by GfG may be used for exchange.

Disregard affects the detector safety, the type approvals are void, resp. the detectors are not operated according to ATEX.

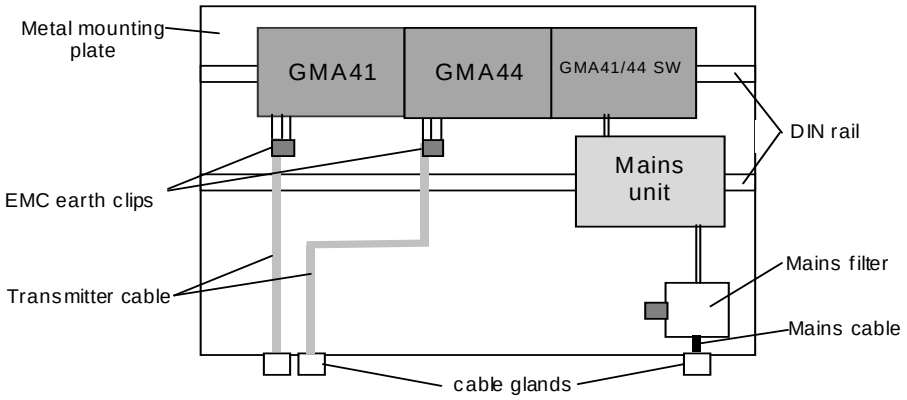
We recommend a regular function test and overhaul and to call GfG's service for the regular maintenance.

Influence of Interfering Gases and Oxygen

Interfering gases, oxygen surplus and oxygen deficiency may affect the measurement of gases by the transmitter. Please adhere to the operation manual of your transmitter.

Instruction for Installation

The GMA41 controller must not be installed in hazardous areas. It shall preferably be vibration-free installed. Vibration load may cause short-term fault reports at the relay outputs. The transmitter and the mains supply are connected according to the terminal diagram. Make sure that the shield of the transmitter cable is already grounded close to the terminals of the GMA41 on the metal mounting plate, e.g. by means of EMC earth clips.



Wiring example

Inside the wall mount casing or the cabinet the transmitter cable should be laid separately from other control and mains cable. The mains supply for the GMA41 is generally to be fed over a mains filter (e.g. FN 610). This filter should also be mounted and grounded on a metal mounting plate close to the cable entry. Once the GMA41 is mounted into a casing and 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 see the operation manual of your transmitter.

Putting into Operation

After installation gas warning systems have to be tested for faultless functioning, be adjusted and put into operation, by an expert. The testing and adjustment shall be carried out in accordance with the manufacturer’s operation manual. They are only allowed to be carried out by an expert (see information sheet T023 7/09, section 8.1, as well as DIN EN 60079-29-2, Section 8.9).

Please call GfG’s service, or an expert authorized by GfG for putting into operation.

Transmitter Cable

The GMA41 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 (see connection diagram in the manual's annex). Even with the maximum cable lengths the specific power supply for the transmitter has to be guaranteed. For detailed information please refer to the operation manual of your transmitter.

Accessories

Key-operated Switch Module GMA41/44 SW (#):	The module GMA41/44 SW allows to control a collective alarm. In addition to this, it provides the possibility of alarm suppression, e.g. during service or maintenance.

Remarks concerning the Technical Safety of the GMA41

Contact Protection

Mains supply and relay contacts of the GMA41 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 controller operated on 230 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 zeropoint adjustment	- Adjust the zeropoint, calibrate
Display - - - LED „**S F**" lights up	- ADC overrange - stored overrange	- If there is a gas-free atmosphere at the transmitter, you can reset the stored measurement value check transmitter cable/renew
	- short circuit at the transmitter cable	- check transmitter cable/renew
Display _ _ _ LED „**S F**" lights up	- Display deviation (< -99) - ADC range deviation	- Check calibration of transmitter and GMA controller
	- Cable cut	- Check transmitter cable
	- Zeropoint deviation by I_{IN}≤3,00mA (signal input 4..20mA) I_{IN}≤0,15mA (signal input 0,2..1mA)	- Check calibration of transmitter and GMA controller - Check service key - Check transmitter cable

Service Address

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

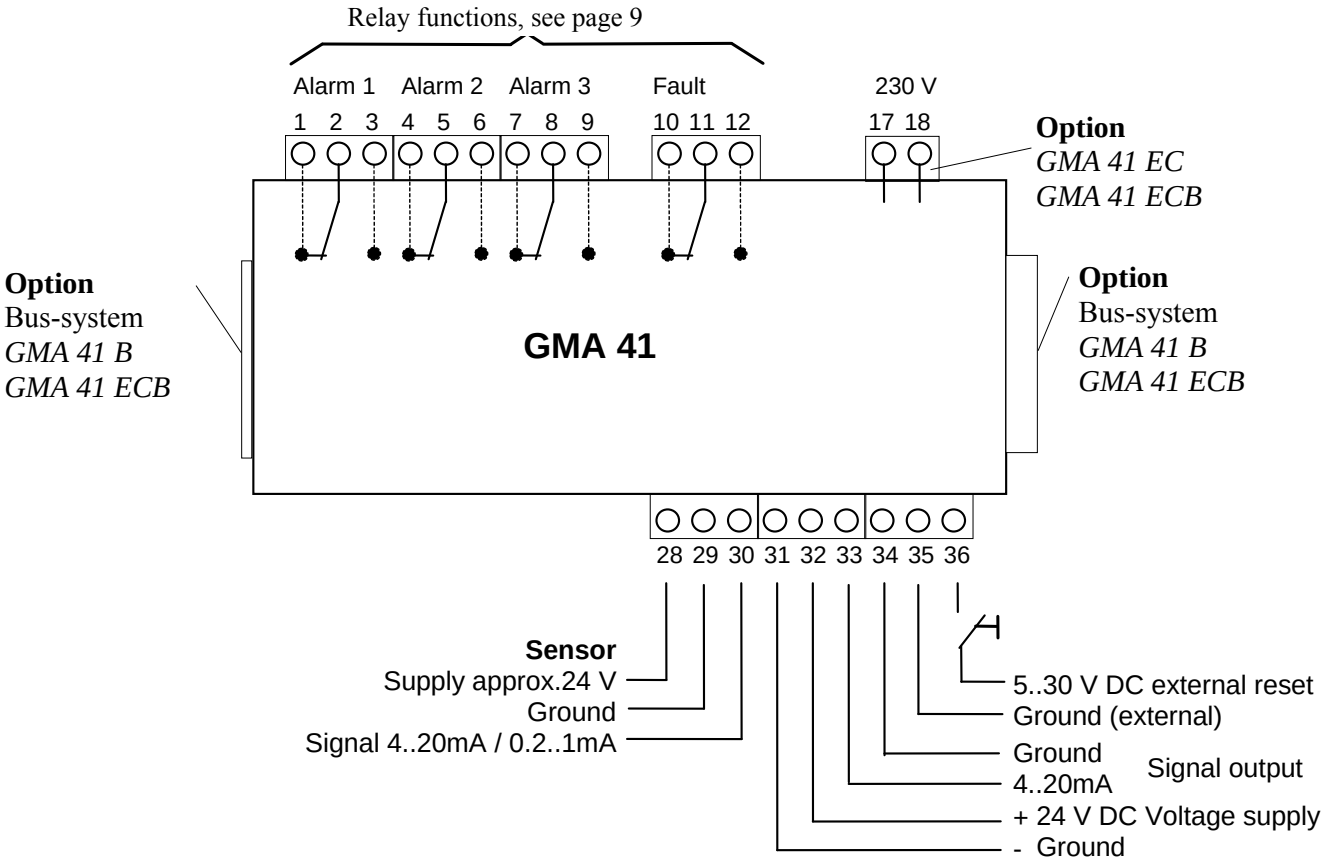
GfG Gesellschaft für Gerätebau mbH
Klönnestraße 99 – D-44143 Dortmund
Phone: +49-231-564000
Fax: +49-231-516313
E-Mail: info@gfg-mbh.com

GMA41 - Gas List

Gas Nr.	Gas	Chemical Formula	GMA Nr
1	Acetone	CH6O	1
2	Acetonnitrile	C2H3N	2
3	Acetylene	C2H2	3
4	Acrylnitrile	C3H3N	4
5	Aminopropane	C3H9N	5
6	Ammonia	NH3	**nh3**
7	Amyl alcohol	C5H12O	7
8	Benzine 60/95	Mixture	8
9	Benzine 80/110	Mixture	9
10	Benzine (fuel)	Mixture	10
11	Benzene	C6H6	11
12	Comb. gases and vapours	Mixture	12
13	Bromtrifluoromethane (Halon)	C Br F3	13
14	Butadien - 1.3	C4H6	14
15	n-Butane	C4H10	**but.**
16	i-Butane	(CH3)3CH	16
17	Butanol - 1	C4H10O	17
18	Butanon - 2	C4H8O	18
19	n-Butylacetate	C6H12O2	19
20	i-Butylacetate	C6H12O2	20
21	n-Butyl alcohol	C4H10O	21
22	1-Butylene	C4H8	22
23	Chlorine	Cl2	**CL2**
24	Chloromethane	CH3Cl	24
25	Hydrogen chloride	HCl	**HCL**
26	Hydrogen cyanide	HCN	**hcn**
27	Cyclohexane	C6H12	27
28	Cyclopentan	C5H10	28
29	Cyclopropane	C3H6	29
30	Dichlordifluoromethane (R12)	C Cl2 F2	30
31	1.1 Dichlorethane	C2H4Cl2	31
32	Dichlorfluoromethane (R21)	CH Cl2F	32
33	Dichloromethaen	CH2Cl2	33
34	1.2 Dichloropropane	C3H6Cl2	34
35	Diethylamine	C4H11N	35
36	Dimethylether	C2H6O	36
37	Epichlorhydrin	C3H5Cl O	37
38	Natural gas (H+L)	Cn Hm, N2	38
39	Ethane	C2H6	39
40	Ethanol	C2H5OH	**Eol.**
41	Ethyl acetate	C4H8O2	41
42	Ethyl alcohol	C2H6O	42
43	Ethylen	C2H4	43
44	Ethylen oxide	C2H4O	44
45	FAM-Benzine	Mixture	45
46	Jet fuel 40/180	Mixture	46
47	Formaldehyde	CH2O	47
48	Frigen 22	CH Cl F2	**r22**
49	Helium	He	49
50	Heptane	C7H16	50
51	n-Hexane	C6H14	51
52	i-Hexane	C6H14	52
53	Hexanon-2	C6H12O	53
54	Isobutyl acetate	C6H12O2	54
55	Carbon dioxide	CO2	**CO2**
56	Carbon monoxide	CO	**CO**
57	Coke gas	CO, CH4, H2	57
58	Air	N2, O2, CO2	58
59	Methane	CH4	**CH4**
60	Methanol	CH4O	60
61	Methyl acetate	C3H6O2	61
62	Methyl alcohol	CH3OH	62
63	Methylbutylketone	C6H12O	63
64	Methyl chloride	CH3Cl	64
65	Methylene chloride	CH2Cl2	65
66	Methyl-i-butylketone	C6H12O	66
67	Methylethylketone	C4H8O	67
68	Methylglycol	C3H8O2	68
69	Methylmethacrylate	C5H8O2	69
70	Methylpropanol	C4H10O	70
71	Monochlordifluormonobrom.	C Br Cl F2	71
72	n-Nonane	C9H20	**non.**
73	i-Octane	C8H18	73
74	n-Octane	C8H18	74
75	i-Pentane	C5H12	75
76	n-Pentane	C5H12	76
77	Pentanon-2	C5H10O	77
78	Penten-1	C5H10	78
79	Pentyl acetate	C7H14O2	79
80	Perchloroethylene	C2Cl4	80
81	Propane	C3H8	**Pro.**
82	Propanol-2	C3H8O	82
83	i-Propyl acetate	C5H10O2	83
84	n-Propyl acetate	C5H10O2	84
85	n-Propyl alcohol	C3H8O	85
86	i-Propyl alcohol	C3H8O	86
87	Propylene	C3H6	87
88	Propylenedichloride-1.2	C3H6Cl2	88
89	Oxygen	O2	**O2**
90	Sulfur dioxide	SO2	**SO2**
91	Sulfurhexafluoride	SF6	91
92	Hydrogen sulfide	H2S	**H2S**
93	Town gas	CO, CH4, H2	93
94	Nitrogen dioxide	NO2	**no2**
95	Nitrogen monoxide	NO	**no**
96	Styrene	C8H8	96
97	Tetrachloroethane	C2Cl4	97
98	Toluene	C7H8	98
99	1.1.1-Trichloroethane	C2H3Cl3	99
100	Trichloroethylene	C2HCl3	100
101	Trifluoromethane (R23)	CH F3	101
102	Vinyl acetate	C4H6O2	102
103	Vinyl chloride	C2H3Cl	103
104	Hydrogen	H2	**H2**
105	Water gas	H2, CO, CH4	105
106	Xylene	C8H10	106
107	Ozone	O3	107

Chart 1 - GfG-Gas List

Terminal Plan - GMA41



Technical Data

Gas Monitor GMA41	for mounting on DIN rail	
Type:	GMA41, Software version 2.03	
Dimensions:	106 x 90 x 58 mm (WxHxD), without Bus-system	
Power supply		
Operational voltage:	*GMA41, GMA41B*	24 V DC
	GMA41 EC, GMA41 ECB	230 V / 50Hz or 115 V / 60 Hz or 24 V DC
Current consumption:	max. 150 mA at 24 V DC	
	max. 2.6 W at 230 V and 115 V	
Primary fuse:	*GMA41 EC, GMA41 ECB*	T 0.10 A
Secondary fuse:	*GMA41 EC, GMA41 ECB*	T 0.50 A
Climate Conditions		
for operation:	0 to +55 °C, 0 to 99 % r.h., 700 to 1300 hPa	
	0 to +40 °C with built-in mains unit (*GMA41 EC (#) and GMA41 ECB (#)*)	
recommended storage conditions for GMA41, accessories, spares:	-25 to +50 °C, 0 to 99 % r.h.	
Transmitter connection		
Transmitter connection:	2-, 3-wire transmitter	
Voltage supply output:	20 V DC max. 250 mA	
Input signals:	4 .. 20 mA, 0.2 .. 1 mA	
Output signals		
Analog outputs for meas. value:	4 .. 20 mA, max. load 300 Ω (T90 = 18 seconds)	
Display and activation of alarm	T 90 < 3 seconds	
Sensor signal display:	0.12 .. 1 mA Max. deviation:	< 0,2 mA ± 0,04 mA
		0.2 .. 0.5 mA ± 0.02 mA
		> 0.5 mA + 0.05 mA
	2,4 .. 20 mA Max. deviation:	< 4 mA ± 0,8 mA
		4 .. 10 mA ± 0.4 mA
		> 10 mA + 1 mA
Relays:	max. switch voltage 250 V AC 50/60 Hz or 250 V DC	
	max. switch current 4 A AC/DC	
	max. switch performance 1000 VA AC or depending on voltage 50 .. 200 W DC	
	Relay outputs and mains entry are operation insulated	
Logical outputs	4 open collector outputs for alarm 1, alarm 2, alarm 3, fault	
	Operation only on safety low voltage	
	Max. switch voltage: 30 V	
	Max. switch current: 100 mA	
External reset:	High active from 3 .. 24 V DC (input resistance 11kΩ)	
DIN rail mounting:	DIN EN 50022	
Safety		
Protection:	DIN EN 60529 - IP –20	
Protective separation:	by safety transformer	
GMA41 EC, GMA41 ECB	Type: BV EI 306 2064 2.6VA PRI 230V / SEC 18 V 50 - 60Hz	
Protective insulation:	as per EN 61010 up to over voltage category III and soiling degree 2	
Approvals:		
EMC Test	EN 50270 : 2006	
	PfG-Nr. 41300500 (for tested ranges see page 4)	
EC type approval function test:	⟨Ex⟩ II (2)G	
	BVS 03 ATEX G 005 X (EC-Type Examination Certificate)	
Production supervision:	CE 0158 (Notified body: DEKRA-EXAM)	

Annex

The mains units mentioned in the annex are not subject to the type examination.

Selection of the proper Mains Unit for GMA41 Configurations

Depending on the requested monitor configuration you have to select a mains unit from a choice of three performance classes.

1. Select your specific monitor configuration (type and quantity of controllers and transmitters).
2. Add the individual current consumptions of the controllers and transmitters.
3. Compare the result with the chart below and select the suitable mains unit.

Please note:

- Only the following transmitters can be attached to a GMA41 EC, 41 ECB and 44 EC, 44 ECB: Transmitter EC24 or EC25.
- Only transmitters of the same type and for the same gas can be attached to a GMA 44.
- **If a GMA 44 is used, always select mains unit PS 50 (or higher)**
- To keep the voltage reduction resulting from the combination of several controllers ($\geq$ 6) as low as possible, make sure that the voltage supply is suitably fed.

	Current consumption [mA]	Qty.	Current consumption x Qty. [mA]
Evaluation Unit			
GMA41/ GMA41 B	150		
GMA44 /GMA44 B *	150		
Key-operated Switch Module (only for B models)	100		
Transmitter			
EC24	30		
EC25	30		
CS21	90		
CC0238 EX	100		
CI21	100		
CS24 EX	120		
CC24 EX	120		
IR24	200		
			Total current consumption

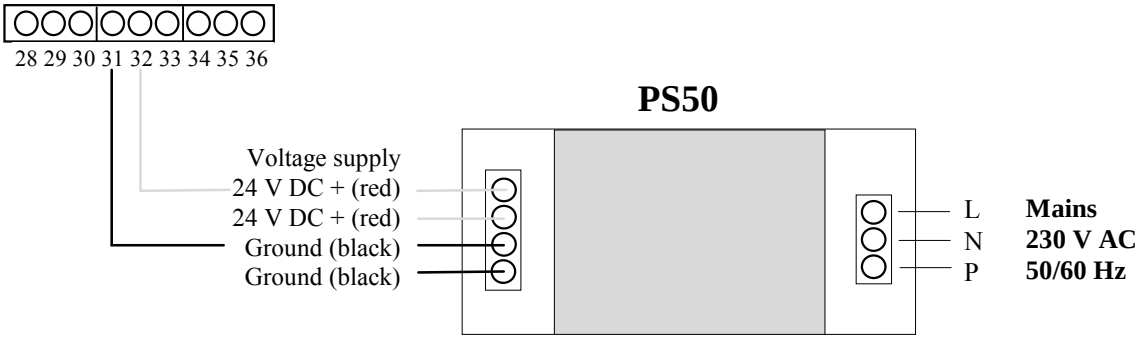
GMA 44 / GMA 44B

			Mains Unit
0 mA <		< 400 mA	PS12
400 mA <		< 1000 mA	PS30
1000 mA <		< 2000 mA	PS50
2000 mA <			on request

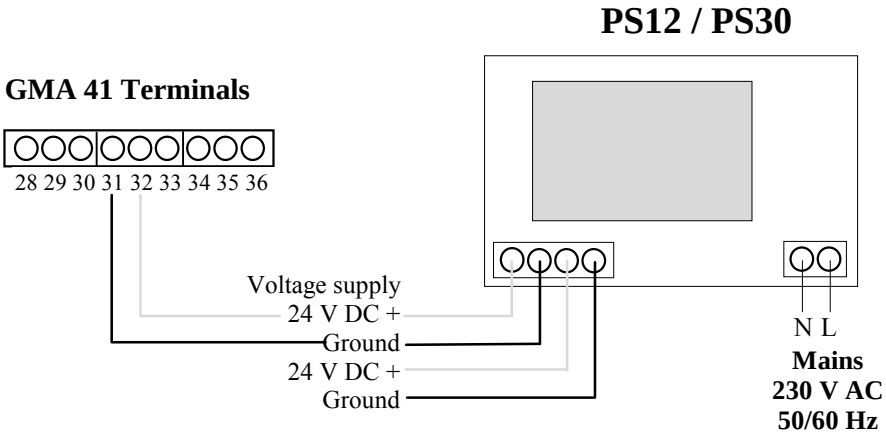
*** GMA 44 / GMA 44B requires mains unit PS 50 or higher.**

Connection Diagram of Mains Units

GMA 41 Terminals



The mains unit PS 50 comes complete with 2 x 0.5 m cable *red* and 2 x 0.5 m cable *black*, so the supply can be effected at two places.



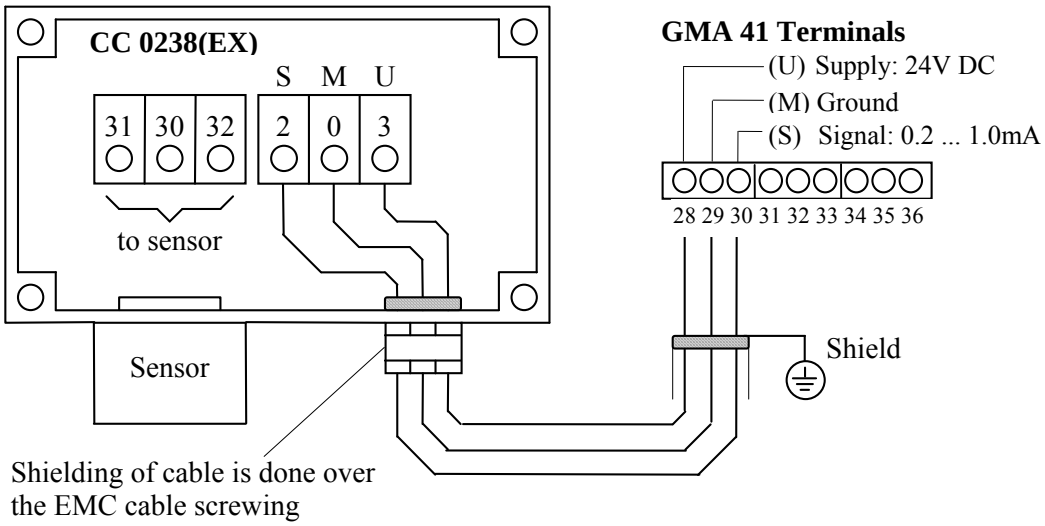
As the PS 50, the mains units PS12 and PS30 also allow the supply to be effected at two or more places.

Technical Data of Mains Units

Type	PS12 Mains units (not stabilized)	PS30	PS50 Stabilized control mains unit
Dimensions (WxHxD):	106 x 76 x 64 mm	106 x 76 x 85 mm	225 x 65 x 43.5 mm
Weight:	445 g	898 g	464 g
Input			
Primary voltage:	230 V / 50Hz		
Primary fuse:	T 0.16 A	T 0.4 A	
Output			
Secondary voltage	30 .. 21 V	27 .. 20 V	24 V
Secondary current	0 .. 400 mA	0 .. 1000 mA	0 .. 2000 mA
Power:	8.4 VA	20 VA	48 VA
Secondary fuse:	T 0.50 A G	T 1.25 A G	internal overload protection
Climate Conditions			
for operation:	-10 ... +55 °C / 0 ... 99 % r.h. / 700 ... 1300 hPa		-10 ... +55 °C / 20 ... 90 % r.h./ 700 ... 1300 hPa
Recommended storage conditions:	0 ... 30 °C, 20 ... 80 % r.h.		
DIN rail mounting:	DIN EN 50022		
Safety			
Protection:	DIN 40050 – IP –20		
Protective separation:	By means of safety transformer		
	EI 48 V11419 12.0VA PRI 230V / SEC 20 V 50 - 60Hz	EI 60 V11505 30.0VA PRI 230V / SEC 21 V 50 - 60 Hz	
Protective insulation.	As per EN 61010 up to overvoltage category III and soiling degree 2		
Safety standards:	DIN EN 61558		UL 1950 EN 60950 VDE 0160

Transmitter CC0238 EX

The CC sensor is designed as a 3-wire transmitter. The supply voltage and the 0.2 - 1 mA output signal use the same ground line. Cable type: e.g. LiYCY 3 x 0.75 mm² (up to 200 m).

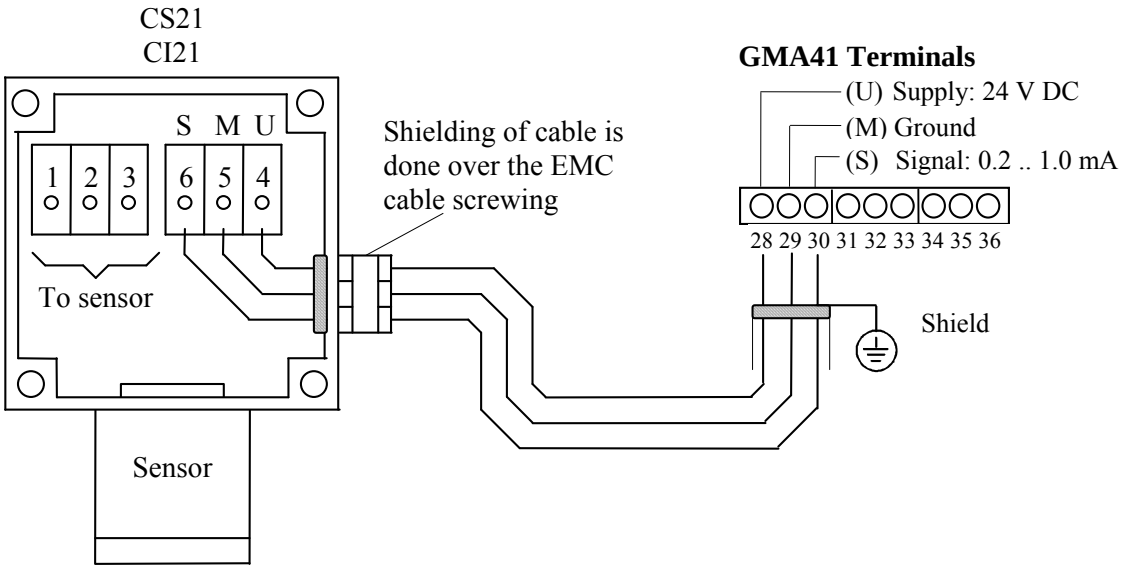


Transmitter CS21 and CI21

These sensors are designed as 3-wire transmitters.

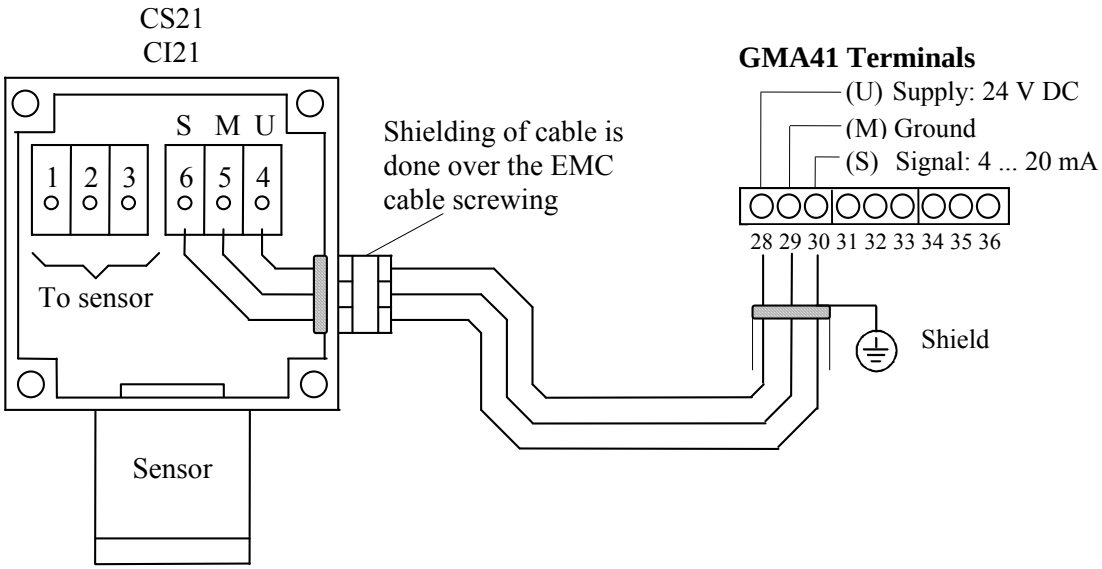
0.2 – 1 mA output signal

The supply voltage and the 0.2 – 1 mA output signal use the same ground line. Cable type: e.g. LiYCY 3 x 0.75 mm² (up to 200m)



4 – 20 mA output signal

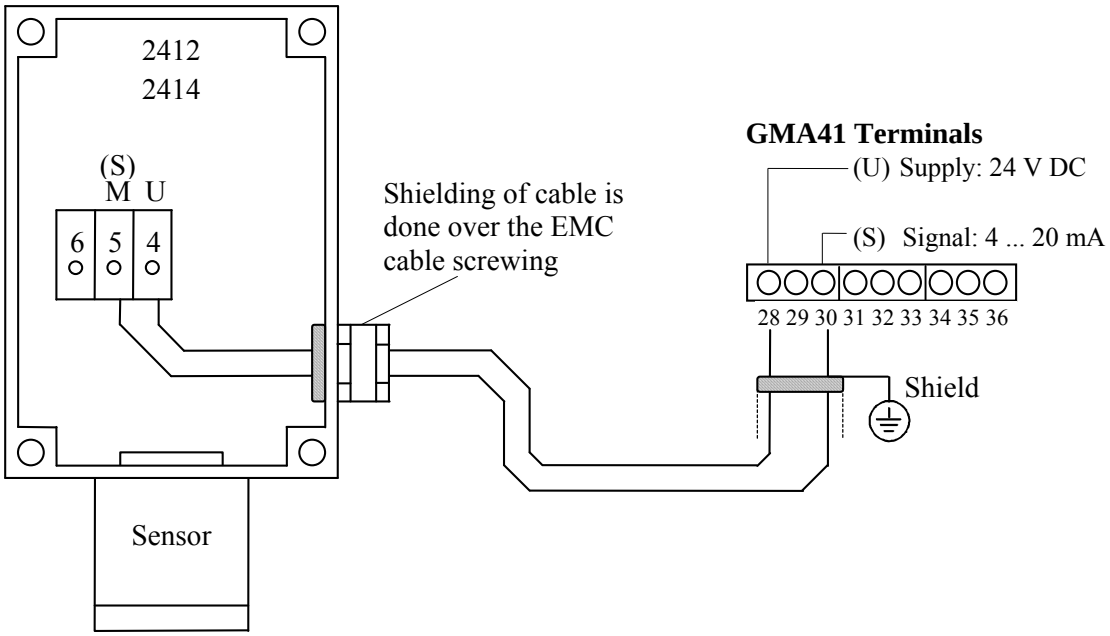
The supply voltage and the 4 – 20 mA output signal use the same ground line.



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

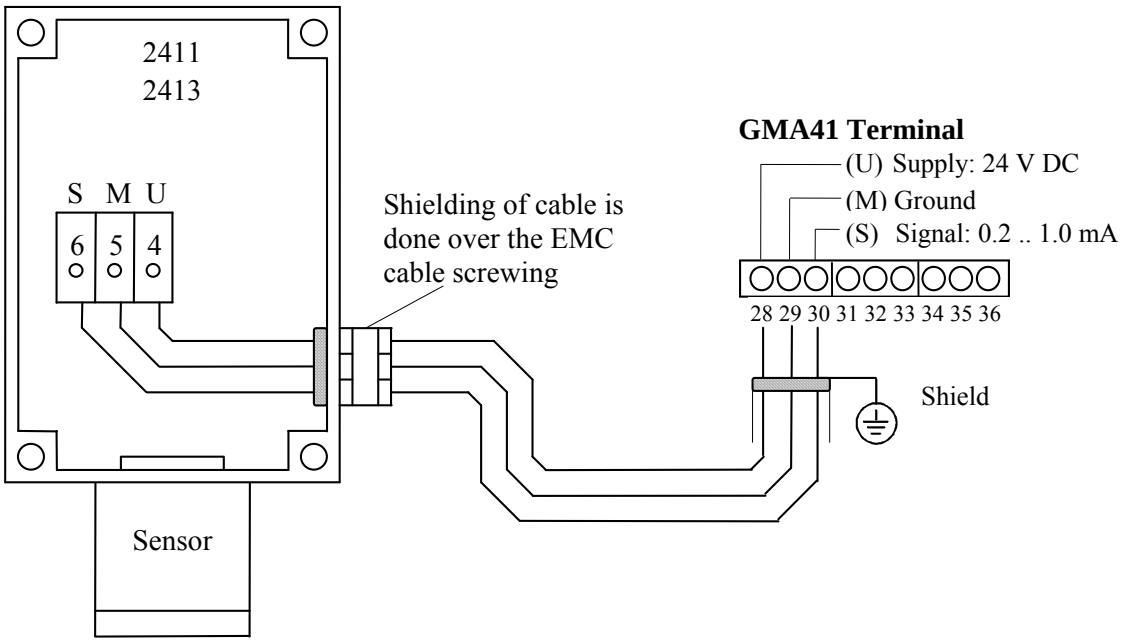
4 – 20 mA output signal

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



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 – 1 mA output signal use the same ground line.



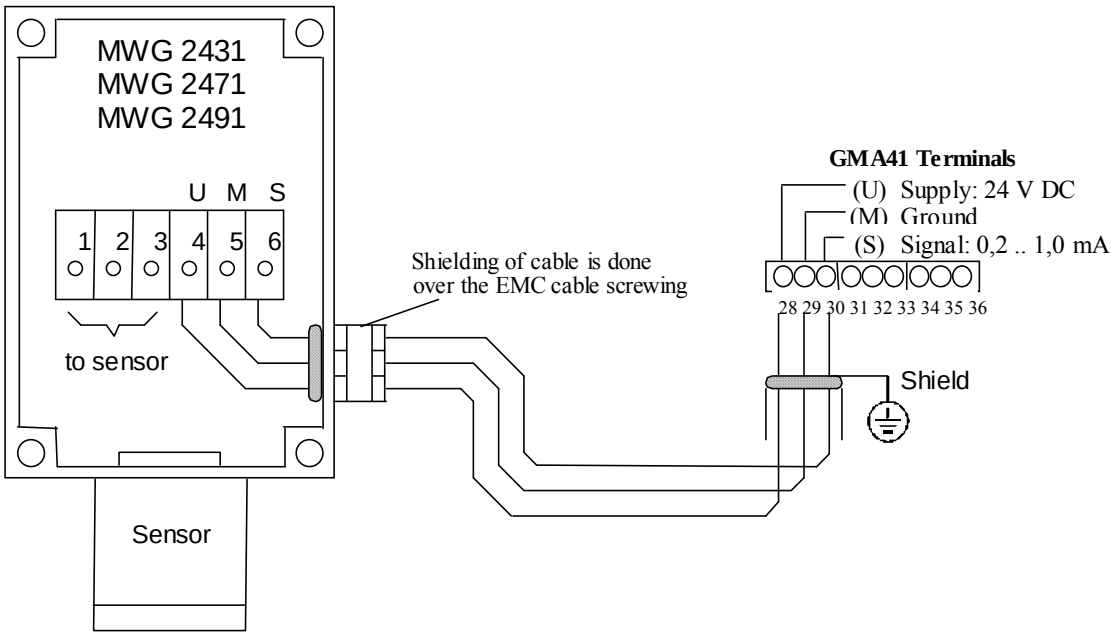
Transmitter CC24 EX (models MWG 2431 and 2432)

Transmitter CS24 EX (models MWG 2471 and 2472)

Transmitter IR 24 (models MWG 2491 and 2492)

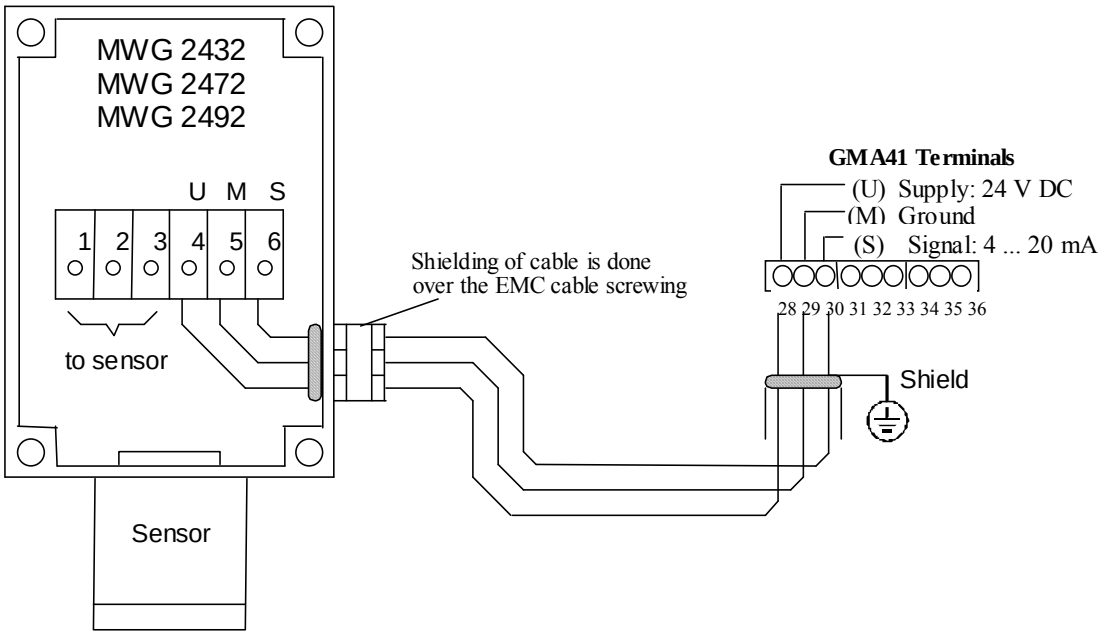
0.2 – 1 mA output signal

The Transmitters CC model MWG 2431, the CS model MWG 2471 and the infrared transmitter MWG 2491 are designed as 3-wire transmitters. The supply voltage and the 0.2 - 1mA output signal use the same ground line.



4 – 20 mA output signal

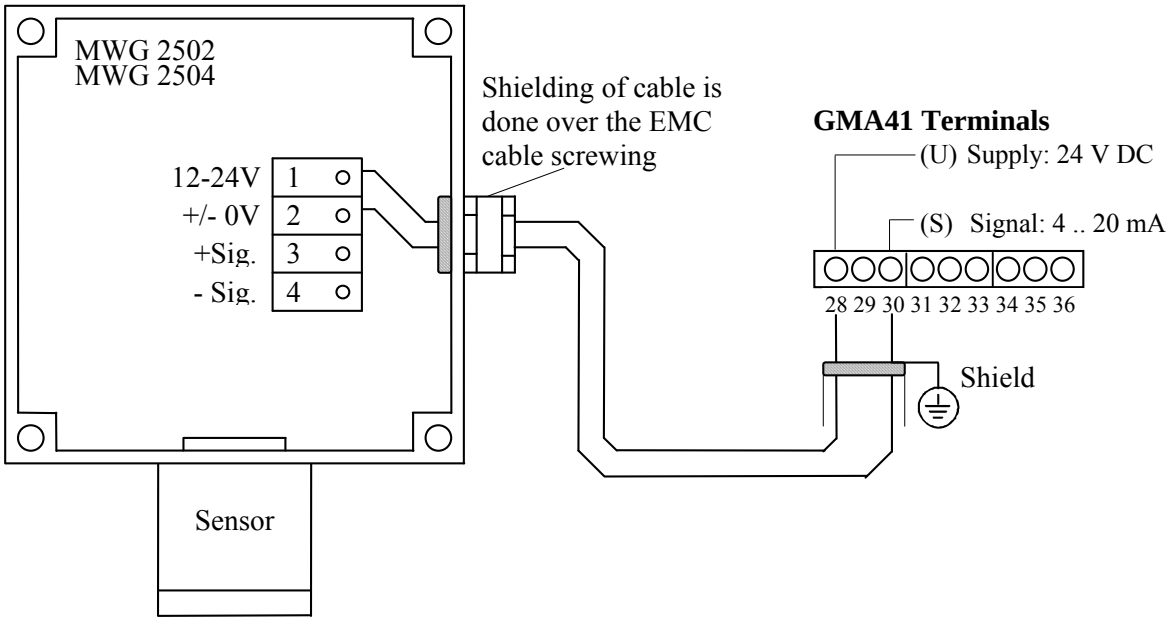
The CC model MWG 2432, the CS model MWG 2472 and the infrared transmitter MWG 2492 are designed as 3-wire transmitters. The supply voltage and the 4 – 20 mA output signal use the same ground line.



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

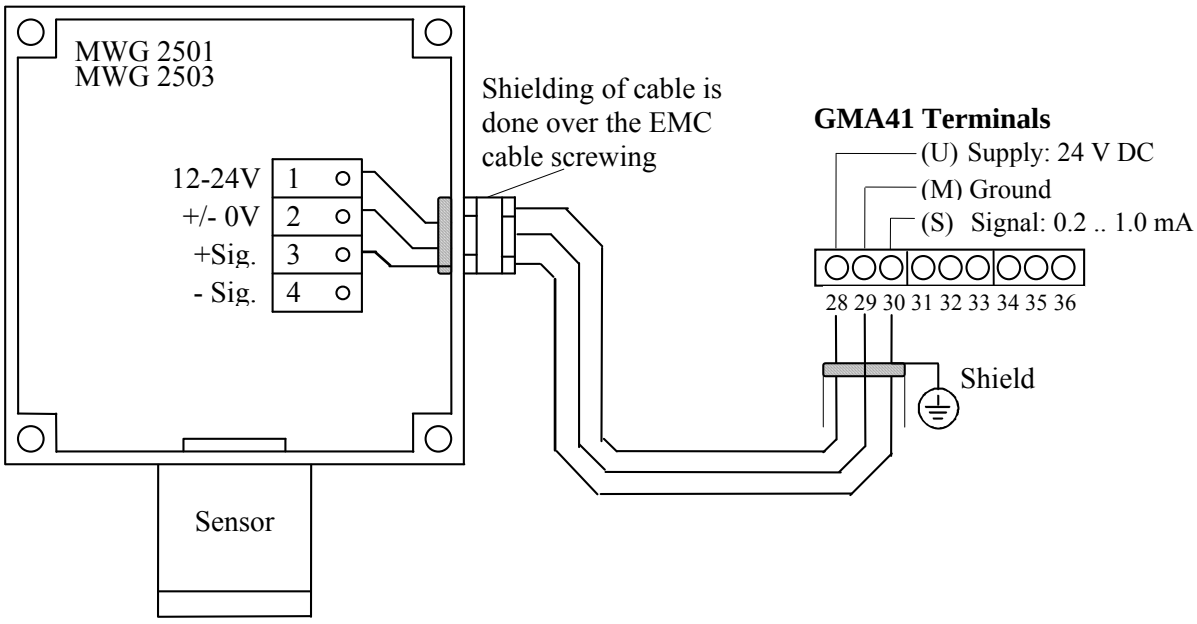
4 - 20 mA output signal

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



0.2 – 1 mA output signal

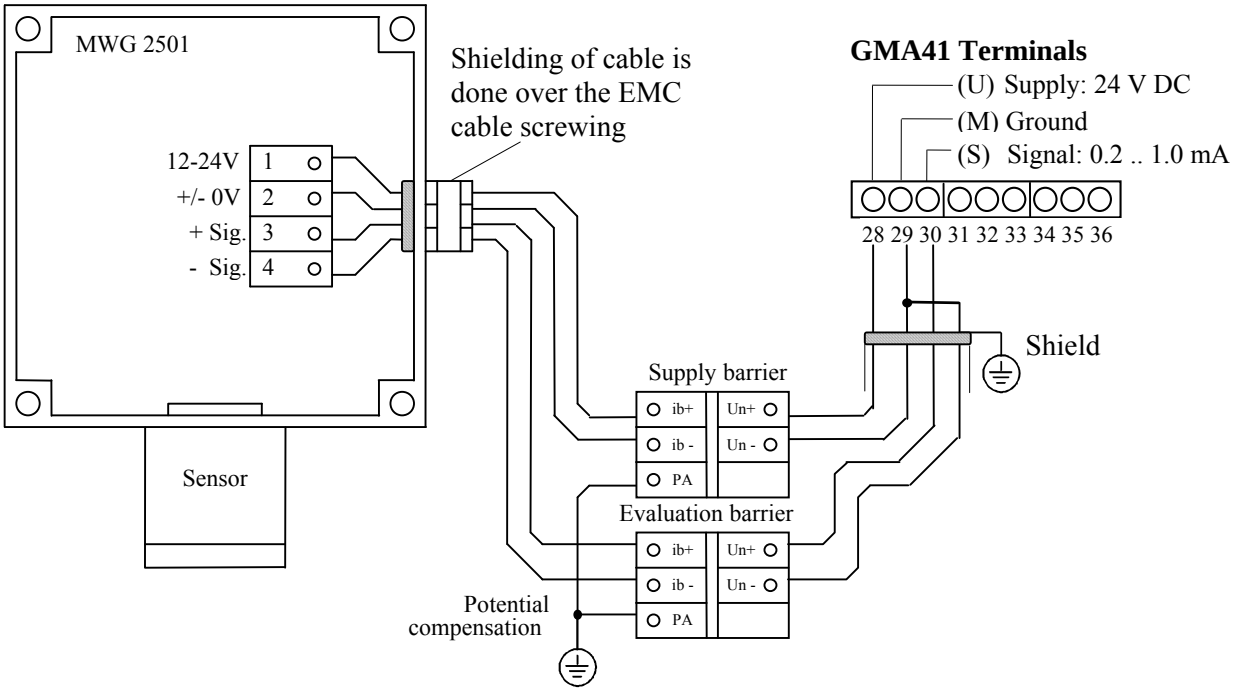
The EC models MWG 2501 and MWG 2503 are designed as 3-wire transmitters. The supply voltage and the 0.2 – 1 mA output signal use the same ground line.



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

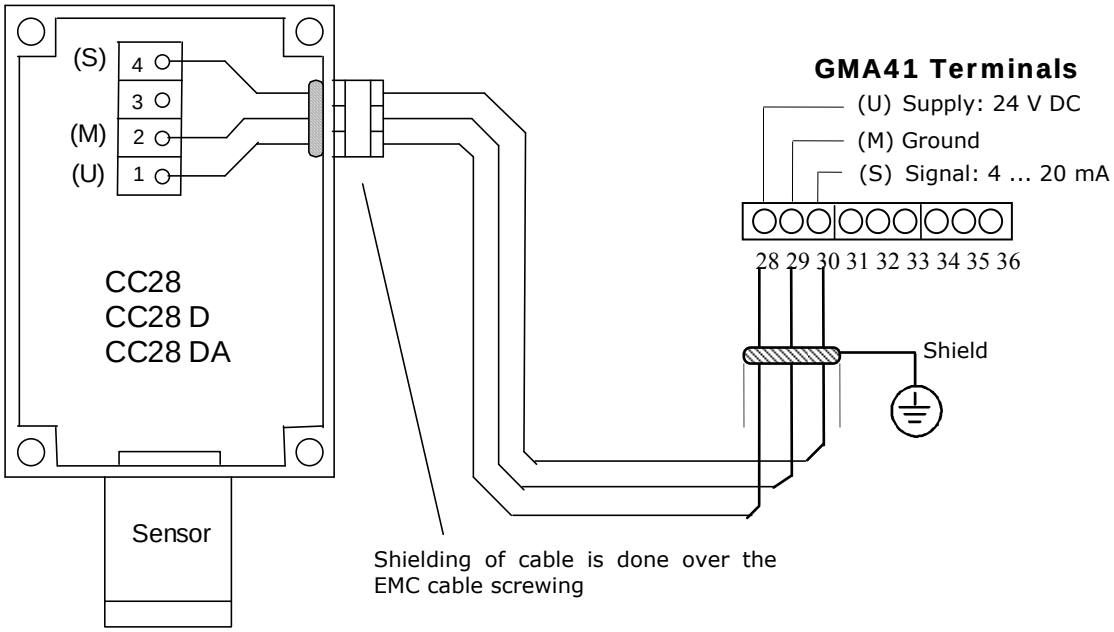
0.2 – 1 mA output signal

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 GMA41 both in the supply lines and in the signal lines.



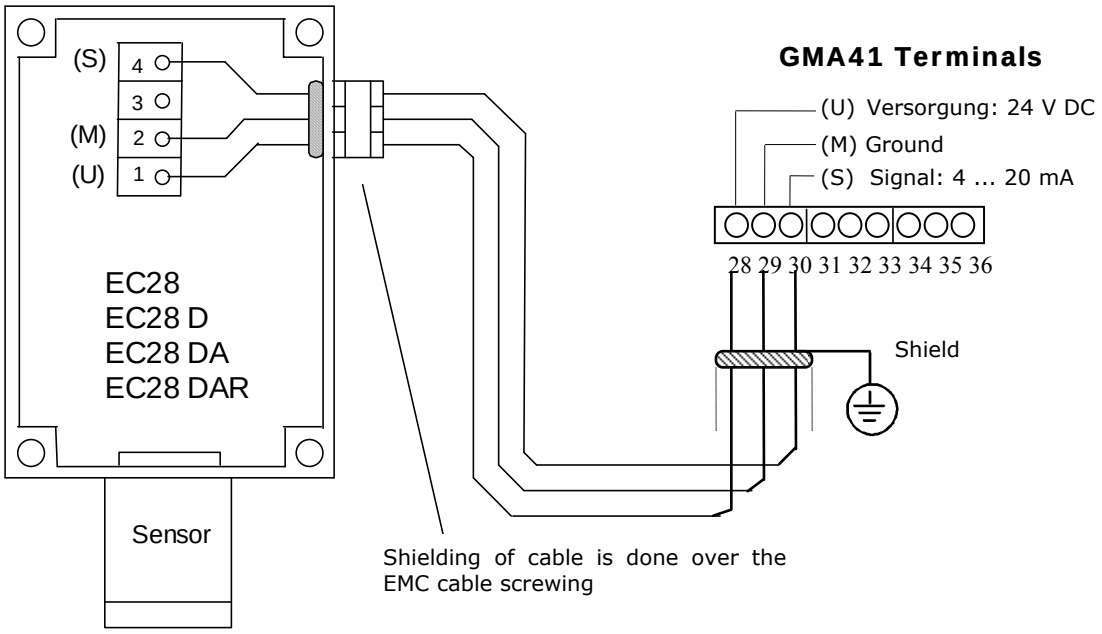
Transmitter CC28

Transmitters CC28, CC28 D and CC28 DA are connected to the GMA41 via 3 wires. Voltage supply and output signal are using the same ground line.
Cable type: e.g. LiYCY 3 x 0,75 mm² (up to 200m)
LiYCY 3 x 1,5 mm² (up to 1 km)



Transmitter EC28 (part 1)

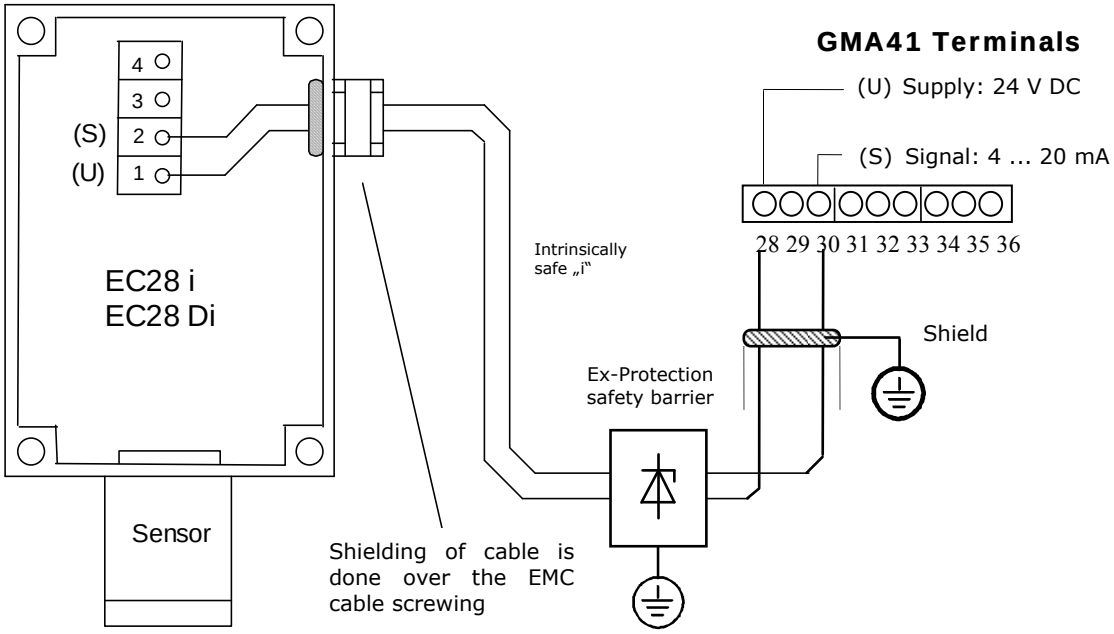
Transmitters EC28, EC28 D, EC28 DA and EC28 DAR are connected to the GMA41 via 3 wires. Voltage supply and output signal are using the same ground line.
Cable type: e.g. LiYCY 3 x 0,75 mm² (up to 500m resp. 200m for EC28 DA/DAR)
LiYCY 3 x 1,5 mm² (up to 1 km)



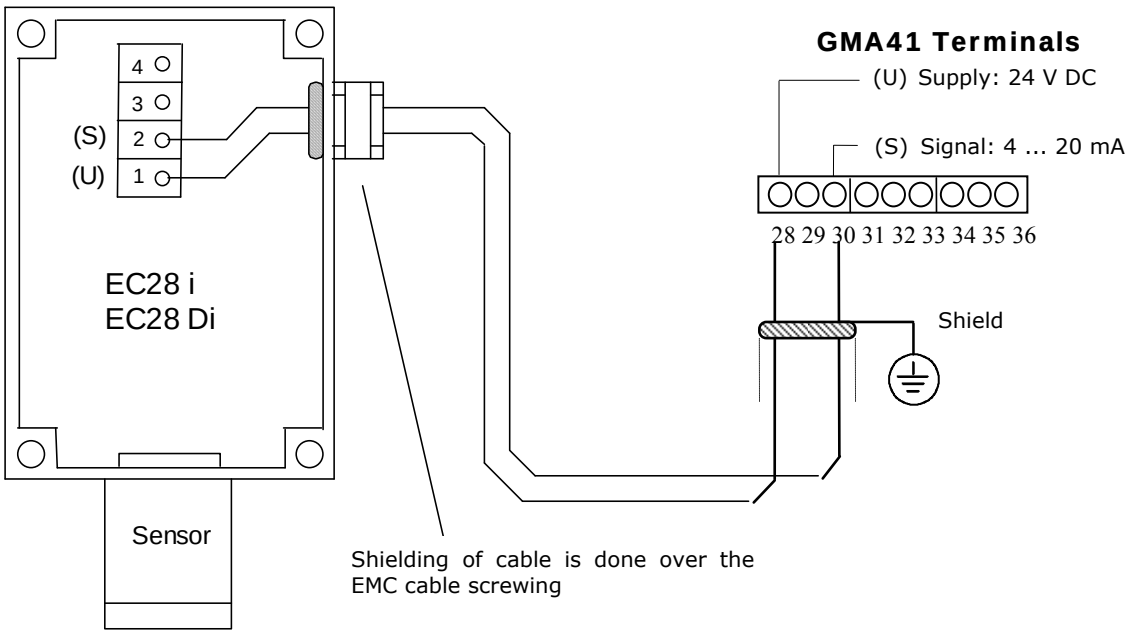
Transmitter EC28 (part 2)

Transmitters EC28 i and EC28 Di are connected to the GMA41 via 2 wires.
Voltage supply and output signal are using the same wire.
Cable type: e.g. LiYCY 2 x 0,75 mm² (up to 500m)
LiYCY 2 x 1,5 mm² (up to 1 km)

If the transmitter is installed in explosion endangered areas, connection must be done through a safety barrier:

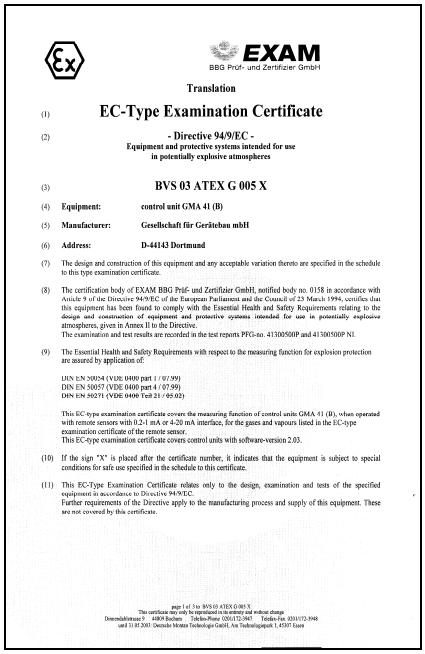


If the transmitter is **not** installed in explosion endangered areas, it may be connected to the GMA41 without an interlinked safety barrier:



GfG Gesellschaft für Gerätebau mbH
P.O.Box 44 01 64 D-44390 Dortmund
Phone: +49-231-564000
Fax: +49-231-516313
E-Mail: info@gfg.biz
Internet: www.gfg.biz

EC-Type Examination Certificate



EXAM
BBG Prüf- und Zertifizier GmbH

Translation

(1) **EC-Type Examination Certificate**

(2) **- Directive 94/9/EC -**
Equipment and protective systems intended for use in potentially explosive atmospheres

(3) **BVS 03 ATEX G 005 X**

(4) **Equipment:** **control unit GMA 41 (B)**

(5) **Manufacturer:** **Gesellschaft für Gerätebau mbH**

(6) **Address:** **D-44143 Dortmund**

(7) The design and construction of this equipment and any acceptable variation thereto are specified in the schedule to this type examination certificate.

(8) The certification body of EXAM BBG Prüf- und Zertifizier GmbH, notified body no. 0158 in accordance with Article 9 of the Directive 94/9/EC of the European Parliament and the Council of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres, given in Annex II to the Directive.
The examination and test results are recorded in the test reports PFG-no. 41300500P and 41300500P NI.

(9) The Essential Health and Safety Requirements with respect to the measuring function for explosion protection are assured by application of:

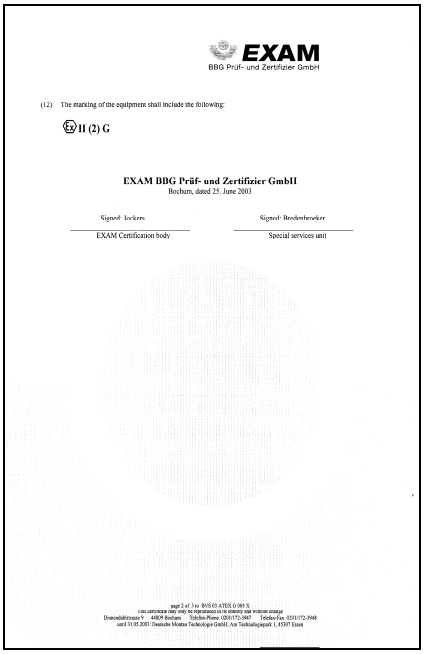
DIN EN 50054 (VDE 0400 part 1 / 07.99)
DIN EN 50057 (VDE 0400 part 4 / 07.99)
DIN EN 50271 (VDE 0400 Teil 21 / 09.02)

This EC-type examination certificate covers the measuring function of control units GMA 41 (B), when operated with remote sensors with 0.2-1 mA or 4-20 mA interface, for the gases and vapours listed in the EC-type examination certificate of the remote sensor.
This EC-type examination certificate covers control units with software-version 2.03.

(10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

(11) This EC-Type Examination Certificate relates only to the design, examination and tests of the specified equipment in accordance to Directive 94/9/EC.
Further requirements of the Directive apply to the manufacturing process and supply of this equipment. These are not covered by this certificate.

Dimmendahlstrasse 9 44809 Bochum Telefon-Phone 0201/172-2667 Telefax-Fax 0201/172-3948
until 31.05.2003: Deutsche Montan Technologie GmbH, Am Technologiepark 1, 45307 Essen



EXAM
BBG Prüf- und Zertifizier GmbH

(12) The marking of the equipment shall include the following:

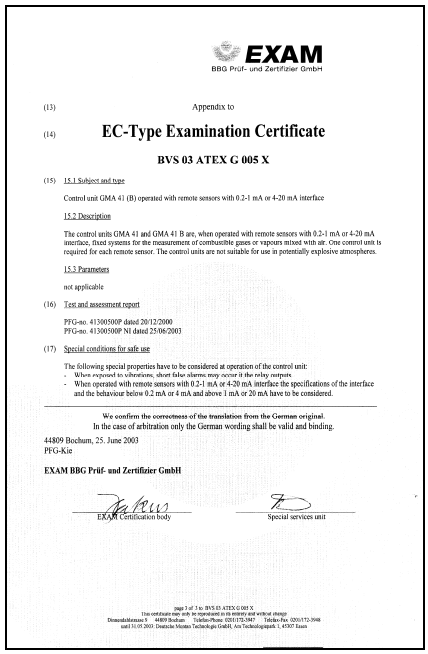
Ex II (2) G

EXAM BBG Prüf- und Zertifizier GmbH
Bochum, dated 25. June 2003

Signed: Jockers
EXAM Certification body

Signed: Brodenbrocker
Special services unit

Dimmendahlstrasse 9 44809 Bochum Telefon-Phone 0201/172-2667 Telefax-Fax 0201/172-3948
until 31.05.2003: Deutsche Montan Technologie GmbH, Am Technologiepark 1, 45307 Essen



EXAM
BBG Prüf- und Zertifizier GmbH

(13) Appendix to

(14) **EC-Type Examination Certificate**

BVS 03 ATEX G 005 X

(15) 15.1 Subject and type

Control unit GMA 41 (B) operated with remote sensors with 0.2-1 mA or 4-20 mA interface

15.2 Description

The control units GMA 41 and GMA 41 B are, when operated with remote sensors with 0.2-1 mA or 4-20 mA interface, fixed systems for the measurement of combustible gases or vapours mixed with air. One control unit is required for each remote sensor. The control units are not suitable for use in potentially explosive atmospheres.

15.3 Parameters

not applicable

(16) Test and assessment report

PFG-no. 41300500P dated 20/12/2000
PFG-no. 41300500P NI dated 25/06/2003

(17) Special conditions for safe use

The following special properties have to be considered at operation of the control unit:
- When exposed to vibrations, short false alarms may occur at the relay outputs
- When operated with remote sensors with 0.2-1 mA or 4-20 mA interface the specifications of the interface and the behaviour below 0.2 mA or 4 mA and above 1 mA or 20 mA have to be considered.

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.

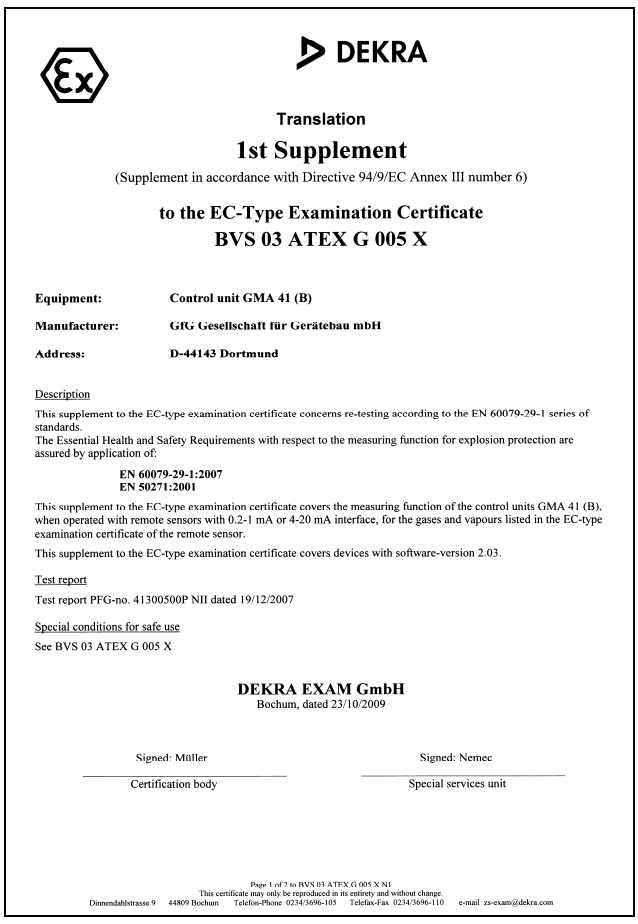
44809 Bochum, 25. June 2003
PFG-Kie

EXAM BBG Prüf- und Zertifizier GmbH

EXAM Certification body

Special services unit

Dimmendahlstrasse 9 44809 Bochum Telefon-Phone 0201/172-2667 Telefax-Fax 0201/172-3948
until 31.05.2003: Deutsche Montan Technologie GmbH, Am Technologiepark 1, 45307 Essen



DEKRA

Translation

1st Supplement

(Supplement in accordance with Directive 94/9/EC Annex III number 6)

to the EC-Type Examination Certificate
BVS 03 ATEX G 005 X

Equipment: **Control unit GMA 41 (B)**

Manufacturer: **GfG Gesellschaft für Gerätebau mbH**

Address: **D-44143 Dortmund**

Description

This supplement to the EC-type examination certificate concerns re-testing according to the EN 60079-29-1 series of standards.
The Essential Health and Safety Requirements with respect to the measuring function for explosion protection are assured by application of:

EN 60079-29-1:2007
EN 50271:2001

This supplement to the EC-type examination certificate covers the measuring function of the control units GMA 41 (B), when operated with remote sensors with 0.2-1 mA or 4-20 mA interface, for the gases and vapours listed in the EC-type examination certificate of the remote sensor.

This supplement to the EC-type examination certificate covers devices with software-version 2.03.

Test report

Test report PFG-no. 41300500P NII dated 19/12/2007

Special conditions for safe use

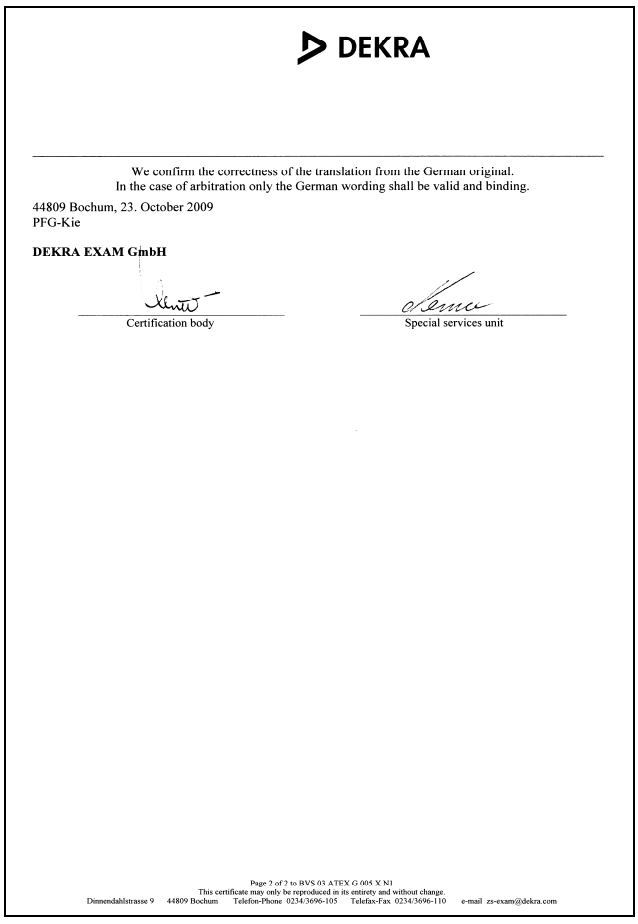
See BVS 03 ATEX G 005 X

DEKRA EXAM GmbH
Bochum, dated 23/10/2009

Signed: Müller
Certification body

Signed: Nemec
Special services unit

Dimmendahlstrasse 9 44809 Bochum Telefon-Phone 0234/3696-105 Telefax-Fax 0234/3696-110 e-mail zs-exam@dekra.com



DEKRA

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.

44809 Bochum, 23. October 2009
PFG-Kie

DEKRA EXAM GmbH

Certification body

Special services unit

Dimmendahlstrasse 9 44809 Bochum Telefon-Phone 0234/3696-105 Telefax-Fax 0234/3696-110 e-mail zs-exam@dekra.com

EC- Declaration of Conformity

GMA41 (B)

GfG Gesellschaft für Gerätebau mbH
Klönnestrasse 99
D-44143 Dortmund
Tel: +49 (231) 56400-0
Fax: +49 (231) 516313
E-Mail: info@gfg-mbh.com
www.gfg.biz

Edited: 17.01.2005 Amended: 25.02.2010

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** -Certificate No. BVS 03 ATEX ZQS / E 187- issued by the notified body, DEKRA EXAM GmbH, 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 ignition protection classes explosion- proof encasing, increased safety, encapsulation and intrinsical safety, as well as their measuring function.

The Gas Monitor **GMA41** complies with **directive 94/9/EC** for devices and protective systems for proper use in explosion endangered areas (ATEX directive), with **council directive 2004/108/EC** for electromagnetic compatibility and with **directive 2006/95/EC** for electrical safety.

For the measurement function	BVS 03 ATEX G 005 X
Labelling	Ⓔx II (2G) G
	CE 0158

The directives have been complied with under consideration of the standards mentioned below:

- **Safe and accurate measuring function**
  - Gas detectors- Performance requirements of detectors for flammable gases — EN 60079-29-1
  - 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. — DIN EN 50271

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

- **Operational safety**
  - Safety requirements for electrical equipment for measurement, control and laboraty use. General requirements. — EN 61010

The evaluation of the health requirements has been done, documented and filed by a notified body with register no. 0158 (DEKRA EXAM GmbH, Dinnendahlstraße 9 D-44809 Bochum).
The EMC testing laboratory EM TEST GmbH, Kamen has been charged with testing and evaluation of the electromagnetic compatibility.

Always adhere to the safety notes of the operation manual 185-000.13

Dortmund, 25.02.2010

.....
H.J. Hübner
President CEO

ATEX EG-Kon019/Siebrecht

GfG Gesellschaft für Gerätebau mbH
Klönnestrasse 99
D-44143 Dortmund
Tel: +49 (231) 56400-0
Fax: +49 (231) 516313
E-Mail: info@gfg-mbh.com
www.gasmessung.de
www.gfg.biz

Operational Conditions

The SIL ability of the controller in combination with the determined error rate is only valid, if the following operational conditions are being complied with:

The relevant transmitter must be mounted in a position which is suitable for the detection task, must be properly connected to the controller GMA41(B), and the gas warning system must be put into operation by the manufacturer GfG Gesellschaft für Gerätebau mbH or by an authorised representative.

The connected transmitter must send defined status signals to the controller for internal failures resp. short circuit, so transmitter failure can be recognized. This is automatically made sure when transmitters 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 connected transmitter has to be regularly serviced by an expert and must be calibrated with a certified test gas.

The service intervals must be determined according to bulletin BGI 518 of the Association of Workers' Compensation Insurance Carriers (= bulletin T 023 of BG-Chemie, edition 07/2009).

Annual Proof Test

At least once a year a Proof Test of the complete safety chain has to be effected. For the controller the Proof Test is equivalent to a system check as per operational safety regulation and includes the regular calibration / adjustment of the connected transmitter as well as triggering and testing of the switching function of alarm relays and fault relays.

SIL- Declaration of Conformity

GMA41
GMA41B

Edited: 28.01.2010 Changed:

GfG Gesellschaft für Gerätebau mbH
Klönnestrasse 99
D-44143 Dortmund
Tel: +49 (231) 56400-0
Fax: +49 (231) 516313
E-Mail: info@gfg-mbh.com
www.gasmessung.de
www.gfg.biz

The evaluation unit **GMA41 (B)** complies with the folloowing European standards on functional safety:

Functional safety of electrical/electronic/programmable electronic safety-related systems
EN 61508-1:2001

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 50271:2001

The following nominal values for single channel and dual channel use of the evaluation unit **GMA41 (B)** have been determined:

	Single channel use	**Redundant use**
Safety function	Explosion protection	
Detection range	0 – 100 % UEG	
SIL ability hardware	2	3
SIL ability software	1 as per EN 50271	1 as per EN 50271
Detector type	B	
SFF	93.90	
HFT	0	1
β Faktor	—	5 %
PFD	1.19×10^{-4} (per year)	5.99×10^{-6} (per year)
λ_{du}	2.59×10^{-8} (per h)	
λ_{dd}	2.21×10^{-7} (per h)	
λ_{su}	1.65×10^{-7} (per h)	
λ_{sd}	1.26×10^{-8} (per h)	
Proof Test Intervall	1 year	
MTTR	24 h	

The calculation of the nominal values 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 adhere to the following listed Operational conditions and safety notes of the operation manual 185-000.13

Dortmund, 29.01.2010

.....
Dipl. Kfm. H.J. Hübner
President CEO