Worldwide Supplier of Gas Detection Solutions

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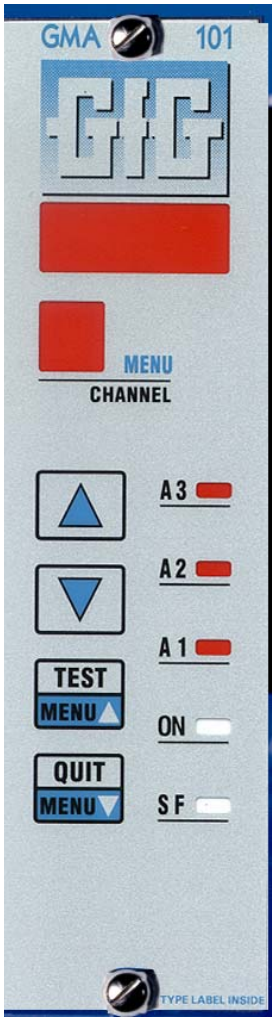
GMA101

Operation Manual



Content

Introduction

Each detection point of your fixed gas monitoring system consists of a transmitter and a control module GMA101, which are connected by means of a remote sensor cable. The GMA101 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 GMA1 offers a variety of features, which allow to adapt 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 GMA101 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 GMA101 gives a warning by means of the LED displays and controls the relevant alarm relays (optional). In addition to this, the GMA101 provides the measurement value as an analog output signal for further evaluation. The GMA101 is easy to operate and maintenance-free. Should unexpected failures or system faults occur, the comprehensive failure recognition allows a quick and specific service.

Application and Purpose

In combination with the connected transmitter, the GMA101 forms a fixed gas monitoring system for continuous measurement of the gas concentration and for the warning from combustible gases and vapors in the LEL range, toxic gases and oxygen in the ambient air.
The function and accuracy of the GMA101 have been tested by "DMT-Deutsche Montan Technologie GmbH" for the use as a warning system for hazards from explosive gas mixtures. The test was based on DIN EN 50054 "Electrical apparatus for finding and measuring combustible gases - General requirements and test methods" and DIN EN 50057 "Electrical apparatus for finding and measuring combustible gases - Requirements of the operational behaviour of Group II devices with a detection range up to 100 % of the Lower Explosion Limit" and prEN 50271 “Electrical apparatus for detection and measurement of combustible gases, toxic gases or oxygen. Requirements and tests for warning devices, which use software and/or digital technology”. The tests included the listed standard detection ranges. The functions marked (#) have not been part of the function test.

The following standard ranges have been tested:

Gas No.	Gas		Detection range
59	CH_4	Methane	0 .. 100 %LEL
81	C_3H_8	Propane	0 .. 100 %LEL
72	C_9H_{20}	n-Nonane	0 .. 100 %LEL
40	C_2H_5OH	Ethanol	0 .. 100 %LEL

Function-test: PFG-No. 41300700

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 GMA101 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.

Notice:
For the parameter setting of the supplied GMA101 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.

Important for LEL Monitoring

If you use catalytic combustion (CC) transmitters for LEL monitoring, and if a suitable range has been adjusted on your GMA101 controller, please note the following: Due to the detection principle you cannot differ between sensor signals in the LEL range and signals for very high concentrations (e.g. > 20 Vol.% CH_4). This is why the GMA101 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 pages 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.

Detection Mode

Front View GMA101

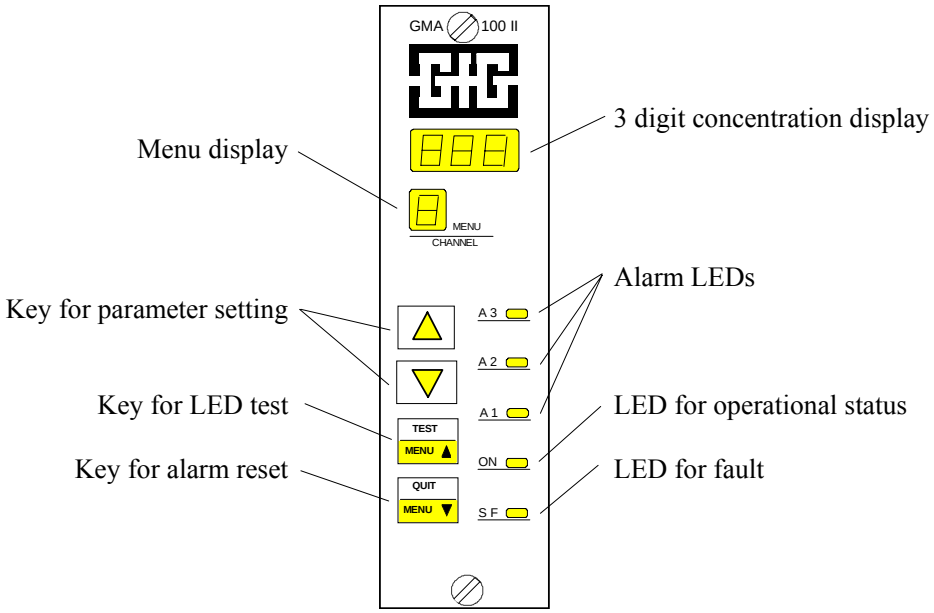


Fig. 1

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. 10 seconds),
- the warm-up of the transmitter connected
  (for detailed information please refer to the operation manual for your transmitter).

During the warm-up period the GMA101 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 signal output 4..20 mA or 0,2..1 mA, which are calibrated for methane, propane (no linear sensor signal) or ethanol and n-nonane (linear sensor signal "standard"), the following display values occur:

Sensor signal

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

Peak Value Memory

The controller GMA101 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 measuring and warning functions are <u>not activated</u>!

LED Test
In detection mode, press key [TEST MENU▲] shortly to activate the self-test of the GMA101 controller.

Fault LED is tested when service menu is activated.

Display of Detection Range and Alarm Thresholds

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 (within det. range)	**A1**	1. Threshold alarm
5	40 (within det. range)	**A2**	2. Threshold alarm
6	40 (within det. range)	**A3**	3. Threshold alarm

Once these readings are complete, the GMA101 returns to detection mode automatically.

Alarm

The GMA101 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 Terminal Diagram Motherboard and 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 GMA101 activates the relevant alarm relay and the logical output. The standard setting for the switching functions is shown below:

Alarm	**Function**	**Resettable during Alarm**	**Resettable after Alarm**	**Remark**
1	non-latching	no	self-resetting	
2	latching	no	Yes	
3	latching	yes	Yes	Same threshold as alarm 2

Overrange Memory
In case the detection range is exceeded by more than 10 %, the GMA101 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. they can only be reset by pressing key QUIT MENU▼, when the gas concentration has fallen below the full scale value.

Please notice: " Important for LEL Monitoring", page 4

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 GMA101. A non-latching alarm turns off automatically, when the gas concentration falls below or exceeds the preset threshold.

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

This function is standard available only 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 GMA101 indicates **overrange**.

Please notice: " Important for LEL Monitoring", page 4

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.

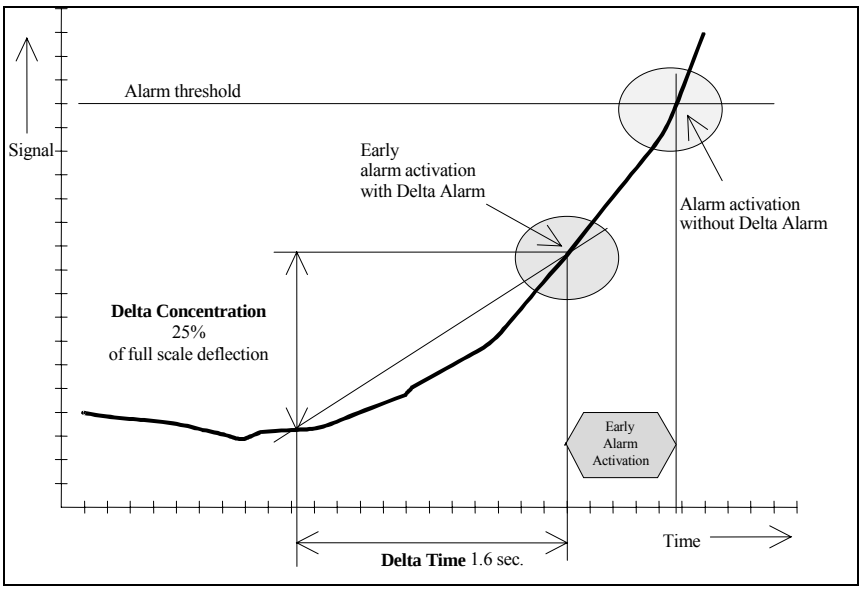


Fig. 2

Time Delay of Alarms (#)

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

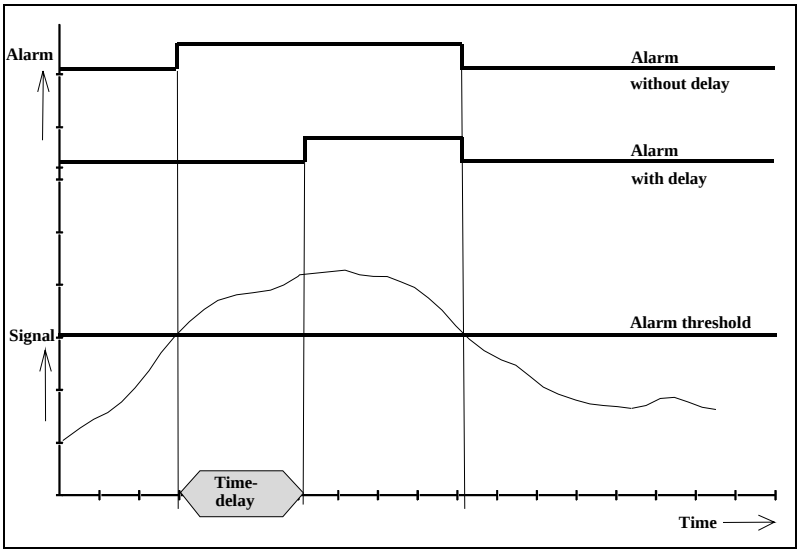


Fig. 3

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 is activated. A fault is signalized:

- if the cable between MWG and GMA101 is cut;
- if the sensor or the circuit of the transmitter is faulty;
- if the zeropoint is deviated;
- if the detection range is exceeded (together with alarm activation);
- if the CPU self-monitoring is faulty.

As soon as the fault is repaired, the yellow LED **“S F”** goes out, the fault relay deactivates and the GMA101 returns to standard detection mode.

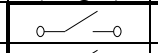
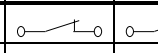
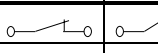
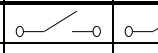
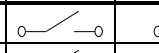
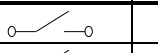
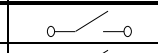
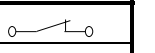
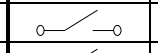
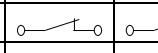
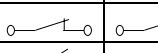
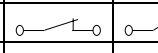
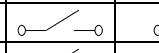
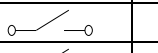
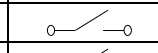
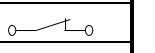
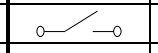
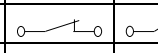
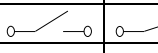
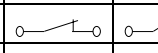
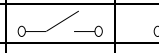
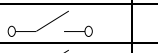
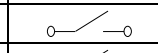
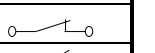
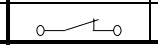
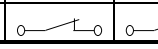
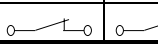
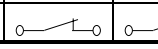
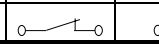
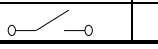
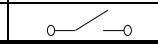
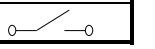
Relays

If the GMA101 has been ordered with the relay extension, it 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. In the standard setting all 4 relays are NO contacts. The alarm relays are 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:

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 Transmitter Signal

Press key [▽], and after approx. 2 seconds the GMA101 displays the signal received from the transmitter in mA (0.2 ... 1 for transmitters with 0.2-1 mA output and 4 … 20 for transmitters with 4-20 mA output). This function allows to check the zeropoint of the transmitter at the GMA101 (see page 11).

Indication of Transmitter in Service Mode

This function is only available for MWG CC24 EX (type MWG 243x II), CS24 EX and EC25.

The transmitters MWG CC24 EX, CS24 EX, EC25 provide a service switch. When this is activated during maintenance (see operation manual for the transmitter), the GMA101 automatically turns to fault indication. Alarm signals are being suppressed.

Activation of Service Mode

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 GMA101.

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 GMA101 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 GMA101 switches to fault. The LEDs "**ON**" and „**S F**" light up, the fault relay is activated.

Adjustments in Service Mode

The display of the GMA101 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**
U1	Detection unit	LEL, ppm	Display only
C2	Gas	CH4, NH3, O2 or GfG-Gas No.	
A1	Threshold Alarm 1	Value in detection range	Adjustment with △ and ▽
A2	Threshold Alarm 2	Value in detection range	
A3	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**
A1	Threshold Alarm 1	Value in detection range	Adjustment with △ and ▽
A2	Threshold Alarm 2	Value in detection range	
A3	Threshold Alarm 3	Value in detection range	

Check of Relays and Logical Outputs

The display of the GMA 101 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 A1, A2 or A3 for the alarm threshold to be set.
3. Set the new alarm threshold by means of keys △ and ▽.

Storing of the parameters see page 14!

Adjustable alarms	
Highest alarm	**Lowest alarm**
End of measurement range	Begin of measurement 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 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 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 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 transmitters for oxygen 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 GMA101 allows to check and adjust 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 GMA101 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 GMA101 to store the peak signal value measured during the duration of the test gas supply. The stored peak values can be used as sensitivity point. Fig. 4 below shows this procedure.

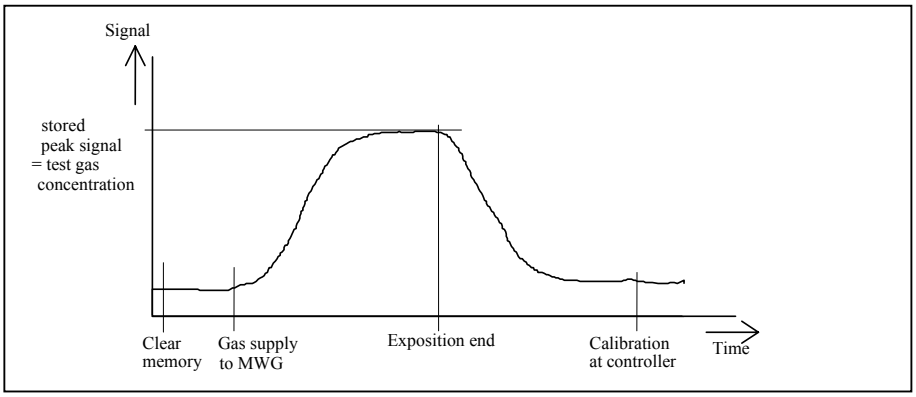


Fig. 4

1. Activate service **menu A**.
2. Use keys TEST MENU ▲ and QUIT MENU ▼ to select menu point [.
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 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 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 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 GMA101 stores all parameters changed in the selected menu point and returns to detection mode.

or

No storage: Press key TEST MENU▲, and the GMA101 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 parameters changed in the selected menu point.

Maintenance

After the installation of a gas warning system and before putting it into operation, a function test must be carried out. The maintenance of a gas warning system contains, according to the „Guidelines for Explosion Protection", and the „UVV-Gases" the inspection, maintenance, calibration and adjustment, regularly function tests and the maintenance.

In the DIN EN 50073 "information sheet for selection, installation, usage and maintenance of devices for detection and measurement of combustibles or oxygen", information sheet T 023 "Gas warning devices for explosion protection – Usage and Operation" and the UVV-gases "accident protection regulations for gases" the responding measures are laid down.

Inspection, maintenance, calibration and adjustment

During the inspection examinations of the gas measurement systems shall be carried out (see information sheet T 023, section 8.1).

- 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 regularly inspection intervals. Inspection intervals should not exceed 4 months. (See information sheet T023, section 8.2, 8.3 and DIN EN 50073, Section 6.4.3).

- 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. (see information sheet T023, Section 8.5 and UVV-gases § 56).

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 leads to exclusion of the function test and thereby exclusion of the controller's technical safety!

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

P.C.Board of the GMA101

The GMA101 is designed as a 19" slide-in controller.

Assembly side of the GMA101 - P.C.Board

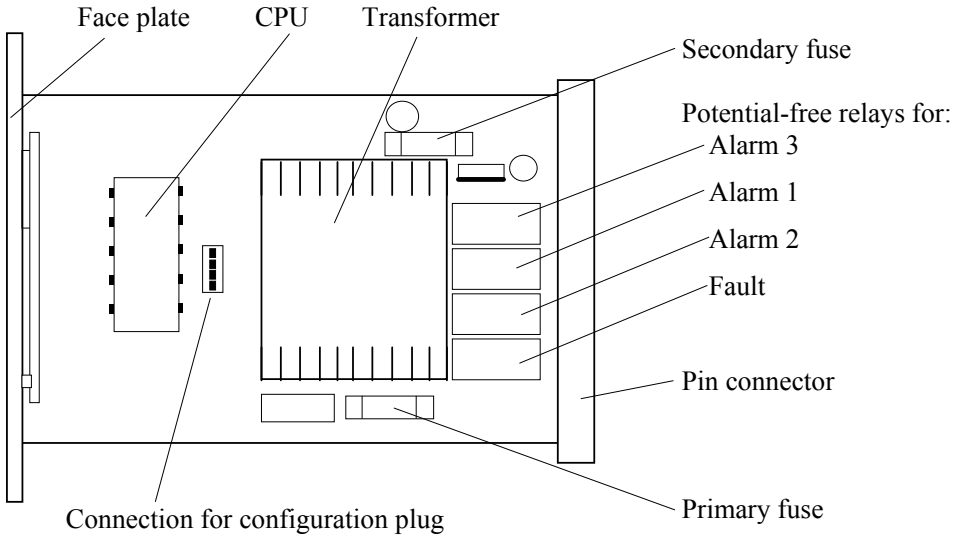


Fig. 5

Solder side of the GMA101 - P.C.Board

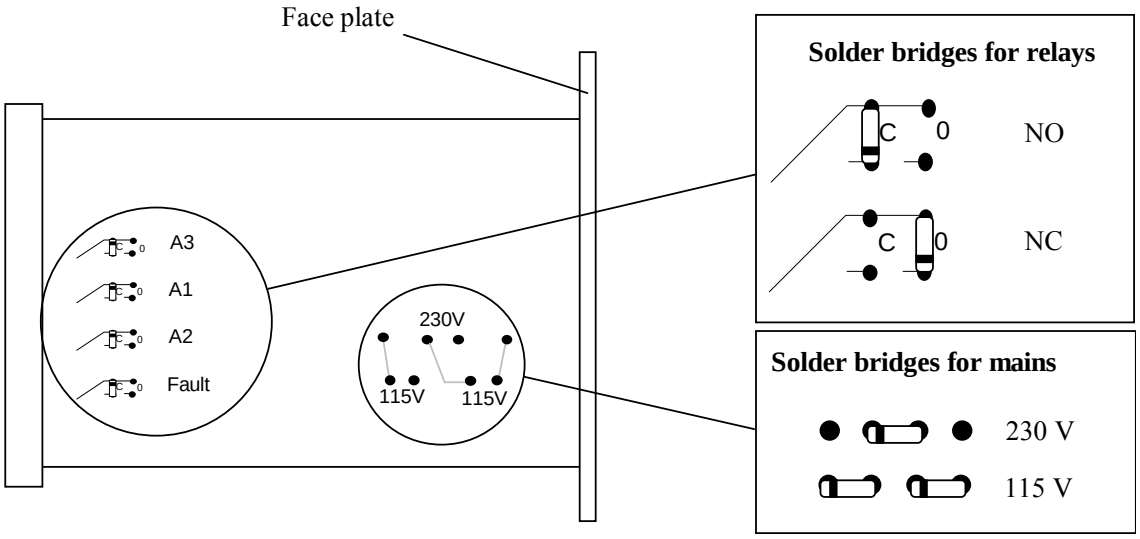


Fig. 6

Changing of Relay Contacts

On the reverse side of the GMA101 main p.c.board you find for every relay two assembly positions for 0 Ω SMD resistors. The position of the resistors decides on whether the relevant relay is a NC contact or a NO contact. On the p.c.board the assembly positions are marked "**O**" (NC contact) resp. "**C**" (NO contact), and the relevant relays are marked "**A1**", "**A2**", "**A3**" and "**FAULT**". Fig. 6 shows all relays assembled as NO contacts.

Setting of Mains Voltage

On the reverse side of the GMA101 main p.c.board you find three marked assembly positions for SMD resistors (fig. 6). Assembling one or two for 0 Ω SMD bridges set the mains voltage to either 230 V or 115 V. Should you wish to change this setting, you have to change the primary fuse as well.

Primary fuse:
For **230 V** configuration: **80 mA T** fuse
For **115 V** configuration: **160 mA T** fuse

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 and Putting into Operation

The GMA101 controller must not be installed in hazardous areas. It shall preferably be vibration-free installed. The transmitter and the mains supply are connected to the GMA101 motherboard (back panel) according to the terminal diagram. Make sure that the shield of the transmitter cable is already grounded in the cable gland. Inside the wall mount casing or the cabinet the transmitter cable should be laid separately from other control and mains cable. In case the cable shield cannot be grounded in a cable gland (e.g. in a cabinet), the shield is to be grounded directly behind its entry into the cabinet. The mains supply for the GMA101 is generally to be fed over a mains filter (e.g. FN 610). This filter should also be mounted and grounded close to the cable entry. The GMA101 controller is grounded over the motherboard and the conductive rack bars. The rack, therefore, must be conductively connected to the casing. Once the GMA101

is mounted into a casing, all transmitters, control groups and the mains supply are connected, you can put the system into operation. For installation and putting into operation of the transmitters please see the operation manual of your specific 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 manufacturers operation manual. They are only allowed to be carried out by an expert. The result of the test must be confirmed by the expert in writing (see information sheet T 023 8/99, section 6.3, as well as DIN EN 50073, Section 6.4.1).

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

Transmitter Cable

The GMA101 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

Casing:	Different sizes of racks or wall mount casings are available for sliding in different quantities of control modules
Relay Module (#):	This module plugs on the motherboard (back panel) and groups the logical outputs of several control modules for a collective gas or fault alarm
Key-operated Switch Module (#):	This module, like the relay module, allows to control a collective alarm. In addition to this, it provides the possibility of alarm suppression, e.g. during service or maintenance. You just have to make sure that the alarm devices are connected to the relays of the key-operated switch module.
Battery Back-up (#):	The gas monitoring system GMA101 is optionally available with a battery back-up.

(#) These components have not been part of the function test according to EN 50054 and 50057.

Storage conditions for accessories are mentioned in the Technical Data.

Remarks concerning the Technical Safety of the GMA101

Contact Protection

Mains supply and relay contacts of the GMA101 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	- Faulty voltage supply, defective fuse or mains unit	- Ensure proper voltage supply
Transmitter signal, but gas-free atmosphere	- Incorrect calibration, incorrect zeropoint adjustment	- Adjust the zeropoint, calibrate
Display - - - LED "**S F**" flashes	- ADC overrange - Stored overrange - short circuit at the transmitter cable	- If there is a gas-free atmosphere at the transmitter, you can reset the stored measurement value Check transmitter cable /renew - check transmitter cable/renew
Display _ _ _ LED "**S F**" flashes	- Display deviation (< -99) - ADC range deviation - Cable cut - Zeropoint deviation by 25% signal output 4..20 mA = 3 mA 0,2 mA = 0,15 mA - Service-signal / transmitter - short circuit at the transmitter cable	- Check calibration of transmitter and GMA controller - Check transmitter cable - Check calibration of transmitter and GMA controller Check service key - Check transmitter cable

Spare Parts

	Description			**Part No.**
1.	Primary fuse	T 0.08 A	(set of 5)	2121301
2.	Primary fuse	T 0.16 A	(set of 5)	2121302
3.	Secondary fuse	T 0.5 A	(set of 5)	2121303

Service Address

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

GfG Instrumentation, Inc.
1194 Oak Valley Drive
Ann Arbor, Mi. 48108
Phone: (734) 769-0573
Fax: (734) 769-1888
E-Mail: info@gfg-inc.com

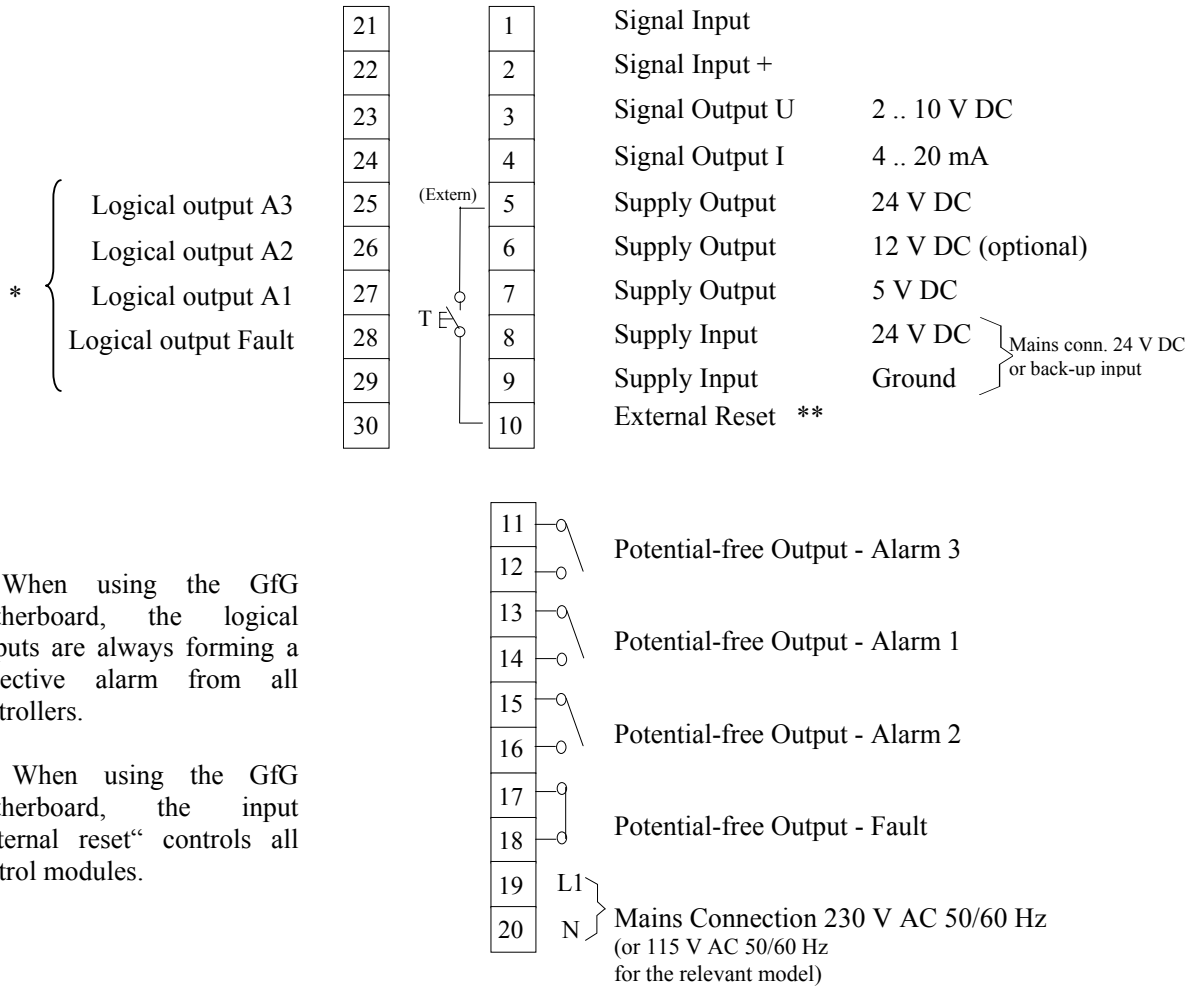
GMA101 - Gas List

Gas Nr.	Type of 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	Cyclopentane	C5H10	28
29	Cyclopropane	C3H6	29
30	Dichlorodifluoromethane (R12)	C Cl2 F2	30
31	1.1 Dichlorethane	C2H4Cl2	31
32	Dichlorofluoromethane (R21)	CH Cl2F	32
33	Dichloromethane	CH2Cl2	33
34	1.2 Dichloropropane	C3H6Cl2	34
35	Diethylamine	C4H11N	35
36	Dimethyletheer	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	Ethylene	C2H4	43
44	Ethylene oxide	C2H4O	44
45	FAM-Benzine	Mixture	45
46	Kerosene 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

Gas Nr.	Type of Gas	Chemical Formula	GMA Nr
55	Carbon dioxide	CO2	**CO2**
56	Carbon monoxide	CO	**CO**
57	Coke oven 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	Methyl butyl ketone	C6H12O	63
64	Methyl chloride	CH3Cl	64
65	Methylene chloride	CH2Cl2	65
66	Methyl-i-butyl ketone	C6H12O	66
67	Methyl ethyl ketone	C4H8O	67
68	Methyl glycol	C3H8O2	68
69	Methylmethacrylate	C5H8O2	69
70	Methylpropanol	C4H10O	70
71	Monochlorodifluoromonobrom.	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	Propylendichloride-1.2	C3H6Cl2	88
89	Oxygen	O2	**O2**
90	Sulphur dioxide	SO2	**SO2**
91	Sulphur hexafluoride	SF6	91
92	Hydrogen sulphide	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 gass	H2, CO, CH4	105
106	Xylene	C8H10	106
107	Ozone	O3	107

Chart 1 - GfG Gas List

Terminal Diagram Motherboard



* When using the GfG motherboard, the logical outputs are always forming a collective alarm from all controllers.

** When using the GfG motherboard, the input „external reset“ controls all control modules.

Connection of Transmitter Cable to Motherboard

3-Wire Transmitter
Connection 12 V - MWG

1	Ground	
2	Signal	
6	Supply	12 V DC

3-Wire Transmitter
Connection 24 V - MWG

1	Ground	
2	Signal	
5	Supply	24 V DC

Technical Data

Control Module GMA101	for 19" racks
Type:	GMA101, software version 2.03
Dimensions:	Height: 129 mm, Width: 35.2 mm, Depth 160 mm (175 mm with socket bar)
Current Supply	
Operational voltage:	1. 24 V DC (Uin) [21 to 28 V] 2. 230 V / 50Hz or 115 V / 60 Hz
Power consumption:	max. 11 W at 24 V DC max. 13 W at 230 V and 115 V
Primary fuse:	T 0.08 A (for 230 V), T 0.16 A (for 115 V) G-fuse
Secondary fuse:	T 0.50 A G-fuse
Climate Conditions	
for operation:	0 ... +55 °C, 0 ... 99 % r. h., 700 ... 1300 hPa
recommended storage conditions for GMA101, accessories, spares:	-25 ... +55 °C, 0 ... 99 % r. h.
Transmitter Connection	
Transmitter connection:	2-, 3- or 4-wire transmitters
Current supply output:	20 V DC, max. 250 mA
Input signals:	4 .. 20 mA, 0.2 .. 1 mA
Outputs	
Analog outputs for meas. value:	4 .. 20 mA, max. load 200 Ω (T_{90} = 18 sec.) 2 .. 10 V
Display and alarm activation	T_{90} < 3 sec.
Sensor signal display:	0.2 .. 1 mA Max. deviation: < 0.2 mA ± 0.04 mA 0.2 .. 0.5 mA ± 0.02 mA > 0.5 mA + 0.05 mA 4 .. 20 mA Max. deviation: < 4 mA ±0.8 mA 4 .. 10 mA ± 0.4 mA > 10 mA + 1 mA
Relays (if ordered):	max. switch voltage 250 V AC 50/60 Hz or 250 V DC max. switch current 4 A AC/DC max. switch power 1000 VA AC or voltage dependant 50 .. 200 W DC Relay outputs and mains connection are operation insulated
Logical outputs:	4 open collector outputs for Alarm 1, Alarm 2, Alarm 3, Fault Operation allowed on low safety voltage only max. switch voltage 30 V max. switch current 100 mA
External reset:	high active 3 ... 24 V DC (input resistance 11 kΩ)
Connector:	DIN 41612 form F
Safety	
Protection:	DIN 40050 - IP30 (controller in 19" rack) DIN 40050 - IP00 (individual controller)
Protective separation:	by means of safety transformer type: KLF-EN 14VA PRI 2x115V / SEC 2x18V 50-60Hz
Protective insulation:	acc. to EN 61010 up to overvoltage category III and soiling degree 2
Tests	
EMV Test	according EN 50270: 1999 type 2 EN 50054: 1998
Function test	Deutsch Montan Technologie GmbH (DMT) PFG-No. 41300700 (tested detection range: see page 3)

Applicational Hints from test report PFG-No. 41300700

The controller GMA 101, produced by Gesellschaft für Gerätebau mbH, Dortmund, is, if operated with transmitter MWG 0238 Ex or transmitter with 0,2 .. 1 mA or 4 .. 20 mA signal output, based on the measurement results and remarks of test report PFG-No. 41300700P, suitable for detecting methane, propane, ethanole and n-nonane in a gas-air mixture in the detection range 0 .. 110 % LEL, if its characteristics and its version complies with the documentation specified in the test report PFG-No. 41300700P, if it is operated properly and if the following points are adhered to:

- The controller is only allowed to be operated with transmitters with signal output 0,2 .. 1 mA, resp. 4 .. 20 mA, which have been function tested by an acknowledged testing authority. The applicational hints of the respective aptitude test report, respectively the conditions of the safety report are to comply with.

- The operation manual given to and tested by DMT is to be adhered to in all details. When operating the gas detector, make sure that the specific operational conditions are met.

- Before using the gas detector please check, if the response times are short enough to trigger the alarm so quickly, that hazardous situations will be avoided. If necessary, the alarm thresholds are to be set to a considerably lower concentration than standard.

- The information sheet T 023 of the confederation of the chemical industry (4) is to comply with.

- For correct use as a warning instrument for explosive atmosphere the current nationwide accepted value for the LEL is to be used (5), (6).

- For triggering of safety controls only latching alarms may be used, which cannot be reset during alarm conditions. The alarm A3 may only be used for additional external alarm devices, like horns.

- Is the device exposed to vibrations one has to reckon with short-term fault reports on the relay outputs.

- A failure of the power supply has to be treated like an alarm.

- Fault warnings and alarms have to be displayed (e.g. as collective alarm) audibly and visibly on a 24-hour occupied place.

- The controllers are to carry a durable type label, which gives information about the manufacturer, type and the serial number and is marked with:

  "PFG-Nr. 41300700"

  Other regulations for marks, particularly as per ElexV are untouched. With this label the manufacturer confirms, that the controllers comply with the characteristics and the technical specifications described in this report. Any controller not carrying this type label does not comply with the present report.

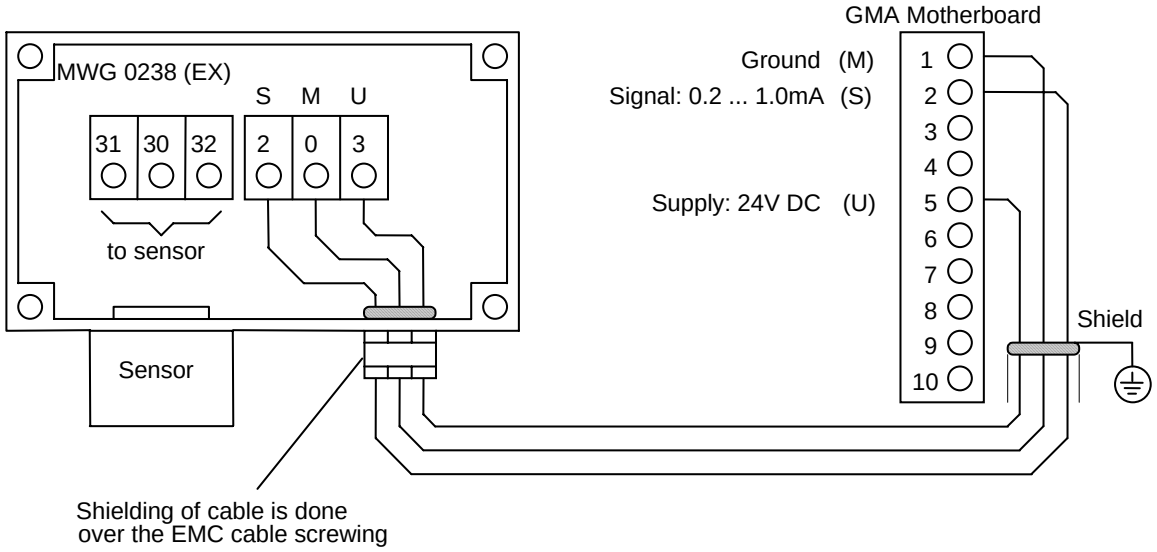
- On request, a complete printout of this report and of the test report PFG-No. 41300700P is at the user's disposal.

Annex

Terminal Diagram of Transmitters

Transmitter CC 0238 EX (model MWG 0238 EX)

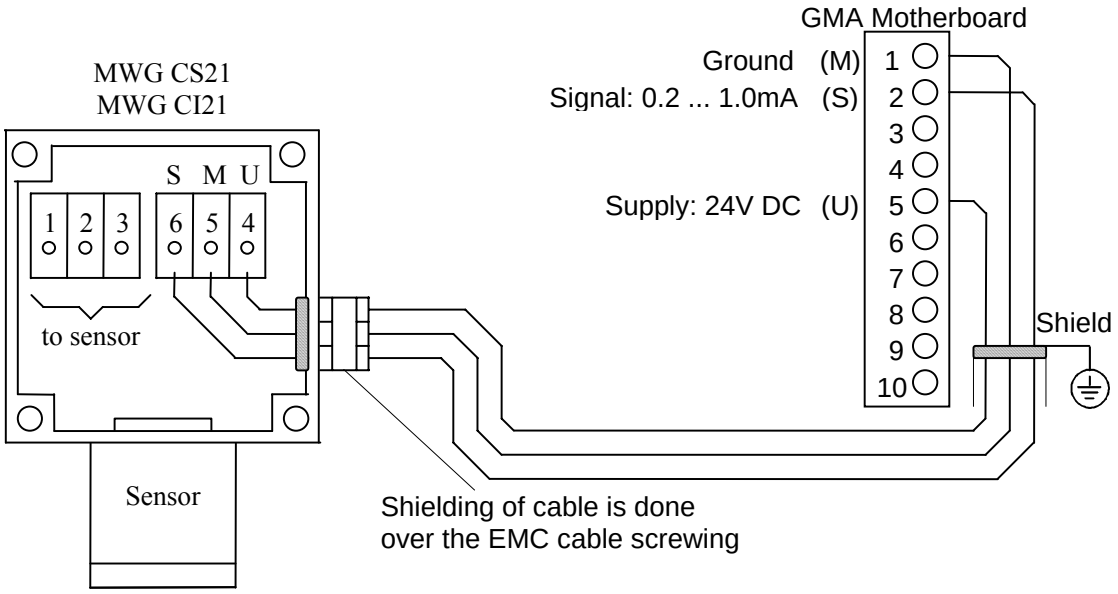
The CC sensors are designed as 3-wire transmitters. The supply voltage and the 0.2 - 1 mA output signal use the same ground line. Cable type e.g. LiYCY 3 x 0.75 mm^2 (up to 200 m).
LiYCY 3 x 1,5 mm^2 (up to 1 km)



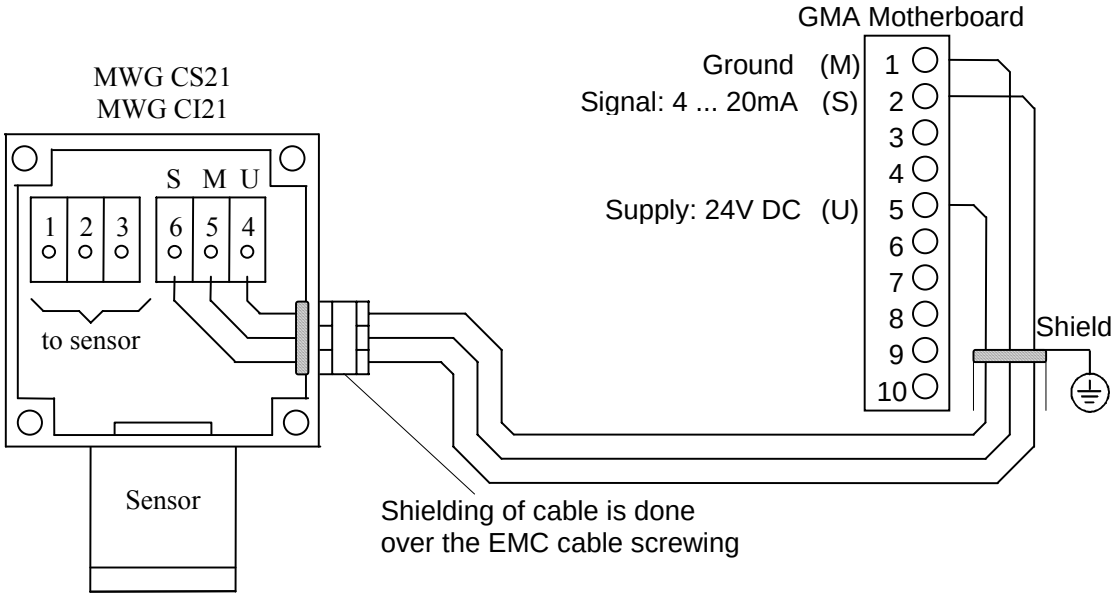
Transmitter CS21 and CI21

These units are designed as 3-wire transmitters.

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 mm^2 (up to 200 m).
LiYCY 3 x 1,5 mm^2 (up to 1 km)

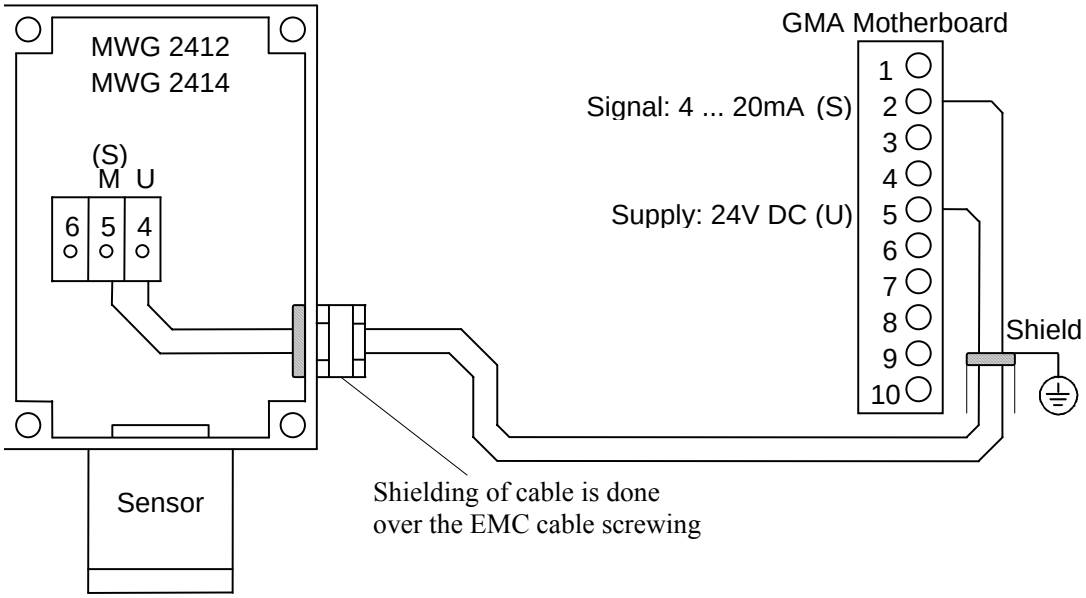


The supply voltage and the 4 - 20 mA output signal use the same ground line.
Cable type e.g. LiYCY 3 x 0.75 mm^2 (up to 200 m).
LiYCY 3 x 1,5 mm^2 (up to 1 km)

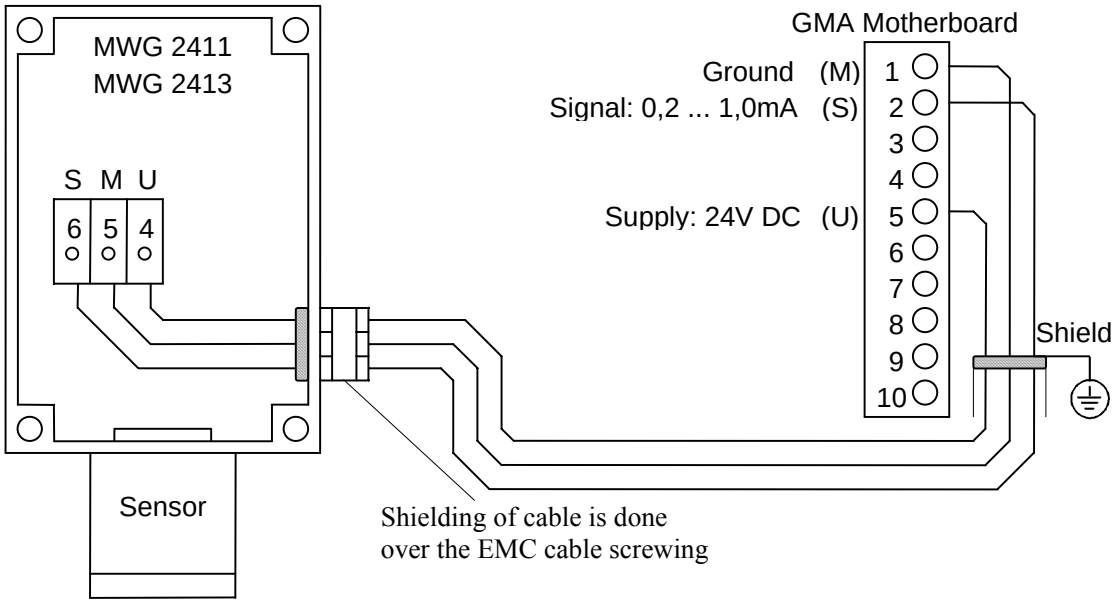


Transmitter EC24 (models MWG 2412, 2414, 2411 and 2413)

The EC sensors MWG 2412 and MWG 2414 are designed as 2-wire transmitters.
The 4 - 20 mA output signal is provided via the supply line.
Cable type, e.g.LiCYC 3 x 0,75 mm^2 (up to 1 km)

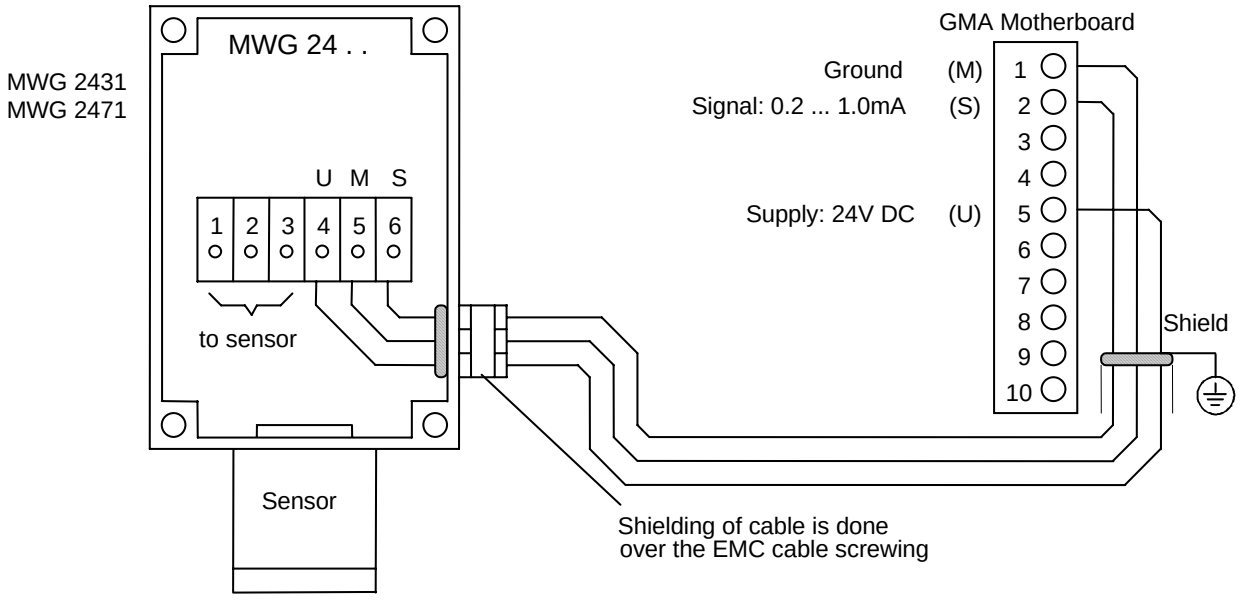


The EC sensors MWG 2411 and MWG 2413 are designed as 3-wire transmitters.
The supply voltage and the 0.2 - 1 mA output signal use the same ground line.
Cable type, e.g. LiYCY 3 x 0,75 mm^2 (up to 200 m)

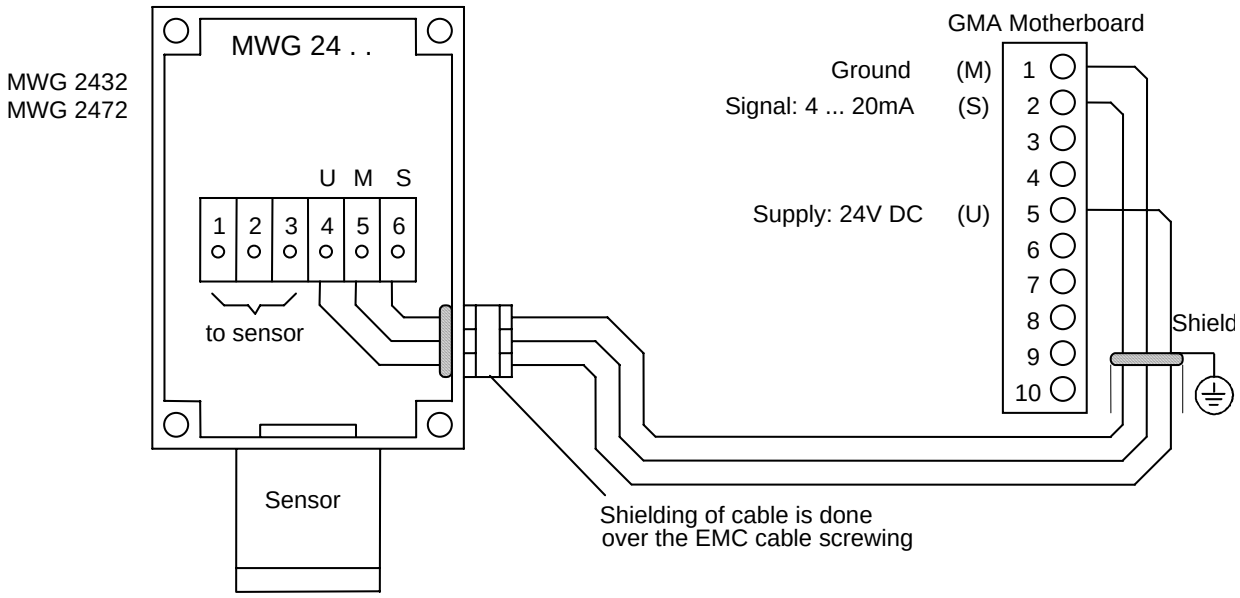


Transmitter CC 24 (models MWG 2431 II and 2432 II)
Transmitter CS 24 (models MWG 2471 II and 2472 II)

The transmitters CC 24 (model MWG 2431 II) and CS 24 (model MWG 2471 II) are designed as 3-wire transmitters. 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 mm^2 (up to 200 m)
LiYCY 3 x 1,5 mm^2 (up to 1 km)

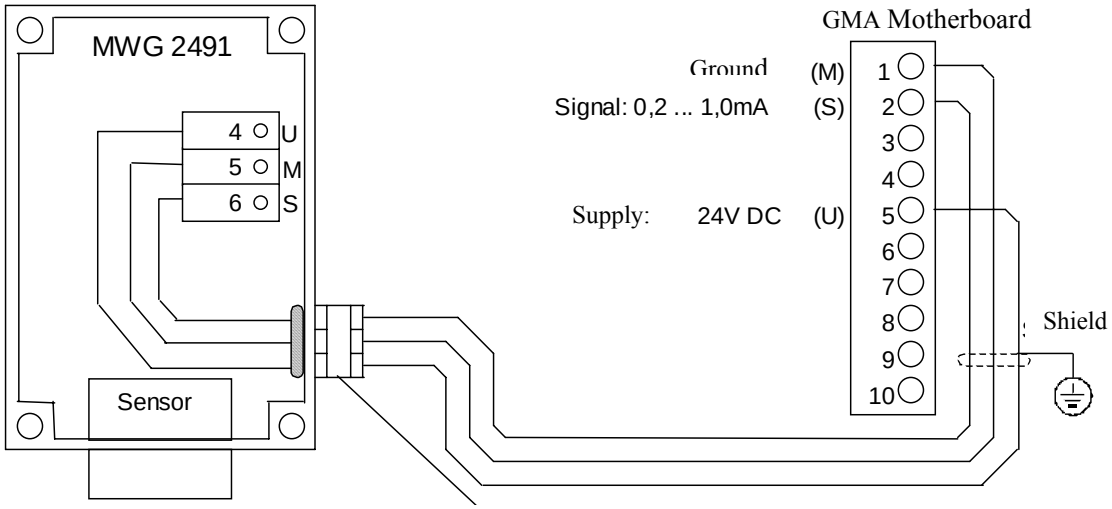


The transmitters CC 24 (model MWG 2432 II) and CS 24 (model MWG 2472 II) are designed as 3-wire transmitters. The supply voltage and the 4 - 20 mA output signal use the same ground line.
Cable type: e.g. LiYCY 3 x 0,75 mm^2 (up to 200 m)
LiYCY 3 x 1,5 mm^2 (up to 1 km)



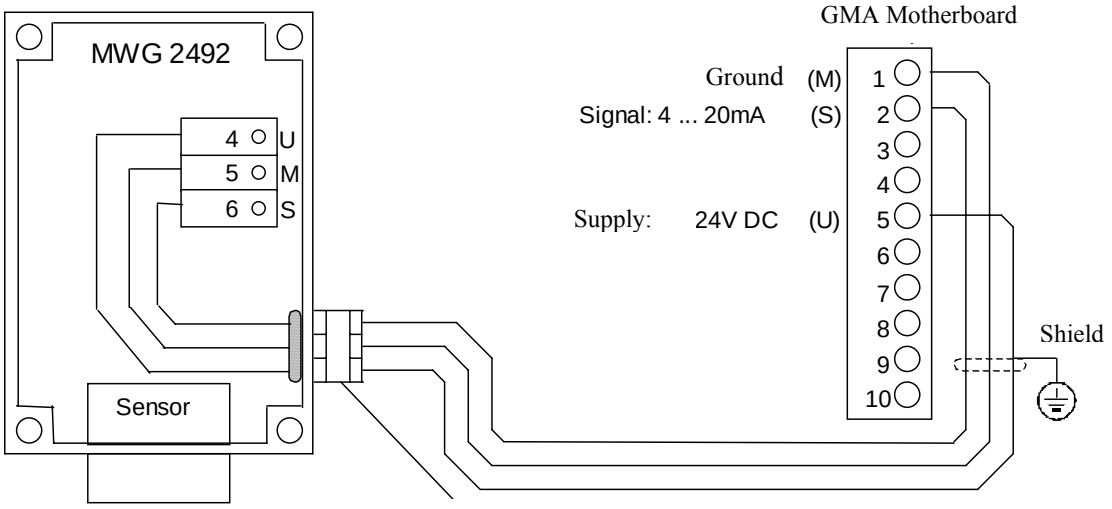
Transmitter IR 24 (models MWG 2491 and MWG 2492)

The IR sensor MWG 2491 is designed as 3-wire transmitter. The supply voltage and the 0.2 - 1mA output signal use the same ground line.
Cable type: e.g. LiYCY 3 x 0,75 mm^2 (up to 150 m)
LiYCY 3 x 1,5 mm^2 (up to 750 m)



Shielding of cable is done over
the EMC cable screwing

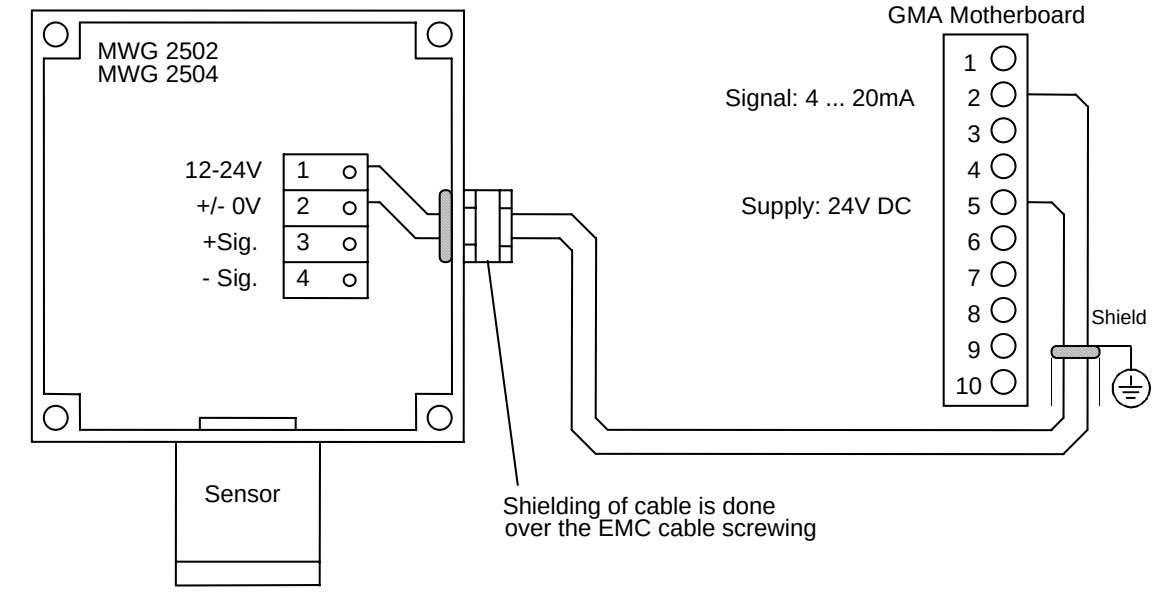
The IR sensor MWG 2492 is designed as 3-wire transmitter. The supply voltage and the 4 - 20mA output signal use the same ground line.
Cable type: e.g. LiYCY 3 x 0,75 mm^2 (up to 150 m)
LiYCY 3 x 1,5 mm^2 (up to 750 m)



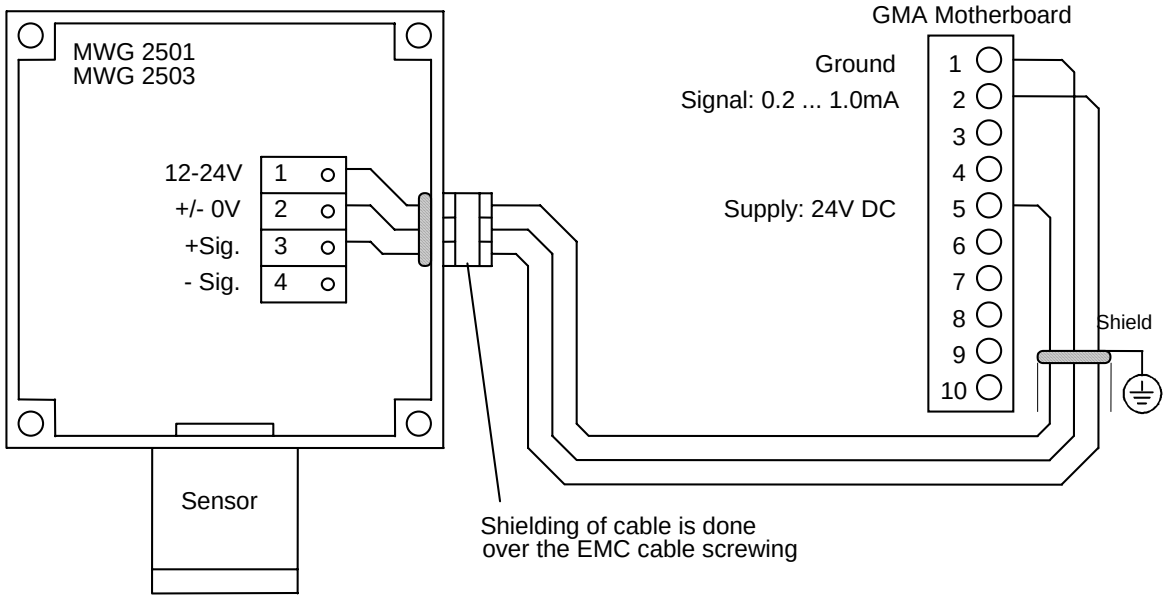
Shielding of cable is done over
the EMC cable screwing

Transmitter EC 25 (models MWG 2502, 2504, 2501 and 2503) without Ex-barrier

The EC sensors MWG 2502 and MWG 2504 are designed as 2-wire transmitters. The 4 - 20 mA output signal is provided via the supply lines.
Cable type: e.g. LiYCY 3x 0,75 mm^2 (up to 1 km)

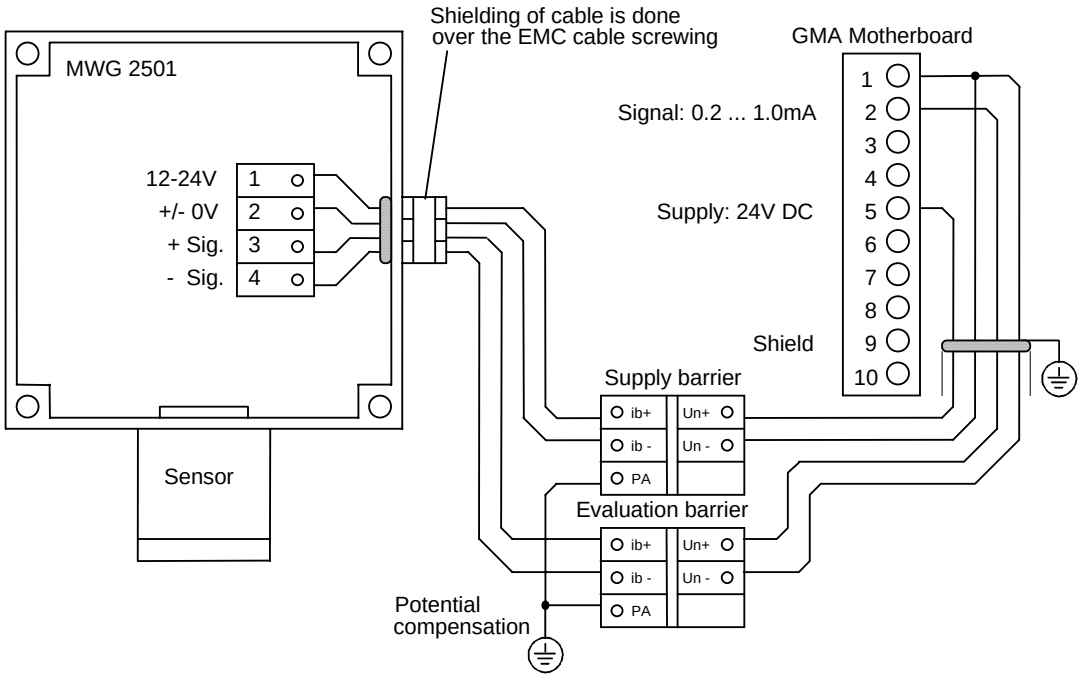


The EC sensors MWG 2501 and MWG 2503 are designed as 3-wire transmitters. The supply voltage and the 0.2 - 1 mA output signal use the same ground line.
Cable type: e.g. LiYCY 3x 0,75 mm^2 (up to 1 km)



Transmitter EC 25 EX (model MWG 2501) with Ex-barrier

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 GMA101 both in the supply lines and in the signal lines.



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