smart GasDetection Technologies

Operation Manual

GMA400-MT16

Gas detection controller for DIN rail mounting

Translation of the original
operation manual
236-000.20_BA_GMA400

Version 1 as of August 1, 2025

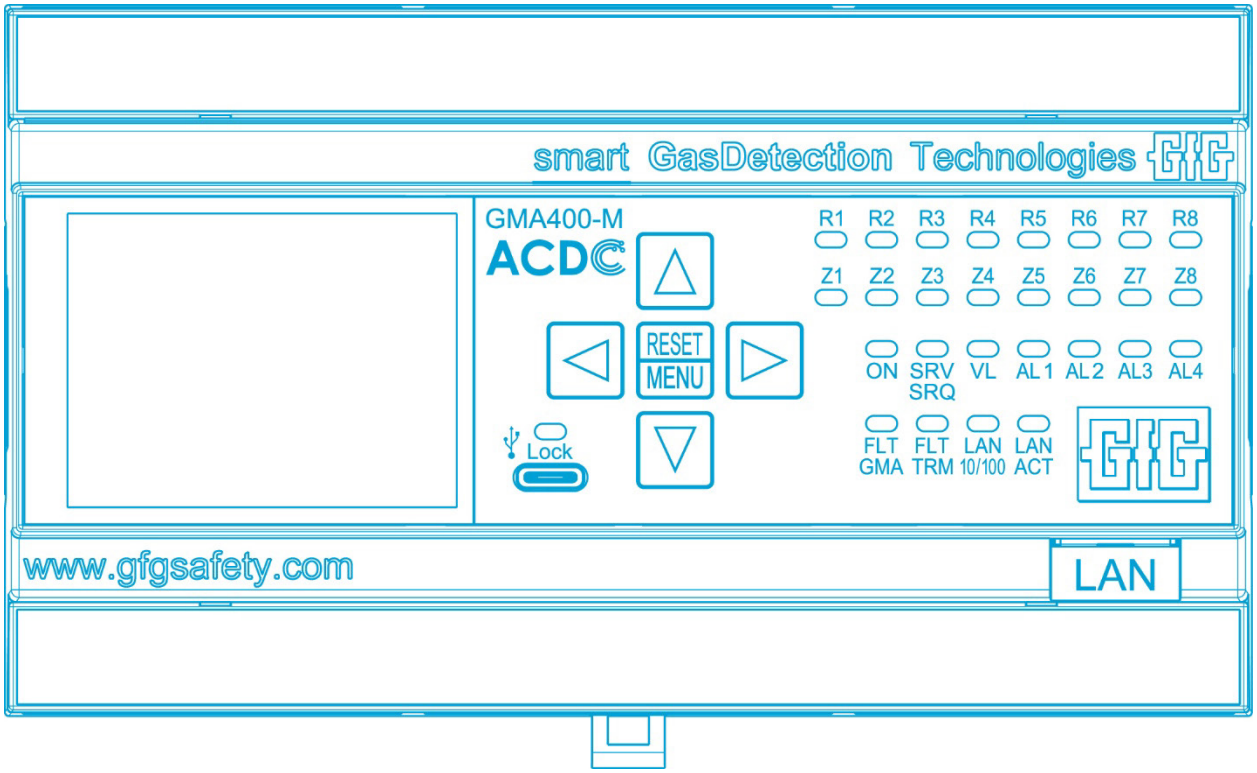


Table of Contents

1 Introduction

The GMA400-MT16 is a gas detection controller with up to 16 analog or ACDC inputs.

The GMA400 is designed for mounting on DIN rails in control cabinets inside buildings. Installation in potentially explosive areas is not permitted (*for more information, see 4.2 Installation location*).

These operating instructions enable the various target groups to use the GMA400-MT16 gas detection controller in accordance with its intended purpose – from installation and operation to maintenance and disposal.

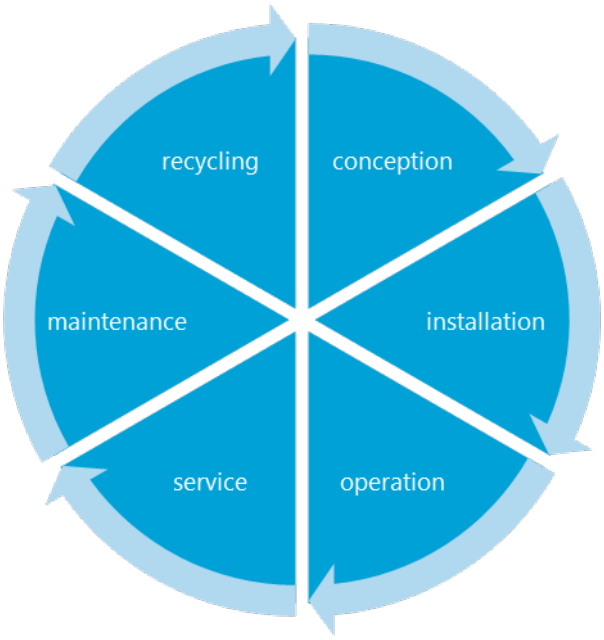


Figure 1: Product life cycle of a GMA400-MT16 from GfG

We are happy to support you with service and consulting at all stages of the GMA400-MT16 product lifecycle. For more information, please contact your GfG service and sales representatives.

1.1 Functional scope of your GMA400

Please note that not all of the functions described below are available in cost-optimized versions of the GMA400 with reduced functionality.

This operating manual also mentions other products such as the configuration software or relay modules, which are not included in the scope of delivery of the GMA400 controller and are available separately.

In addition, certain functions are not included in the general product scope but can be customized as options – see table above. Please contact your GfG sales or service representative for more information.

Optional functions of the GMA400
Extension Number of measuring points up to 128
Modbus/TCP*
Web interface
Humidity-dependent ventilation

* May be required

1.2 Disclaimer

These operating instructions are valid only for the language setting "English." They take into account the legal requirements arising, for example, from the Product Safety Act, case law, or applicable standards.

The operating instructions enable the target groups of the product to use it as intended – from configuration and installation to operation, maintenance, and disposal. The provisions of these operating instructions must be read carefully and observed at all times. Only qualified personnel may make adjustments to the product and use these operating instructions for this purpose. If the provisions of these operating instructions are not observed or the product is used for purposes other than those for which it is intended, GfG shall not be liable for any damage caused as a result.

1.3 Area of application and intended use

The GMA400 is a gas detection controller designed for mounting on DIN rails. In conjunction with connected transmitters, the GMA400 forms a fixed gas warning system for continuous monitoring of gas concentrations and for alarming in the event of combustible gases and vapors in the area below the lower explosion limit. It also warns of toxic gases in the ambient air and measures the oxygen concentration there.

In addition to the transmitters mentioned, external relay modules GMA200-RT are also available. However, the GMA is only one of many components in the constantly growing GfG portfolio (*see also 9.3 Compatible system components*) 9.3.

1.4 Document list

Additional documents may be required for system setup, see:

Document
Operation manual: GMA400-M Modbus Appendix
Operation manual: Relay module GMA200-RT/RTD

1.5 Abbreviations

The following terms are used in the rest of this document:

Gas-related abbreviation	Explanation
EX	Explosion hazard due to flammable gases, see also DIN EN 60079-29-1
OX	Risk of suffocation due to lack of oxygen, see also DIN EN 50104
TOX	Risk of poisoning due to toxic gases, see also DIN EN 45544
LEL	Lower explosive limit
UEL	Upper explosive limit

Technical abbreviation	Explanation
ACDC®	ACDC (Analog Carrier for Digital Communication) is a technology patented by GfG that enables existing analog cabling in gas detection systems to be used for digital data transmission.
GMA	GMA is the product name of the gas detection controller developed by GfG. In German, GMA stands for *GasMessAuswertung* (gas measurement evaluation). The device evaluates the data from connected transmitters and initiates appropriate actions based on the gas readings.
INH	Inhibit
PE	Protective earth / Protective ground
PELV	Protective extra low voltage (protective earth voltage)
SELV	Safety extra low voltage (protective extra-low voltage, ungrounded)
t90	Response time when the measurement signal changes to 90%
TRM	Transmitter

2 General description

2.1 Device structure

Transmitters with ACDC® interfaces, analog 4-20 mA interfaces, and transmitters with digital RS-485 interfaces can be connected to the GMA400. Two microprocessors redundantly evaluate the analog and/or digital input signals from the connected transmitters. Another microprocessor displays the gas measured values on the display and communicates with other devices for process data management in a non-safety-relevant manner. LEDs indicate the status of the gas detection controller, the measuring points, and the relays.

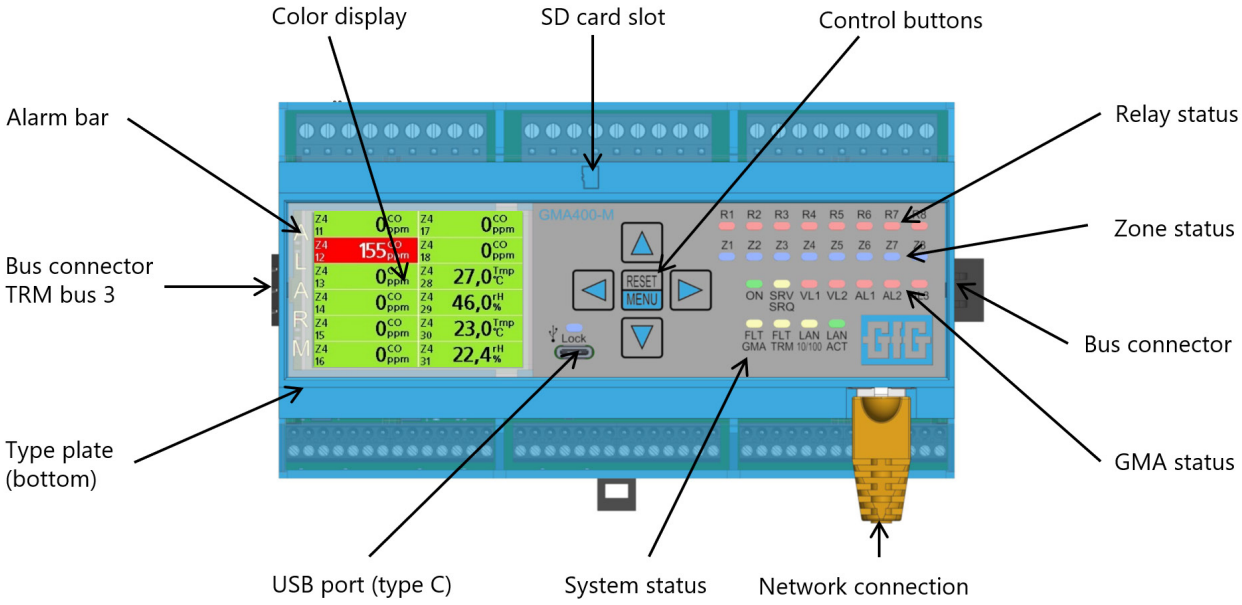
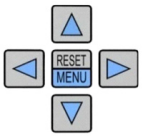


Figure 2: Front view of the GMA400-MT16

The device essentially has two separate systems: The first has two redundant processors for gas detection, including functionally safe evaluation and transmission. The second system ensures IT security with a powerful communication processor. This separation has the advantage that different security concepts cannot interfere with each other. This means that a hacker attack from the Ethernet interface cannot directly influence the gas detection technology.

2.1.1 Operating buttons



In detection mode, the arrow buttons are used to navigate between different screens with different measuring point displays. The RESET button also allows alarms to be acknowledged. The buttons are also required for menu control, for calling up information and in service mode for changing certain settings (*see also 5.1 Keyboard* and display).

2.1.2 LED status indicators

LED status indicators on the gas detection controller display the following statuses during operation, depending on the event:

Designation	Color	Function	Status		
			LED off	LED flashing	LED permanently on
ON	Green	Operating status (power supply)	Device de-energized	-	Device ready for operation
SRV SRQ	Yellow	GMA and/or TRM maintenance operation and/or maintenance request[1]	No maintenance operation and no maintenance request active	GMA and/or TRM maintenance request active	GMA and/or TRM maintenance operation active
FLT GMA	Yellow	GMA fault	No GMA fault active	-	GMA fault active
FLT TRM	Yellow	TRM fault	No TRM fault active	-	TRM fault active
VL	Red	Collective ventilation (zones 1–8)	No ventilation active	-	Ventilation active
AL1 – AL4	Red	Alarm 1 – 4[2]	No alarm active	Not acknowledged Alarm active	Acknowledged alarm active
Alarm Bar	Red	Collective alarm (alarms 1–4)[2]	No alarm active	Not acknowledged Alarm active	Acknowledged alarm active
R1 – R8	Red	Relay 1 – 8[3]	Relay logically off (relay function off)	Switch-on delay active (only during alarm)	Relay logically on (relay function on)
Z1 – Z8	Blue	Ventilation and/or alarm in zones 1 – 8	No ventilation and no alarm active	Ventilation active	Alarm active (ventilation also if applicable)
LAN 10 / 100	Green	Data rate of the LAN interface (only valid if LAN ACK is flashing)	10 Mbit/s	-	100 Mbit/s
LAN ACK	Green	Connection status of the LAN interface	No connection available	Connection Existing	-
Lock	Blue	Status of the USB connection (connection must not be disconnected during access)	No access to USB	-	Access to USB

[1] Maintenance operation has higher priority than the maintenance request. This means that if the LED is permanently lit in maintenance mode, a maintenance request may also be active at the same time.

[2] If an alarm has been triggered, the corresponding red alarm LED flashes until the alarm condition is no longer met in the case of a non-self-holding alarm. In this case, the alarm is automatically reset.
However, if the alarm condition for a specific alarm is still met and the alarm is acknowledged using the RESET button, the LED will stop flashing and remain lit. If another measuring point also triggers an alarm, the corresponding alarm LED will start flashing again.

[3] The LED corresponds to the logical condition that must be fulfilled in order to activate the parameterized function of the relay. Depending on the parameterization (working or quiescent current), the actual switching state of the relay (coil energized or de-energized) is inverted with respect to the logical relay function and LED display.
If an alarm with a switch-on delay is assigned to the relay as a function, the LED flashes during the switch-on delay. At the same time, the relay remains logically switched off. The LED and relay are only switched on when the alarm is active.

2.1.3 Internal alarm bar

For local restricted visual alarms, the GMA400 has an LED alarm bar to the left of the display (*see 2.1 Device structure*). This flashes red as soon as an alarm has been activated and remains static after it has been acknowledged (*see table above at 2.1.2 LED status indicators*).

2.1.4 LCD graphic display

During detection mode, the graphic display shows the measured values and status information of the measuring points with corresponding color coding. The control buttons can be used to switch between different collective and individual measured value screens with varying levels of detail (*5.3.1 Measured value screens*).

The display is also used to show status messages from the GMA that require acknowledgment, e.g., in the event of malfunctions and maintenance requests (*see 7 Fault or 8.2 Service (SRV)*).

In addition, the menu system can be opened on the display using the control buttons and the menu navigation can be controlled to display device and status information as well as configuration settings (*6 Menu system*). Test functions and limited configuration changes can also be carried out in the service menu (*6.8 Service Menu*).

2.1.5 Internal horn

The GMA400 has a built-in horn for acoustic alarms on site. This horn can be assigned to specific alarm functions and measuring points as an "internal relay" using the GMA-Config software (*sold separately, not included in the GMA400 function package*).

2.1.6 USB interface

The USB interface serves as an interface for configuration purposes. When connected to a USB cable, the GMA400 can be configured for a wide range of detection tasks from a PC or laptop using the GMA-Config software program from GfG (*see 3 Configuration*).

2.1.7 Ethernet interface

The Ethernet interface serves as an interface for accessing the web interface of the GMA400 for visualizing measured value data and status information on end devices in the Ethernet network (*see 2.9 Web interface*). The data can also be read out there via Modbus TCP for further process data processing or for visualization with the GMA-Visual software from GfG (*see 2.10 Modbus/TCP*).

2.1.8 Connection terminals

The GMA400 has 69 connection terminals for the following inputs and outputs (*see also the terminal assignment at 4.3.3 Terminal assignment diagrams*)*:*

Terminal assignment:

- 2x power supply (24 V)
- 16x analog inputs (4-20m A)
- 8x digital inputs
- Switching contacts of the 8x internal relays
- 6x RS-485 bus connections (Modbus RTU)
- 2x voltage outputs (24 V for digital inputs)

2.1.9 Side bus connector

In addition to the connection terminals, the GMA400 has a bus connector on both sides, to which one of the RS-485 bus connections from the terminals is routed in parallel (TRM bus3).
The bus connector is used for convenient connection of compatible expansion devices such as the GMA200-RT relay module by simply stacking them on the DIN rail (*see 4.3Electrical installation*).

Note: Only two of the three connections may be used for the TRM bus3 (no star wiring!).

2.2 Analog or ACDC inputs

The GMA400 has 16 analog inputs, each of which can be connected to a transmitter with an analog output signal (4–20 mA) can be connected. Each input can be operated either purely analog or additionally with modulated digital data transmission. The latter is the GfG-patented ACDC interface, which can only be used with the GMA400 in conjunction with compatible GfG transmitters. The parameterization determines whether a transmitter with an analog 4–20 mA or ACDC interface is to be connected to the analog input. In terms of hardware, the analog inputs are identical.

The analog input signals are continuously monitored for short circuits in the connection cables in conjunction with a cyclic load switching function. Detected short circuits are reported as transmitter faults.

The following data rates can be set for digital ACDC transmission:

Interface	Data rate (in bits/s)	Default (in bits/s)
ACDC	9,600 / 19,200 / 38,400	19,200

Note: ACDC is an electrical point-to-point connection that does not require termination for digital data transmission.

2.3 Digital RS-485 bus connections

A total of six RS-485 interfaces enable the connection options shown below.
Data is transferred using the Modbus RTU communication protocol.

<table>
<tr><th>Bus</th><th>Mode</th><th>Connection options</th></tr>
<tr><td>COM bus</td><td>Server</td><td rowspan="2">Connection to a bus client and transmission of measured value data, status information, and configuration settings on request for further process data processing (e.g., for visualization).</td></tr>
<tr><td rowspan="2">GMA bus</td><td>Server</td></tr>
<tr><td>Client</td><td rowspan="5">Connection of up to:
128 digital transmitters (e.g., EC22, CC22, CS22, IR22, EC28, IR29, CC33)
8 relay modules (GMA200-RT),
16 display modules (GMA22-RS/RW),
64 alarm panels (ALP30/40)
and control of data transmission for querying measured value data and status information or for transmitting output and display states.</td></tr>
<tr><td>TRM bus1</td><td>Client</td></tr>
<tr><td>TRM bus2</td><td>Client</td></tr>
<tr><td>TRM bus3</td><td>Client</td></tr>
<tr><td>TRM bus4</td><td>Client</td></tr>
</table>

A maximum of 63 of the physical GfG bus participants with digital RS-485 interface specified in the table may be connected to each of the TRM bus connections TRM bus1 – 4 and to the GMA bus in client mode.

The GMA bus and the COM bus can be used in server mode to transfer process data to other client devices on request. These may be, for example, a higher-level control device, a PLC, a gateway, or a PC for visualizing the measurement data. Even in server mode, no more than 63 physical bus participants may be connected to the bus connection, even if they are not being communicated with.

2.3.1 Ring bus operation

The TRM bus connections TRM bus1+2 and TRM bus3+4 can each be connected together to form a ring bus. The individual bus pairs act on a common bus segment and both TRM bus connections alternately attempt to reach the bus participants. In the event of a bus interruption in the ring, the participants can thus be reached from different sides and trouble-free operation can be maintained. This significantly increases system availability. An interruption of the ring bus is reported as a GMA maintenance request.

Note: With the ring bus, both TRM bus connections must be parameterized identically.

2.3.2 Data rate

The data rates of the buses can be set according to the following table:

Bus	Data rate (in bits/s)	Default (in bit/s)
COM bus	9,600 / 19,200 / 38,400 / 57,600 / 115,200 / 230,400	115,200
GMA bus	9,600 / 19,200 / 38,400 / 57,600 / 115,200 / 230,400	115,200
TRM bus1	9,600 / 19,200 / 38,400 / 57,600 / 115,200 / 230,400	19,200
TRM bus2	9,600 / 19,200 / 38,400 / 57,600 / 115,200 / 230,400	19,200
TRM bus3	9,600 / 19,200 / 38,400 / 57,600 / 115,200 / 230,400	19,200
TRM bus4	9,600 / 19,200 / 38,400 / 57,600 / 115,200 / 230,400	19,200

Note: The devices connected to the buses must also support the selected data rate. In addition, the data rate is reduced depending on the cable length (*see 2.3.7Cable lengths*).

2.3.3 Termination

For each RS-485 bus connection, a 120 Ohm terminating resistor can be switched on electronically for bus termination. The status of the bus termination can be viewed in the menu and changed by authorized users (*see 6.8.2 Bus Settings*Bus).

Note: The bus must always be terminated at the beginning and end. Star-shaped cable routing is not permitted. For ring buses, the termination for both bus connections must be activated in the GMA400. No termination may take place within the bus cable.

2.3.4 Fast timing

If the data rate exceeds 19,200 bits/s, two different pause times between telegrams are possible according to the Modbus specification:

- Either the pauses continue to be based on 19,200 bits/s,
- or to the current data rates.

Fast timing only affects data rates >19,200 bits/s. If fast timing is activated, all bus participants must support it. Activating this option can significantly increase the data throughput, especially at high data rates.

However, if the timing options of the other bus participants are not known, this option should be deactivated.

2.3.5 Cycle times

The cycle time of the buses partly determines the response time of the entire system. Normally, the GMA400 polls all bus participants every second. However, if there are a large number of participants on a bus and the data rate is low, one second is no longer sufficient to address all of them. The GMA400 would detect this as an error and therefore switch to fault mode. However, some gas detection processes are very slow, in which case longer polling times have no effect.

The following table shows the correlation between data rate, polling interval, and number of participants:

Time	Data rate in bits/s					
	9,600	19,200	38,400	57,600	115,200	230,400
1s	16	32	64	128	≥ 128	≥ 128
2s	32	64	128	≥ 128	≥ 128	≥ 128
3s	48	96	≥ 128	≥ 128	≥ 128	≥ 128
4s	64	128	≥ 128	≥ 128	≥ 128	≥ 128
5s	80	≥ 128	≥ 128	≥ 128	≥ 128	≥ 128
6s	96	≥ 128	≥ 128	≥ 128	≥ 128	≥ 128
7s	112	≥ 128	≥ 128	≥ 128	≥ 128	≥ 128
8s	128	≥ 128	≥ 128	≥ 128	≥ 128	≥ 128

Note:

- All bus participants must be taken into account: transmitters, relay modules, etc.
- Multi transmitters (with multiple gases) must be considered multiple times accordingly
- The maximum number of 64 physical participants per bus must not be exceeded (dark shading), even if more should be possible at the logical level
- The maximum cable length must not be exceeded
- Depending on the cable length and cross-section, the minimum voltage for each individual bus participant must not be undershot

The GMA400 is also considered a bus participant or, in the case of a ring bus, even two.

2.3.6 Diagnosis

Analyzing a highly dynamic system such as a bus is always challenging. The GMA400 therefore enables the actual status of each bus to be analyzed using error counters:

- **Participant target/actual:** The GMA400 takes into account the number of participants connected to each bus and how many are actually accessible. Both values must match.
- **Timeout:** Each bus participant is addressed per cycle. If there is no response, the timeout counter is increased by one for each missing telegram.
- **CRC error:** Each telegram is provided with a checksum (CRC) for error detection. If the checksum does not match the data content, the telegram is ignored. In this case, the CRC error counter is incremented by one for each telegram.
- **Echo error:** The GMA400 sends telegrams on the bus connection and receives them back at the same time (echo). If the echo signal is missing or disturbed, this indicates a short-circuited bus or a defective bus driver and the error counter is incremented.

The counters can be viewed via the menu and the web interface of the GMA400.

2.3.7 Cable lengths

The maximum cable length of the bus must not exceed 1,312 feet / 1,200 meters. The actual maximum cable length and the maximum transmission rate also depend heavily on the network structure. Star topologies in particular should be avoided due to the long branch cables. Instead, a chain structure with short branch cables should be used. The maximum baud rates listed in the following table as a function of the cable length serve as rough guidelines:

Cable length	Maximum baud rate
up to 546 yd / 500 m	230,400 Bd
up to 1,093 yd / 1,000 m	115,200 Bd
up to 1,312 yd / 1,200 m	57,600 Bd

2.3.8 Cable cross-sections

The cable cross-sections must be selected depending on the power requirements of the individual bus participants, as a sufficiently high voltage must be available at the bus participants.

2.4 Digital inputs

The GMA400 has eight digital inputs that can be assigned to various functions.

Optionally, evaluation in the GMA can also be redundant, with two inputs for one function. Because the two inputs are also evaluated internally in the GMA400 independently of each other by two microcontrollers, safety is significantly increased. However, this function only makes sense if the external signaling is also designed with two channels.

The GMA400 also generates two time-delayed pulse outputs that can be used to check the connection cable at the input for cross-connections and short circuits. This check can be activated via parameterization. If this parameter is deactivated, the GMA400 also accepts short test pulses from externally connected devices that perform their own line checks.

The following parameter settings are possible:

- High or low active
- With or without redundancy (two-channel)
- With or without short-circuit monitoring (monitoring only permitted in conjunction with low-active)
- Input functions:
    - Alarm acknowledgment
    - Maintenance
    - Fire alarm
    - Forced ventilation
    - Start relay time control
    - Relay control
    - Monitoring of measured gas flow

The various input functions are described below.

2.4.1 Alarm acknowledgment

In addition to the RESET button on the front of the GMA400, which is used to acknowledge alarms from all measuring points, additional external buttons can be connected. These can be used, among other things, to acknowledge alarms from individual measuring points or entire groups of measuring points that are located at a distance.

Only self-holding alarms that are no longer active can be reset. This is not possible for alarms that are still pending. However, the horn signals for pending alarms can be acknowledged.

2.4.2 Maintenance

To facilitate servicing, the transmitters of individual or multiple zones can be set to a special maintenance status, e.g., using a key switch. The alarms of the respective transmitters are then deactivated for the duration of the maintenance. The GMA signals this special status via the maintenance relay, which must then be evaluated.

Alternatively, the maintenance state can be started by a pulse (edge-triggered). After a parameterized timeout of up to 20 hours, the maintenance state is automatically terminated. Another pulse terminates the maintenance state before the timeout expires.

2.4.3 Fire alarm

An external fire alarm system can report a detected fire to the GMA400 via a digital input. In this case, the ventilation control of the GMA is deactivated so that the fire is not supplied with additional air (oxygen) through ventilation (*see 2.6.1 Ventilation control*).

2.4.4 Forced ventilation

To manually activate a parameterized ventilation control, digital inputs can be parameterized so that they ventilate one or more zones for as long as, for example, a connected switch is activated (*see 2.6.1 Ventilation control*).

2.4.5 Relay time control start

If a relay time control is parameterized in the GMA, a digital input can be assigned to start the time sequence control. The start then occurs when the signal at the digital input changes (*see 2.7.3 2.6.1Time control*).

2.4.6 Relay control

Application 1: For example, horns and alarm panels are installed in a system and are controlled by the relays of the GMA. The digital inputs of the GMA can then be parameterized so that the horns and alarm panels can be easily tested by activating the input.

Application 2: Depending on the requirements, one input (or two redundant inputs) can be used for safety-related relay switching (evaluation module).

2.4.7 Monitoring of measured gas flow

With some transmitters, it is possible to supply the gas to be measured via a hose or pipe. A flow in the supply must be monitored, if necessary, e.g., to detect a pump failure or a blockage. The signal from a flow monitor can be fed back to a digital input of the GMA and the assigned transmitters report a fault in the measured gas flow (flow fault) if the flow is too low.

This eliminates the need for flow evaluation by an external control system. In addition, errors in the measured gas supply can be clearly assigned to the corresponding transmitter. Measured gas monitoring can also be parameterized for multiple transmitters.

2.5 Measuring points

The GMA can be connected to up to 128 physical transmitters to determine a wide variety of gas concentrations or other measured variables, such as temperature or humidity. Analog 4-20 mA or ACDC inputs and digital RS-485 bus connections are available for connection. Internal measured variables of the GMA, e.g., supply voltage or temperature, can also be used as measurement inputs for the measuring points.

In addition, up to 32 virtual measuring points can be configured, each of which is assigned measured values from the 128 real measuring points as input measured variables. Mathematical operations are then applied to the measured values, such as determining the minimum or maximum measured value.

2.5.1 Transmitter groups

Often, numerous transmitters are connected to a GMA400, which are used to evaluate the same gas and the same measuring range (alarm). It has therefore proven useful to manage transmitter groups with central settings in the GMA, to which the transmitters or measuring points are assigned. In this way, several transmitters with the same settings can be assigned to a common transmitter group. Virtual measuring points must also be assigned to a transmitter group.

The GMA400 has a total of 16 transmitter groups, each with the following settings:

- Transmitter type
- Measuring range and measured variable (usually gas type)
- Two averaging intervals (*see 2.5.2.2 Time-averaged values*)
- For alarms 1 – 4 respectively:
  - Alarm threshold with hysteresis
  - Alarm assignment to instantaneous or average value 1 / 2
  - Alarm threshold type (value exceeds / falls below)
  - Alarm self-locking (on / off)
  - Switch-on and switch-off delay for alarms
- For analog transmitters:
  - Special level (<4 mA or >20 mA for startup, fault or maintenance)
  - Sensor designation (abbreviated as MK number)
  - Optional: tolerance band and filter time
  - Optional: Assignment of a linearization table

Due to the complex setting options and to avoid incorrect parameterization, the GfG GMA-Config configuration software must be used for configuration (*see 3 Configuration*). Transmitter templates with predefined plausible settings form the basis, which can only be adjusted by the user to a limited extent (e.g., alarm thresholds and averaging intervals).

Based on the settings in the transmitter groups, the measured value processing and alarm evaluation are performed for each transmitter. The following graphic shows the data flow schematically:

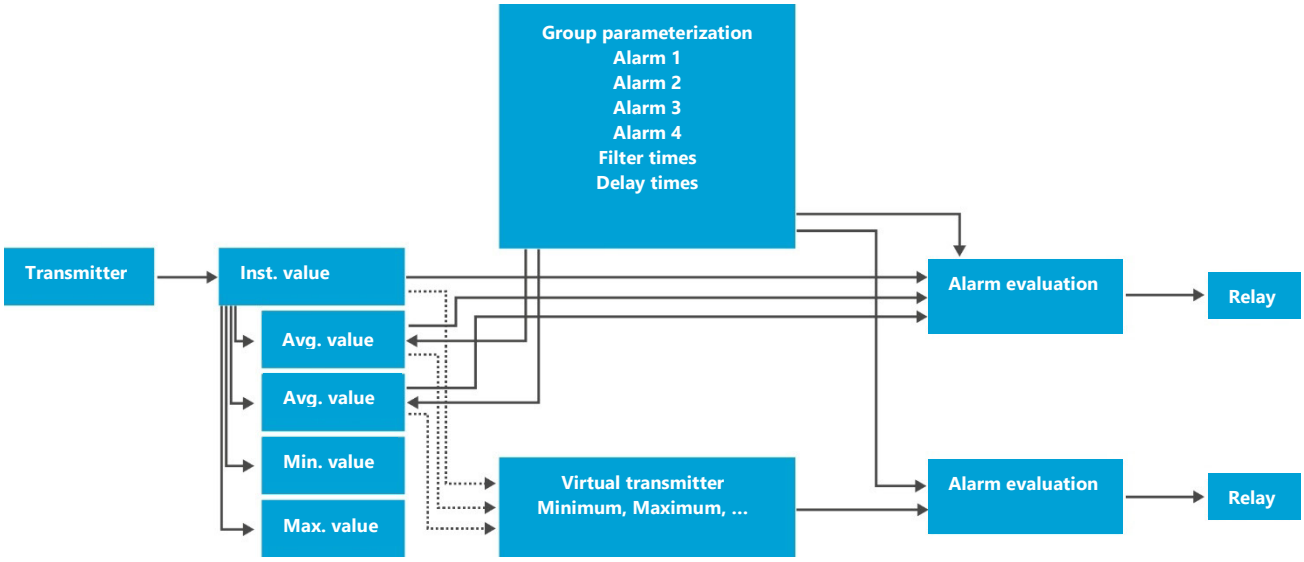


Figure 3 Schematic representation of the data flow at a measuring point

2.5.2 Measured values

A current measured value is generated every second for each measuring point in order to continuously calculate two time-based average values. In addition, minimum and maximum values are determined based on the current value.

2.5.2.1 Instantaneous value

The instantaneous value is the current measured value. This instantaneous value is valid within the following ranges:

- in the measuring range
- in the underrange range up to the underrange fault level (inclusive)
- in the overrange range up to the overrange fault level (inclusive)

Outside this range – below the underrange fault level or above the overrange fault level – the instantaneous value is invalid.

If a transmitter or the GMA400 is affected by a fault of such a nature that the measured value can no longer be trusted, it is also invalid. The GMA then reports a fault for the respective transmitter and displays corresponding special characters instead of the measured value.

With digital transmitters, the current value is transmitted in a ready-to-use form. With analog transmitters, it is calculated from the analog input signal and processed. The following options are available via parameterization:

- Filtering of the instantaneous value (moving average with filter time constant up to 10 s)
- Linearization of the instantaneous value based on a linearization characteristic curve
- Tolerance band on the expected value. This suppresses minor fluctuations in the measured value in the zero point range for toxic and combustible gases. For oxygen measurement, minor fluctuations around 20.9 vol% O_2(fresh air range) are suppressed if necessary. To avoid jumps, the display value is adjusted to the actual measured value up to twice the value of the tolerance band.

2.5.2.2 Time-averaged values

The averaging interval can be parameterized independently for both average values, which are continuously calculated from the instantaneous value. Only valid instantaneous values are included in the average value calculation.

Alarms can refer to the instantaneous value or one of the two average values.

The values can be called up on the display of the device (single screen), in the web display (zone screen), or in the visualization.

2.5.2.3 Minimum and maximum measured values over time

From the start time of the GMA, the minimum and maximum measured values over time are determined based on the instantaneous values with time stamps.

The values can be called up on the device display (single screen) or in the web display (zone screen).

The time stamp is also shown on the single screen, and the values can be reset there by pressing and holding the right arrow button.

2.5.3 Alarms

Each measuring point is assigned to a transmitter group in which four alarm thresholds can be configured within the measuring range (*see 2.5.1Transmitter*). If the alarm thresholds are exceeded or not reached, the red alarm LEDs AL1, AL2, AL3, AL4, the internal alarm bar (collective alarm display), the corresponding zone LED, and the integrated acoustic alarm are activated. Detailed information on the gas concentration level and the alarm status (AL1, AL2, AL3, or AL4) of the respective measuring point are simultaneously shown on the display (*see 5.3.1.1 Alarm screen*).

In addition, depending on the configuration, the configured relays and relay LEDs R1 – R6 are activated (typical configuration).

The alarm parameters *(see 2.5.1TransmitterTransmitter groups)* are configured using the GMA-Config software from GfG. However, the alarm thresholds can also be adjusted in the service menu.

2.5.3.1 Alarm acknowledgment (reset)

The behavior of the alarm LEDs and the internal alarm bar before and after alarm acknowledgment is described under *2.1.2 LED status indicators*.

- **Non-latching alarm:**
  A non-latching alarm is triggered when the gas concentration falls below (rises above) the alarm threshold and the assigned relay(s) is/are deactivated.
- **Self-latching alarm:**
  A self-latching alarm remains active even when the gas concentration falls below (rises above) the alarm thresholds. The alarm and the assigned relay(s) can only be acknowledged or reset by pressing the RESET button on the GMA once the alarm threshold has been exceeded (fallen below). Alternatively, acknowledgment is also possible via appropriately configured digital inputs.
- **Acknowledgeable alarm relay:**
  Relays can be configured to be acknowledged and are reserved exclusively for connection to acoustic/optical signals. Acknowledgment can be performed using the RESET button on the GMA. Alternatively, acknowledgment is also possible via appropriately configured digital inputs.

2.5.4 Analog transmitters (4–20 mA)

Up to 16 analog transmitters with 4–20 mA output can be connected to the GMA400-MT16.

If the current falls below 4 mA or exceeds 20 mA, the GfG-specific special levels for startup, fault, and maintenance stored in the parameterization are evaluated and reported.

The startup message can also be sent via a parameterized startup time (after the GMA400 has started up) and is used for transmitters that cannot output a defined startup level when starting up.

For analog transmitters, the zero point (4 mA) and sensitivity (range from 4 mA to 20 mA) can be fine-adjusted and permanently stored (each in the range from -1.28 to 1.27% of the measuring range). In addition, the sensor number can be parameterized, as this information cannot be read from the transmitter in purely analog form.

2.5.5 Digital transmitters (RS-485 – Modbus/RTU)

Up to 128 digital GfG transmitters can be connected to the GMA400. These digital transmitters perform complex internal signal processing and provide their measured values digitally together with various status information.

The assignment to the bus connection and the bus address for each digital transmitter are defined via parameterization.

Note: Make sure that the bus address is not assigned twice on a bus.

2.5.6 ACDC transmitters

Up to 16 GfG transmitters with ACDC interface can be connected to the analog or ACDC inputs of the GMA400.

All analog data transmission functions (4–20 mA) are retained. In addition, the same data as for the digital transmitters (measured values and status information) is queried and evaluated during modulated digital data transmission. This has the advantage that, compared to purely analog transmitters, significantly more information can be read from the transmitter and evaluated for diagnostic purposes. Furthermore, the measured values are available redundantly, so that the analog measured value continues to be evaluated in the event of a digital data transmission failure (fallback). In addition, analog and digital measured values, if available, are continuously checked for consistency.

The zero point (4 mA) and sensitivity (range from 4 mA to 20 mA) of the ACDC transmitters can also be fine-tuned and permanently stored (each in the range from -1.28 to +1.27% of the measuring range). The measuring chamber number is read out digitally and the parameterized MK number (primarily for purely analog transmitters) is overwritten.

Note 1: If the deviation between the digital and analog measured value exceeds 2% for at least 5 seconds, a maintenance request is triggered for the respective transmitter.

Note 2: If the digital data transmission fails (fallback to analog value), a maintenance request is initially triggered for the affected transmitter. After 8 hours, a TRM fault is additionally reported.

2.5.7 Internal measuring point

The following internal measured variables of the GMA can be parameterized as measurement inputs for the measuring point:

- The internal temperature
- The 24V supply voltage at power supply input 1 (U_{in1})
- The 24V supply voltage at power supply input 2 (U_{in2})
- The maximum of the two 24V supply voltages ($U_{in\text{-}Max}$)

2.5.8 Virtual measuring points

Up to 32 virtual measuring points can be assigned to the 128 real measuring points as input measured variables, to which the following mathematical operations can then be applied:

- Determination of the minimum measured value
- Determination of the maximum measured value
- Calculation of absolute humidity

The virtual measuring points offer simple solutions to complex problems, either individually or in combination.

2.5.8.1 Determination of the minimum or maximum measured value

The virtual measuring point determines the minimum or maximum values of the instantaneous values and the two average values from all assigned real measuring points. This means that no separate average value calculation is performed for the virtual measuring point; instead, the minimum or maximum average values from the assigned measuring points are displayed as average values *(see Figure 4)*.

The alarms of the virtual measuring point are then monitored on the basis of these maximum or minimum values.

Note 1: Only real measuring points with the same parameterization of the measured variable and the measuring range can be assigned to the virtual measuring point.

Note 2: The calculation across multiple measuring points must not be confused with the minimum or maximum value over time under *2.5.2.3*. These values are determined additionally based on the instantaneous value of the virtual measuring point.

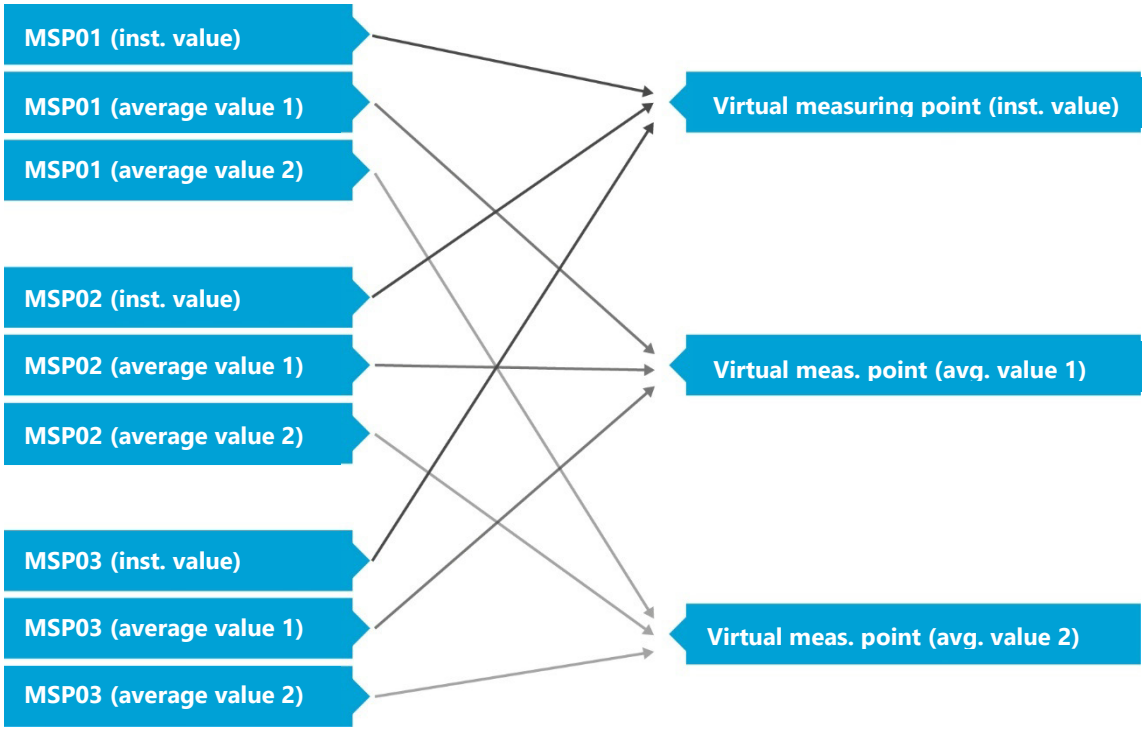


Figure 4: Schematic representations of virtual measuring points

Note 3: The calculation is performed from all assigned measuring points that are not in a special state (fault or maintenance). As long as at least one assigned measuring point is in measuring mode, a measured value is generated for the virtual measuring point. Only when all assigned measuring points are no longer in measuring mode does the calculation of the virtual measuring point also enter the special state.

Note 4: Complex parameterization of the virtual measuring points can result in feedback loops that do not lead to the expected result. Feedback loops in cascading are therefore prohibited during parameterization.

2.5.8.2 Calculation of absolute humidity

Two real measuring points must be assigned to the virtual measuring point, one of which measures the relative humidity and the other the temperature. The virtual measuring point calculates the absolute humidity as a momentary value from the momentary values of these two measuring points and also performs its own average value calculation based on this.

This function is required for humidity-dependent ventilation control.

2.5.9 Transmitter remote adjustment

Remote transmitter adjustment is possible with the GMA400, compatible transmitters (see their operation manuals), and a suitable infrastructure.

The test gas concentration and zero gas must be correctly parameterized on the GMA.

With suitable transmitters, remote adjustment can be activated so that the transmitters detect a zero gas and a test gas. These detected values and the previous adjustment values are displayed side by side on the display of the GMA400 and must be actively confirmed by the user (*for remote adjustment in the GMA400 service menu, see 6.8.4.4 Remote adjustment*).

2.6 Zones

In the GMA, measuring points can be assigned to up to 8 zones. This helps improve clarity by grouping measuring points according to specific areas, such as individual buildings or floors. In addition, a separate ventilation control can be configured for each zone, allowing, for example, individual areas in garages to be ventilated separately.

2.6.1 Ventilation control

In closed garages, there is a potential hazard from exhaust gases from combustion engines, which is why these must be monitored for excessive gas concentrations and, if necessary, ventilated. This is often achieved with a gas detection system and a PLC.

With the GMA400, both functions are integrated in one device. It offers extensive functionality for implementing independent ventilation in up to eight independent areas (zones) – including the requirements for a gas detection system.

The following factors affect the ventilation control:

- Time (fixed ventilation times can be parameterized)
- Gas concentrations (ventilation can be activated if alarm values are exceeded)
- Humidity (the humidity in the building can be minimized)
- Manual (ventilation can be activated via switches)
- Fire alarm system (ventilation can be completely deactivated)

The above events can also be combined.

The smart ventilation control is capable of controlling a two-stage supply and exhaust air system. The time requirements for pole-changing motors are also met.

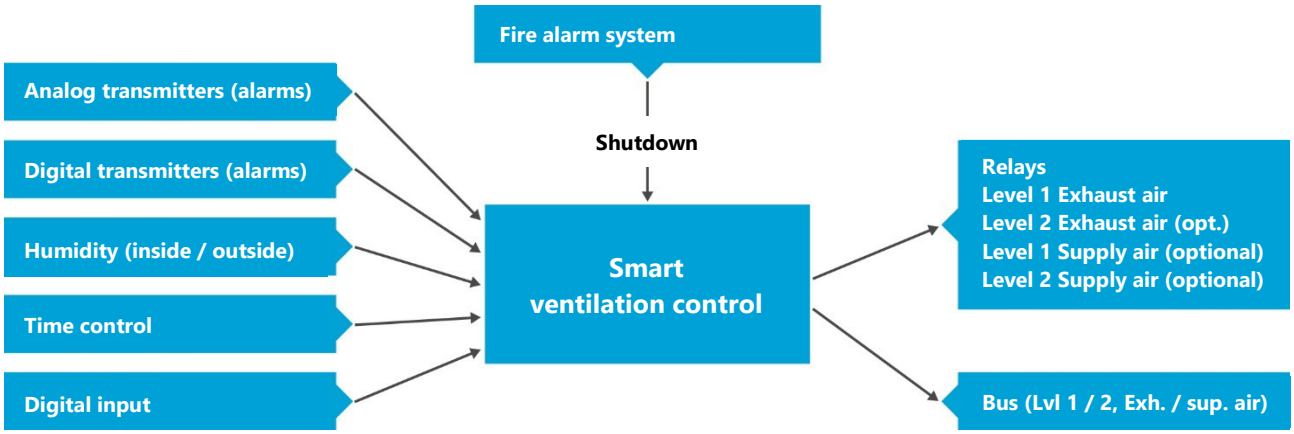


Figure 6: Smart ventilation control using GMA400, schematic diagram

2.6.1.1 Ventilation input parameters

The input parameters of the ventilation control allow the GMA400 to be finely adjusted to the requirements for compliance with normative requirements. In addition, the building infrastructure is optimally protected.

2.6.1.1.1 Time-dependent ventilation

Ventilation usually takes place three times a day, for example at 8 a.m., 1 p.m., and 6 p.m., for a period of 30

minutes.

In the GMA, up to eight fixed ventilation times can be parameterized for each zone, depending on the day of the week. This makes time-controlled ventilation easy to implement.

2.6.1.1.2 Ventilation depending on gas concentration

If configurable gas concentrations are exceeded, ventilation can be activated. Single-stage or two-stage ventilation can be implemented.

These up to two gas concentrations are below the health-endangering threshold and offer a preventive, early opportunity to minimize risk. An alarm is only triggered when health-endangering thresholds are exceeded – if necessary, accompanied by messages instructing people to leave the danger zone. To reduce peaks in gas concentration, e.g., caused by passing vehicles, time averages should be used. The current legal and technical regulations must be observed.

The transmitters are assigned to zones by calculating the maximum value of the virtual measuring points, *see 2.5.8 Virtual measuring points*. This also allows transmitters to be assigned to multiple zones.

2.6.1.1.3 Humidity-dependent ventilation

Climate situations often arise in which ventilating the garage would have a rather counterproductive effect on humidity regulation. This is because relatively low humidity in the environment suggests that ventilation is appropriate.

However, this can be misleading if the temperatures in the surrounding area and in the garage differ greatly. At higher temperatures, the air absorbs significantly more moisture. If this air is used to ventilate a cold garage, the air's capacity to absorb moisture drops abruptly, meaning that the air actually condenses. In this scenario, the garage is prone to increased mold growth, which increases renovation costs. Only a comparison of the absolute humidity in the environment with that in the garage allows for objective ventilation of the building: If the gas concentration is too high, ventilation is carried out regardless of the humidity in order to eliminate the potentially dangerous situation.

The GMA400 conveniently calculates the absolute humidity from a transmitter for relative humidity and another transmitter for temperature. This can be determined for each zone and the surrounding area in order to identify and avoid ventilation situations that are harmful to buildings.

In detail: The humidity and temperature are determined indoors for each zone and outdoors as well. If the absolute humidity value indoors is higher than outdoors, the relative value is higher than a limit value set by the customer (default 55%), and time-dependent ventilation is active, then ventilation is activated. Relative humidity **and** absolute humidity are required for this function.

2.6.1.1.4 Manual ventilation

The "Manual ventilation" function can be assigned to digital inputs of the GMA400 via parameterization: After the input is activated, ventilation is activated in the assigned zones.

2.6.1.1.5 Deactivate ventilation (fire alarm system)

Ventilation could actually fan an already detected fire by supplying additional air (oxygen). To prevent this, the signal from a fire alarm system can instruct the GMA to deactivate all ventilation. This function has the highest priority.

2.6.1.1.6 Priorities

The following table shows the prioritization of the dependencies described above:

Priority	Input parameter	See	Ventilation
1 (highest)	Fire alarm	2.6.1.1.5	OFF
2	Gas concentration	2.6.1.1.2	ON
3	Manual ventilation	2.6.1.1.4	ON
4	Humidity	2.6.1.1.3	OFF
5	Time-dependent	2.6.1.1.1	ON

2.6.1.2 Ventilation output parameters

Up to four relay outputs can be parameterized per ventilation zone, two each for two-stage supply air and exhaust air ventilation.

The relays for supply air and exhaust air are switched simultaneously. In contrast, the relays for the two stages of ventilation are not switched simultaneously. Instead, when switching from stage 1 to stage 2, the relay for stage 1 is first switched off, followed by a pause of one second until the relay for stage 2 is switched on. This allows pole-changing motors to be used for the two-stage ventilation without any additional external wiring for the pause times and to be controlled directly by the GMA.

Furthermore, a minimum start-up time in stage 1 can be parameterized before switching to stage 2 in order to protect pole-changing motors from overload.

Caution: It is possible to perform a manual relay test on the GMA, where not all restrictions can be interlocked. Please note this when performing the relay test!

2.6.1.3 Ventilation control: Parameterization

The ventilation control of the GMA400 offers a wide range of individual parameterization options.

The following diagram shows an example of a system with two zones, each with CO and NO monitoring. The temperature and relative humidity are measured for each zone and once in the outdoor area, and converted into absolute humidity. Two-stage ventilation control with relays is provided for each zone.

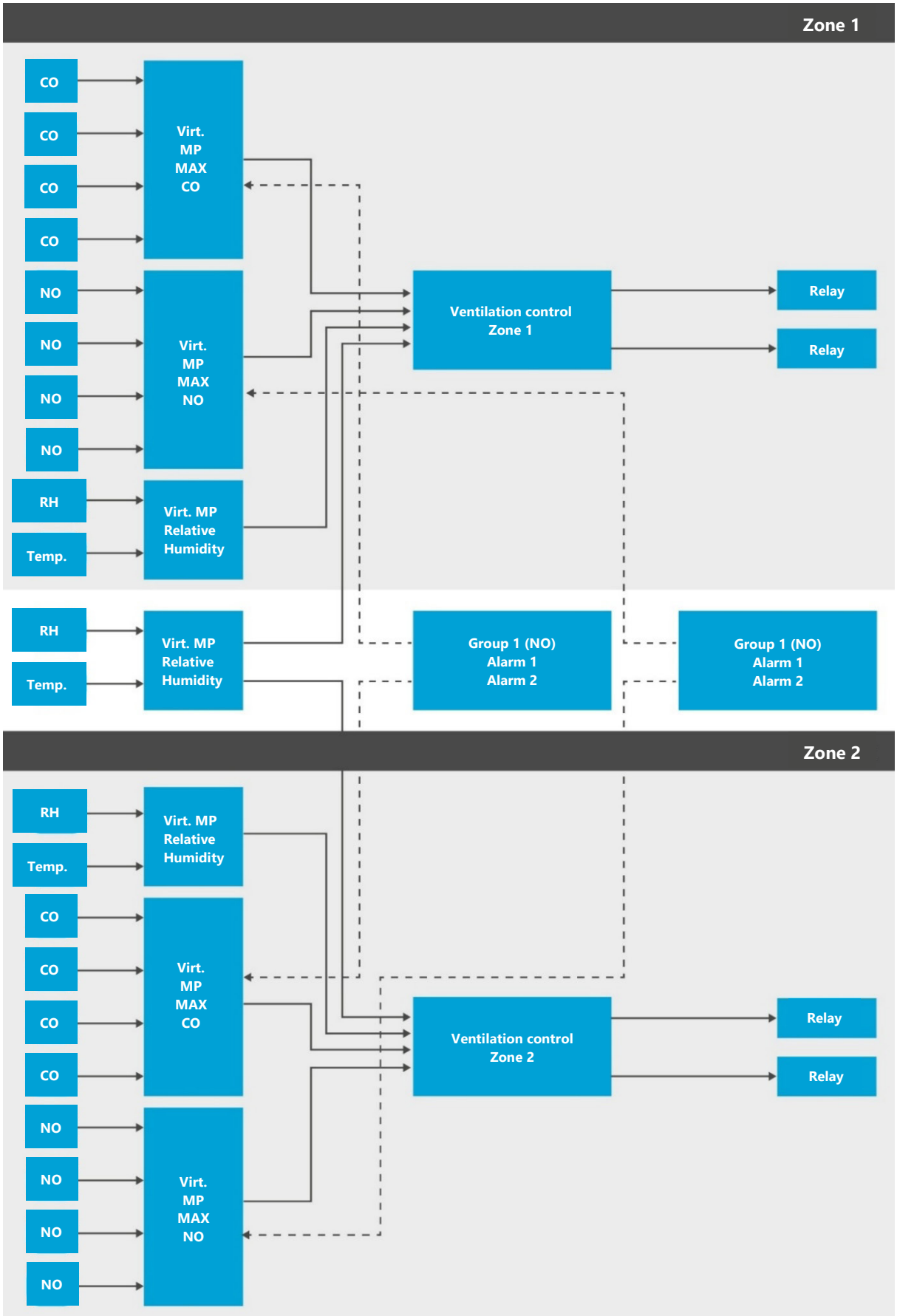


Figure 7: Ventilation control system with 2 zones, each with CO and NO monitoring

For each gas relevant to ventilation – e.g., CO, NO, NO_2, etc. – a virtual measuring point must be assigned to each zone. The virtual measuring point calculates the maximum value from the actual measured values. This virtual measuring point must be assigned to a group that defines the ventilation thresholds via its alarm thresholds. The group definitions can be used across zones, as the ventilation thresholds are usually the same for all zones. The virtual transmitters and the relays to be switched are assigned to the ventilation control of the zone.

The ventilation is now controlled via the maximum values of the gas concentrations with the thresholds defined in the groups, and the assigned relays are switched.

The requirements of the gas detection technology must be met independently of this ventilation parameterization.

Note: Multiple humidity measurements can also be taken in one zone and then linked using minimum, maximum, or average values. This allows the ventilation function to be activated in the event of localized humidity or average humidity.

2.7 Relays

The GMA400 has eight internal relays. These can be expanded by up to 192 external relays.

The internal and external relays are configured exclusively via the GfG GMA-Config software, which offers extensive options for assigning relays to alarm functions and to individual measuring points or measured value groups.

Configuration options:

- Working current principle / quiescent current principle
- Individual alarms for each measuring point and alarm limit value
- Collective or group alarms
- Fault messages
- Configuration of AND/OR links
- Voting functions (e.g., 2 out of 3 measuring points)
- Time control

2.7.1 Internal relays

The eight internal relays each have a potential-free normally open contact. Six relays can be freely configured to implement specified safety measures and alarms. One relay each is available for the safety-related fault message and for maintenance signaling.

2.7.2 External relays

The following expansion modules with external relays can be connected and controlled via the digital RS-485 bus connections, which also allow a spatial separation of max. 1,200 m:

- 8x GMA200-RT relay modules, each with 16 freely configurable relays with potential-free changeover contacts
- 16x GMA22-RW/RS display modules, each with 4 freely configurable relays with potential-free changeover contacts (RW) or potential-free normally open contacts (RS)

The assignment to the bus connection and the bus address for each expansion module are defined via parameterization.

Note: Make sure that the bus address is not assigned twice on a bus.

2.7.3 Time control

The time control allows up to ten timer sequence controls T1 to T10 to be parameterized and implemented, each of which can control up to three assignable relays. Each sequence control consists of three consecutive phases. For each phase, the switching state that is set for the assigned relays at the start of the phase can be parameterized. For the first two phases, the duration of the phase can also be parameterized (up to 24 hours):

- **Phase 1**
  Started by a configurable start event. At the beginning, the assigned relays are set to the configured switching state (on/off). After the configured duration has elapsed, the next phase follows.
- **Phase 2**
  At the start, the assigned relays are set to the parameterized switching state (on/off). Once the parameterized duration has elapsed, the next phase follows.
- **Phase 3**
  At the start, the assigned relays are set to the parameterized switching state (on/off). This phase is the final state of the sequence control and remains until an assigned start event restarts phase 1.

The following start events are possible for the timer sequence control:

Start events for the timer sequence control					
Device start	Every day at 00:00	Mondays at 00:00	Digital input	Manually using the menu	Expiration of one of timers T1 to T10 (i.e., upon entering phase 3)

2.8 Alarm panels

Up to 64 alarm panels can be connected to the GMA400, which are required for visual and acoustic alarms, e.g., for gas alarms in garages.

For each alarm panel, the light and horn can be parameterized as two independent switching outputs, each like a relay, and controlled by the GMA (*see also 2.7 Relays*).

The assignment to the bus connection and the bus address for each alarm panel are defined by the parameterization.

Note: Make sure that the bus address is not assigned twice on a bus!

2.9 Web interface

The web interface is used to visualize process data and device logs via a web browser on end devices that are connected to the GMA via Ethernet (e.g., panel PCs). In addition to visualization, alarms can be acknowledged and restricted system settings can be made with the appropriate authorization.

Authentication with a username and password is required to access the web interface. For this purpose, user administration must be configured using the GMA-Config software from GfG. In addition, the corresponding network settings, such as the IP address, must be configured.

2.9.1 User management

Up to 30 users can be created for the web interface, each of which can be assigned to different user groups with different access rights. In addition, a username (20 characters) and a password (32 characters) must be assigned to each user. The following access rights are possible.

Access right	Permission
Guest	Restricted display of process data (measured values and status information for all measuring points).
User	Display of all process data (measured values and status information for all measuring points, device settings, system status, and device logs, including data log) and change of user password.
Quit	Acknowledgment of alarms.
Config	Change existing users (activation/deactivation, access rights, name and password) and set the date and time.
Admin	Create and delete users, change existing users (activation/deactivation, access rights, name and password), change network settings and set date and time.

2.9.2 Network settings

The following network settings can be configured for access to the web interface using the GMA-Config configuration software from GfG.

- Activation of the web interface and relevant components (IPv4, Ethernet)
- IP address of the GMA400
- Subnet mask of the network
- Optional: IP address of a network gateway (if available)
- Port number for web interface (default: 80 for HTTP)
- Connection timeout for web interface (default: 5 minutes)
- Optional: Text to be displayed when logging into the web interface

The web interface can then be accessed by entering the IP address in the address bar of a client device's web browser in the Ethernet network.

2.9.3 Login

When accessing the web interface, the login window appears first for entering the username and password.

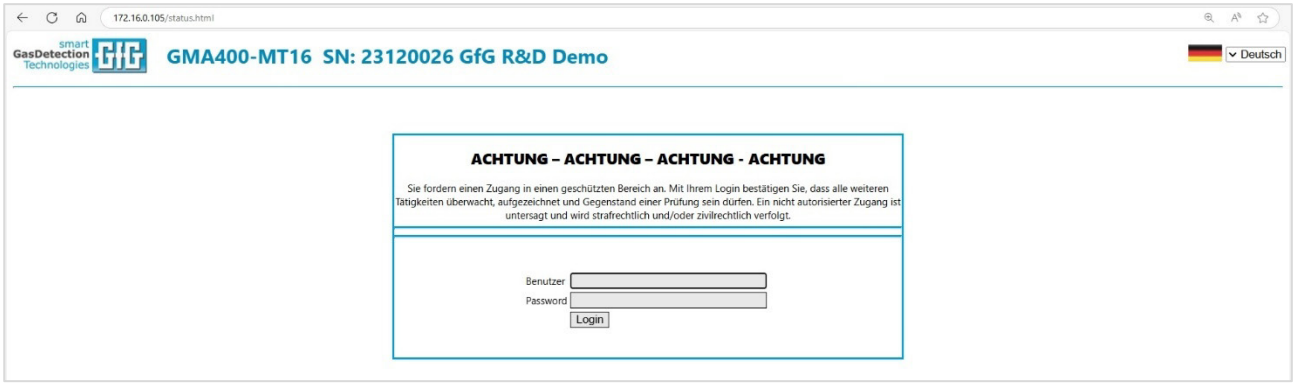


Figure 8: Login window when accessing the web interface

The serial number and device name are displayed in the header. The language can be changed in the top right corner when logging in.

2.9.4 Measuring points

After successful login, the measuring point screen is displayed (the "Measuring points" entry in the left menu bar is active). Under "Overview" in the top menu bar, the measured values and status information of all measuring points in the various zones are displayed. The color scheme is identical to the display in the GMA menu (*see 5.3 Monitoring operation*).

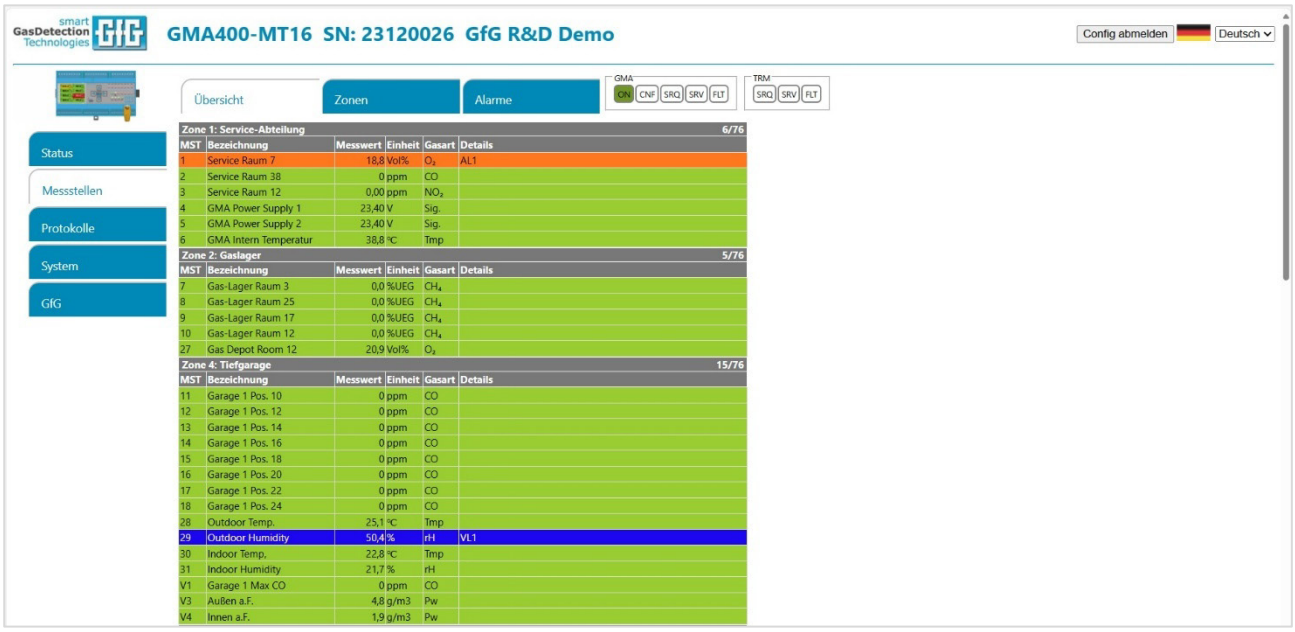


Figure 9: Measuring point screen after login

Under "Zones," only the measuring points of a zone are displayed with more information (additionally min., max., and average values and alarm thresholds). With the appropriate authorization, active alarms can be acknowledged there via the "Reset" button either for individual measuring points or for all measuring points in the zone. If there are multiple zones, you can switch between them by selecting the zone number in the gray header.

Figure 10: Display of the measuring points in a zone

All measuring points with active alarms are listed under "Alarms." With the appropriate authorization, the alarms can be acknowledged there for individual measuring points or for all measuring points in the zone using the "Reset" button.

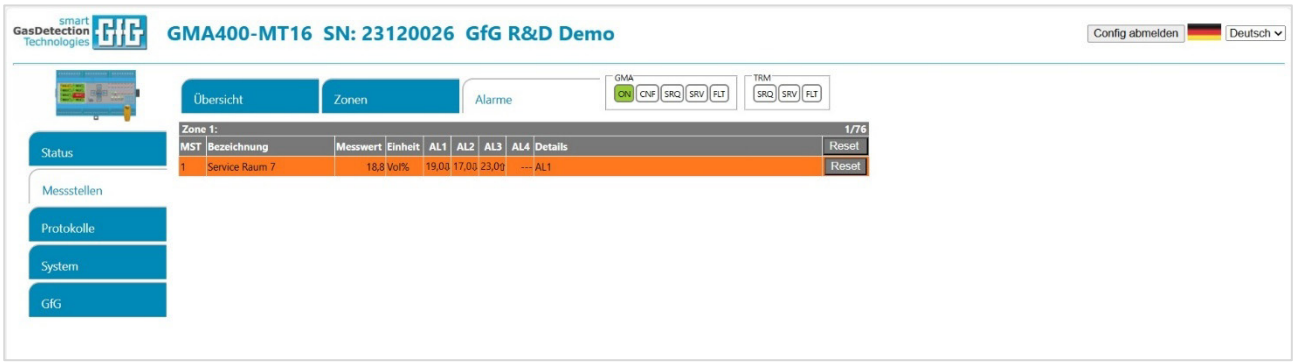


Figure 11: Measuring points with active alarm

2.9.5 Status

Various status information and device settings can be displayed via the "Status" entry in the left-hand menu bar. Status information and settings for the GMA are displayed under "GMA" in the top menu bar. Messages from the GMA in special status in the event of a fault, maintenance, or maintenance request are also displayed there, as well as on the GMA display.

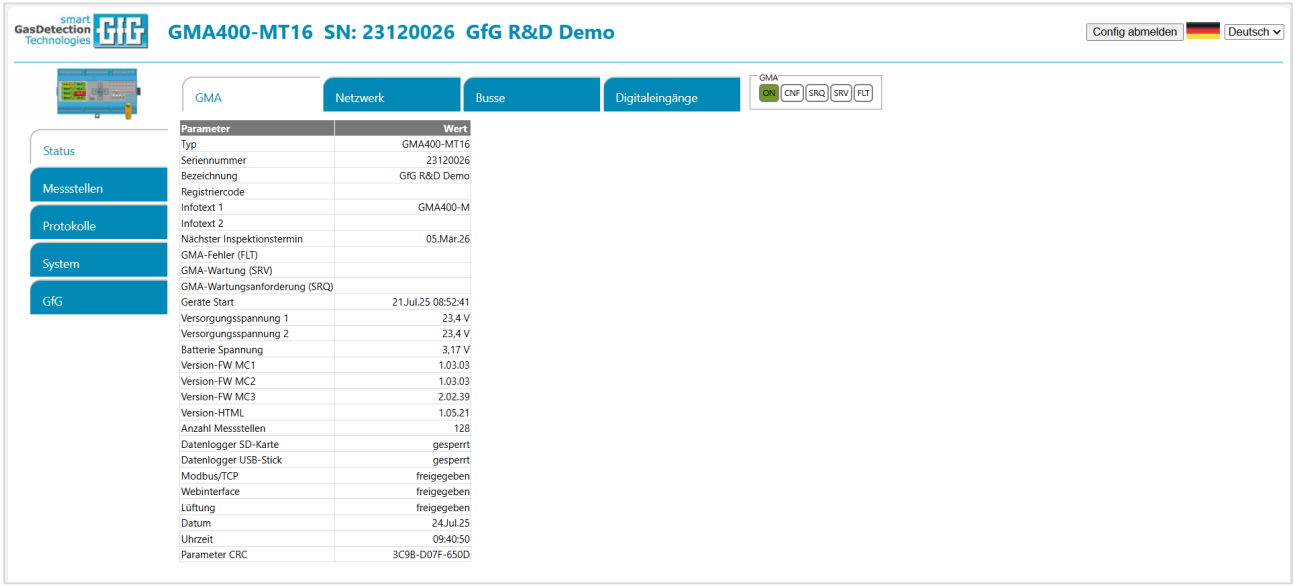


Figure 12: Display of status information and settings of the GMA400

The other entries in the top menu bar display the following information:

- "Network"
  Network settings and status information
- "Buses"
  Configuration of all RS-485 bus connections and respective error counters for diagnostics
- "Digital inputs"
  Configuration, status, and condition of all digital inputs

2.9.6 Logs

The complex GMA400 system offers extensive types of logging for system statuses and measured value data, which are stored internally in the device. These logs can be accessed via the "Logs" entry in the left-hand menu bar. The following logs can be viewed via the entries in the top menu bar:

- Device log
- Event log
- Security log
- Data log

2.9.6.1 Device log

The device log first displays general information such as device type, serial number, and firmware versions in a first table. A second table lists the most recent configuration changes with the date, username, and configuration checksum. A third table lists all parameterized devices to provide a quick overview of the system.

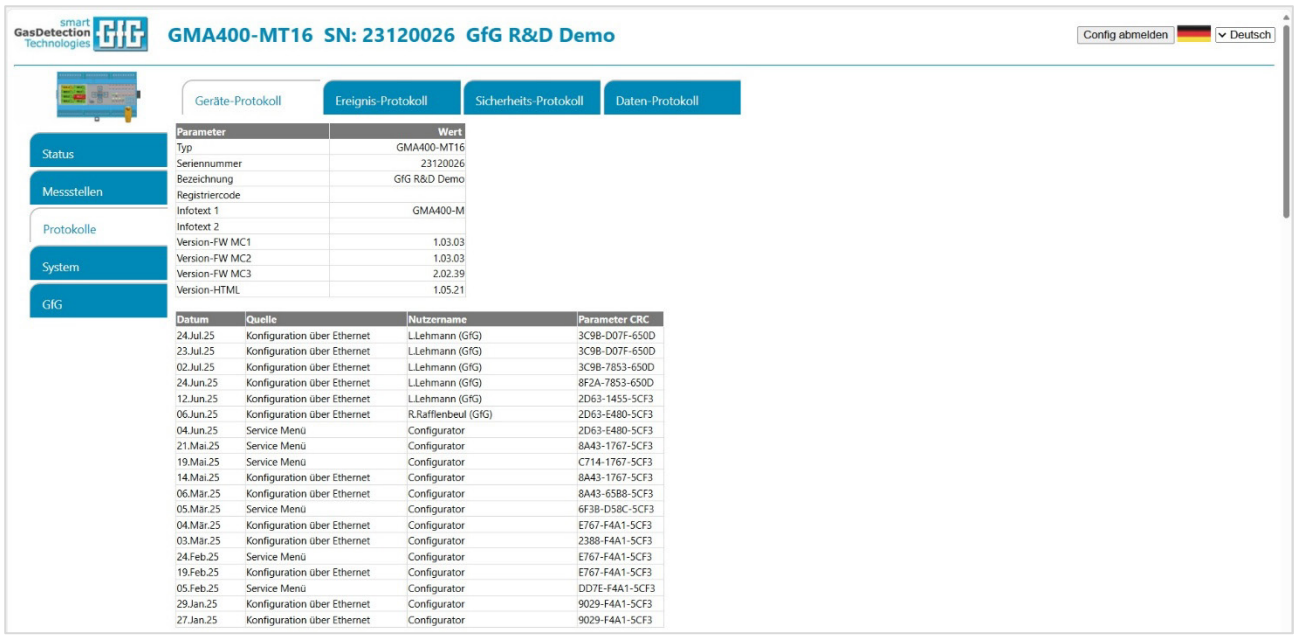


Figure 13: Device log of the GMA400

2.9.6.2 Event log

Events such as malfunctions, maintenance, maintenance requests, or alarms are recorded in the event log. This provides a quick overview of the process status and allows malfunctions to be rectified as quickly as possible.

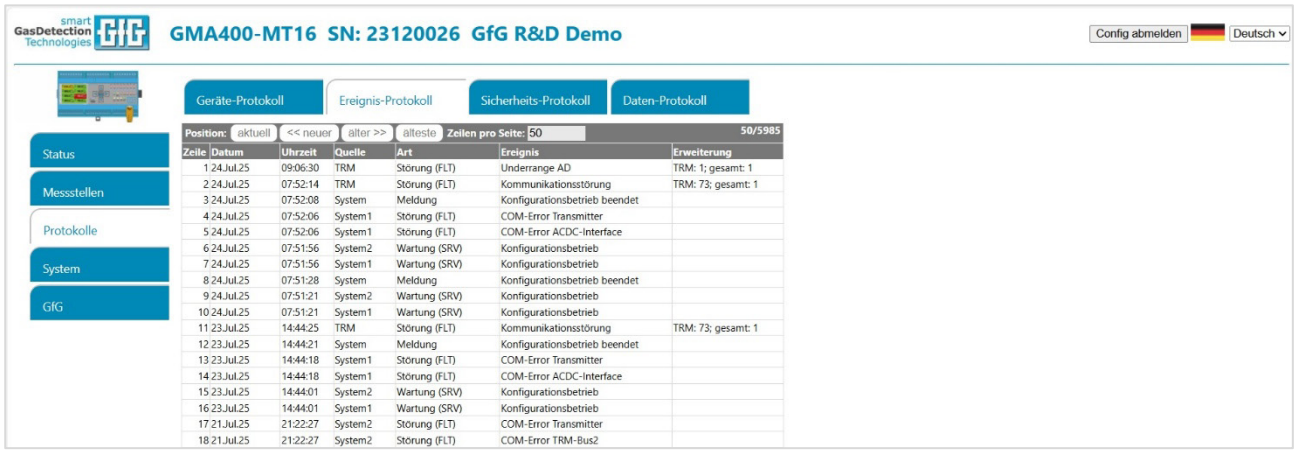


Figure 14: Event log of the GMA400

2.9.6.3 Security log

In order to detect unauthorized access to the GMA, all access and changes to the system are logged internally in the device. Prior authentication of the user is mandatory for all access. For remote access, the IP number from which the access was made is also logged. These logs are for security purposes and therefore cannot be disabled.

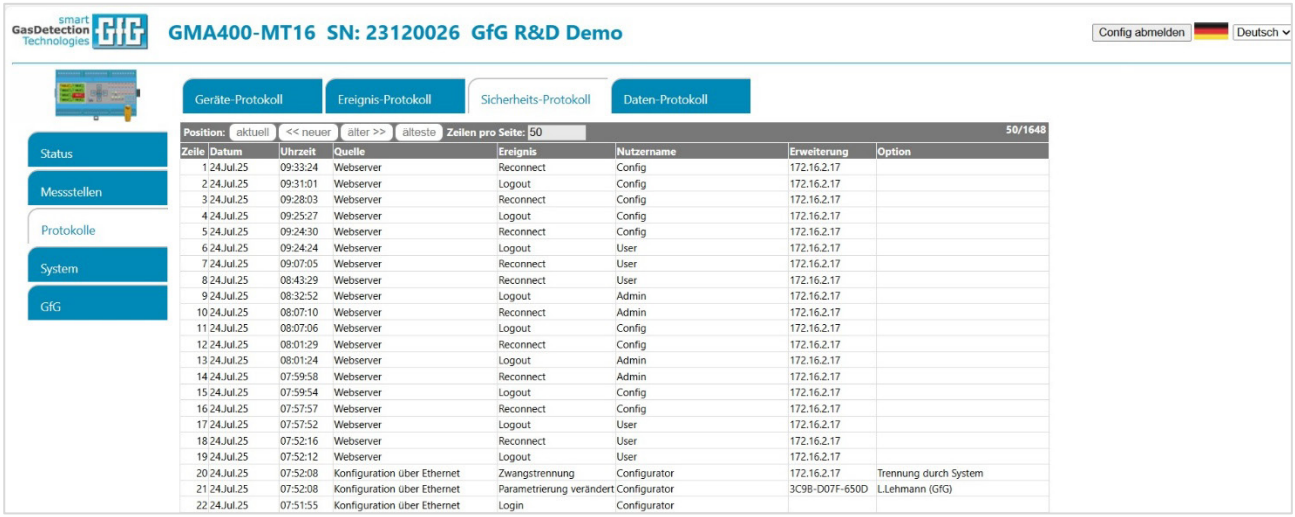


Figure 15: Safety log of the GMA400

2.9.6.4 Data log

The data log cyclically records the measured values and status information of all measuring points with a time stamp. The data can be selected and displayed individually for each measuring point. The recording interval can be configured using the GMA-Config configuration software from GfG. The log memory is a ring memory, i.e., when the memory is full, the oldest data is overwritten with new data. The maximum recording time therefore depends on the configured interval, as shown in the following examples.

- At 10-second intervals: ~2 days of recording
- At 5-minute intervals: ~2 months of recording
- At 1-hour intervals: ~2 years of recording

The data can be easily selected and inserted into Excel for evaluation, for example.

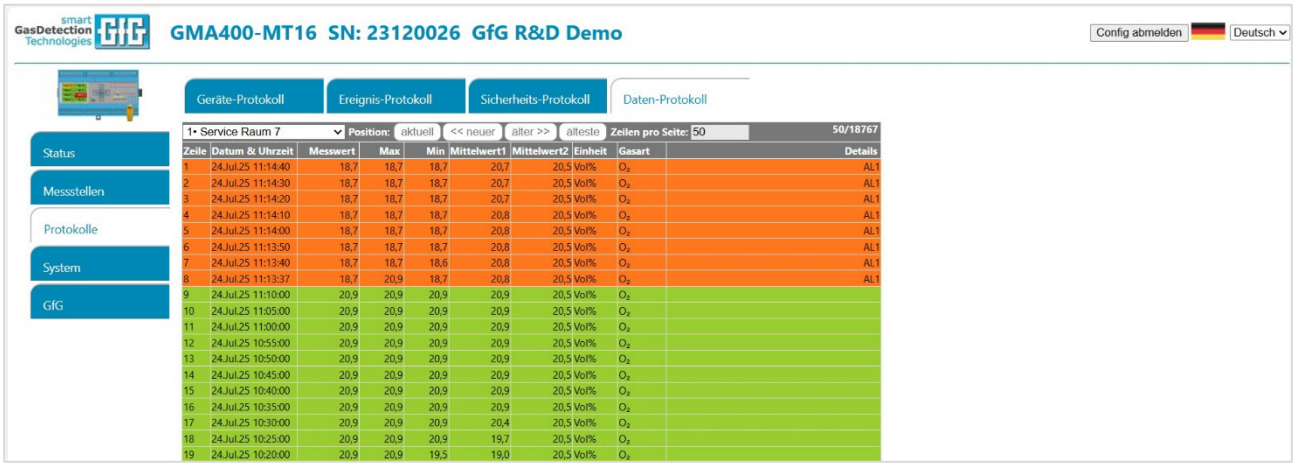


Figure 16: Data log of the GMA400

2.10 Modbus/TCP

In addition to accessing the web interface, the GMA's Ethernet connection can also be used as a Modbus/TCP interface to transfer process data to other client devices in the connected Ethernet network on request. These devices may include a higher-level control unit, a PLC, a gateway, or a PC for visualizing the measurement data.

One application is convenient visualization on display devices in the network using the established GMA-Visual software from GfG. The visualization software may need to be updated for this GMA function.

The following network settings for the Modbus/TCP interface can be parameterized using the GMA-Config configuration software from GfG.

- Activation of the Modbus/TCP interface and relevant components (IPv4, Ethernet)
- IP address of the GMA400
- Subnet mask of the network
- Optional: IP address of a network gateway (if available)
- Port number for Modbus/TCP (default: 502)
- Connection timeout for Modbus/TCP (default: 15 minutes)

The structure and description of the Modbus transmission data are available in a separate document attached to the operating instructions.

3 Configuration

3.1 GfG default settings or GMA-Config software

The most important parameters on the GMA400 have already been preset before delivery to the customer.

Alternatively, these settings can be made directly using the GMA-Config configuration software from GfG, which is available separately. Further information on system requirements, installation, and operation can be found in the corresponding GMA-Config operating instructions.

An existing USB connection is required for parameterization.

Note: When naming transmitters or zones, descriptive names should be used to make operation easier for the user, as these names are used across all communication channels and also on the device itself.

Specifically, location information is suitable for naming transmitters, e.g., " Laboratory gas storage." When naming zones, information relating to the respective building or building areas should be used, such as "Laboratories floor 3," "Underground parking garage level 2," etc.

3.2 Parameterization using GMA-Config software using USB

For parameterization, the GMA400 can be powered using the USB port of the PC or notebook used. Due to the powerful GMA electronics, the USB port must provide at least 500mA.

If the GMA is powered via USB, limited communication through Ethernet is also possible. However, the GMA is not fully functional in this case, which is why several internal errors are reported.

Instead, USB hubs with their own power supply should be connected or the GMA400 should be equipped with its own power supply. The supply voltage of the GMA400 is 24 V.

When selecting a USB cable, very low-cost options should be avoided, as they often cause interference during data exchange between the GMA400 and a PC or notebook.

4 Installation

4.1 Requirements

The design, installation, operation, repair, and maintenance of a complex, cross-departmental system may only be carried out by persons with the necessary qualifications, including many years of experience. For more details, refer to the applicable regulations, e.g., **DGUV Information 213-056 (T 021) "Gas detection devices for toxic gases/vapors and oxygen"** or **DGUV Information 213-057 (T 023) "Gas detection devices for explosion protection.**"

4.2 Installation location

The GMA400 is designed for mounting on DIN rails in control cabinets inside buildings. Installation in potentially explosive areas is not permitted. If gases are to be measured within the potentially explosive area, suitable transmitters must be used. In addition, the connections to the GMA must be protected by suitable barriers.

The GMA should be mounted with as little vibration as possible.

Important note: When using the side connectors, use top-hat rail fasteners to prevent the connectors and devices from shifting on the DIN rail on both sides.

4.3 Electrical installation

4.3.1 Safety note

The electrical installation must be carried out in accordance with DIN VDE 0100 or a comparable country-specific standard.

Cables with dangerous voltages, e.g., 230 V AC, and cables with safe voltages, e.g., 24 V DC, must be laid separately from each other!

The cables used must be suitable for the connected transmitters or devices. Insulated wires and cables must be flame-retardant. During maintenance work while the device is in operation, please note that dangerous voltages may be present in the area of the relay connection terminals on the GMA400! Contact with these areas must be avoided at all costs.

All overcurrent protection devices (fuses, circuit breakers) in the circuits must meet the requirements of the building installation.

4.3.2 24 V DC power supply

The GMA400 is supplied with power from an external 24 V DC power supply unit. This voltage is connected to the terminals (–U1+) (24 V DC1). Optionally, a second 24 V DC power supply unit can be connected to the terminals (-U2+) (24 V DC2) for redundant power supply.

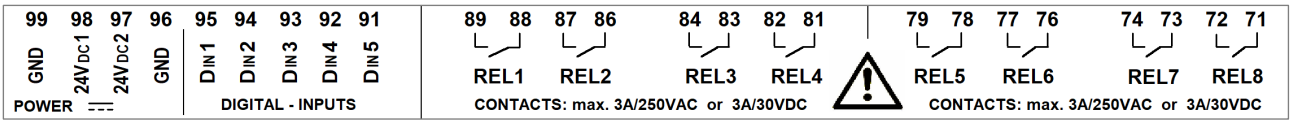
The 24 V DC power supply must be a regulated safety extra-low voltage (SELV) or protective extra-low voltage (PELV).

The power supply units must be sufficiently dimensioned for the GMA400 and all other components supplied in this way.

4.3.3 Terminal assignment diagrams

The power supply and transmitter must be connected according to the following terminal assignment diagrams (also found on the housing, on the terminal covers, and in abbreviated form in front of the PCB terminals).
IMPORTANT NOTE: The voltage supply for the connected transmitters must not be provided via the GMA400, but must be ensured via a terminal strip with a separate voltage supply!

Warning notice on the GMA400 housing:
General warning, see operating instructions!



Terminal block top left

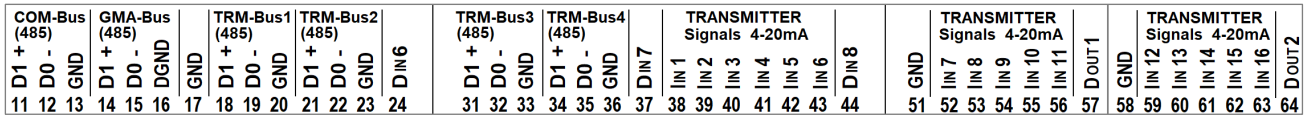
No.	Abbr.	Description	Note
99	GND	Ground / earth connection	with SELV or PELV power supply
98	$24V_{DC}1$	Power supply input 1 with 24 V DC (20-30 V DC	
97	$24V_{DC}2$	Power supply input 2 with 24 V DC (20-30 V DC)	with SELV or PELV power supply (optional)
96	GND	Ground / earth	
95	$D_{IN}1$	Digital input 1	0 / 24 V DC Logic input
94	$D_{IN}2$	Digital input 2	
93	$D_{IN}3$	Digital input 3	
92	$D_{IN}4$	Digital input 4	
91	$D_{IN}5$	Digital input 5	

Terminal block, center top

No.	Abbr.	Description	Note
89	REL1	Relay 1 NO contact (not energized)	max. 3 A / 250 V AC or max. 3 A / 30 V DC
88			
87	REL2	Relay 2 NO contact (not energized)	
86			
85	Do not connect anything for insulation reasons.		
84	REL3	Relay 3 NO contact (not energized)	max. 3 A / 250 V AC or max. 3 A / 30 V DC
83			
82	REL4	Relay 4 NO contact (not energized)	
81			

Terminal block at top right

No.	Abbr.	Description	Note
79	REL5	Relay 5 NO contact (not energized)	max. 3 A / 250 V AC or max. 3 A / 30 V DC
78			
77	REL6	Relay 6 NO contact (not energized)	
76			
75	Do not connect anything for insulation reasons.		
74	REL7	Relay 7 NO contact (not energized)	max. 3 A / 250 V AC or max. 3 A / 30 V DC
73			
72	REL8	Relay 8 NO contact (not energized)	
71			



Terminal block, bottom left

No.	Abbr.	Description	Note
11	D1+	COM bus (RS-485)	e.g., for visualization, ventilation control
12	D0-		
13	GND		
14	D1+	GMA bus (RS-485), galvanically isolated	Safety-related, e.g., for PLC or visualization
15	D0-		
16	DGND		
17	GND	Ground / earth	Device ground / earth
18	D1+	TRM bus1 (RS-485)	For transmitters, relay / display modules, alarm panels
19	D0-		
20	GND		
21	D1+	TRM bus2 (RS-485)	
22	D0-		
23	GND		
24	$D_{IN}6$	Digital input 6	0 / 24 V DC Logic input

Terminal block, center bottom

No.	Abbr.	Description	Note
31	D1+	TRM bus2 (RS-485)	For transmitters, relay / display modules, alarm panels
32	D0-		
33	GND		
34	D1+	TRM bus2 (RS-485)	
35	D0-		
36	GND		
37	$D_{IN}7$	Digital input 7	0 / 24 V DC Logic input
38	$I_{IN}1$	Analog input 1	for 4-20 mA transmitter signals and with ACDC® function
39	$I_{IN}2$	Analog input 2	
40	$I_{IN}3$	Analog input 3	
41	$I_{IN}4$	Analog input 4	
42	$I_{IN}5$	Analog input 5	
43	$I_{IN}6$	Analog input 6	
44	$D_{IN}8$	Digital input 8	0 / 24 V DC Logic input.

Terminal block at bottom right

No.	Abbr.	Description	Note
51	GND	Ground / earth	Device ground / earth
52	$I_{IN}7$	Analog input 1	for 4-20 mA transmitter signals and with ACDC® function
53	$I_{IN}8$	Analog input 1	
54	$I_{IN}9$	Analog input 1	
55	$I_{IN}10$	Analog input 1	
56	$I_{IN}11$	Analog input 1	
57	$D_{OUT}1$	Digital output 1	0 / 24 V DC Clock output
58	GND	Ground / earth	Device ground / earth
59	$I_{IN}12$	Analog input 1	for 4-20 mA transmitter signals and with ACDC® function
60	$I_{IN}13$	Analog input 1	
61	$I_{IN}14$	Analog input 1	
62	$I_{IN}15$	Analog input 1	
63	$I_{IN}16$	Analog input 1	
64	$D_{OUT}2$	Digital output 1	0 / 24 V DC Logic output

Notes:

- The terminal strips use plug-in terminals that are easy to remove. This makes it easier to reconnect or replace devices.
- To enable expansion modules to be connected efficiently to the top-hat rail, there are three-pin plug connections on the right and left sides of the device. The transmitter bus 3 is used for data connection.

Important notes:

- Only two of the three connections for transmitter bus 3 (right, left, terminal strip) may be used, as bus branches are NOT permitted. Star wiring is also prohibited.
- To prevent the side plug connection from coming loose, the devices must be secured against movement on the DIN rail during use.

4.3.4 Connecting the potential-free relay contacts

Additional external alarm devices such as alarm panels, acoustic signal devices, or similar can be connected to terminals R1-R8 (contacts of relays 1-8).

The contacts of adjacent relays 1&2, 3&4, 5&6 and 7&8 may only be operated with the same voltage category.

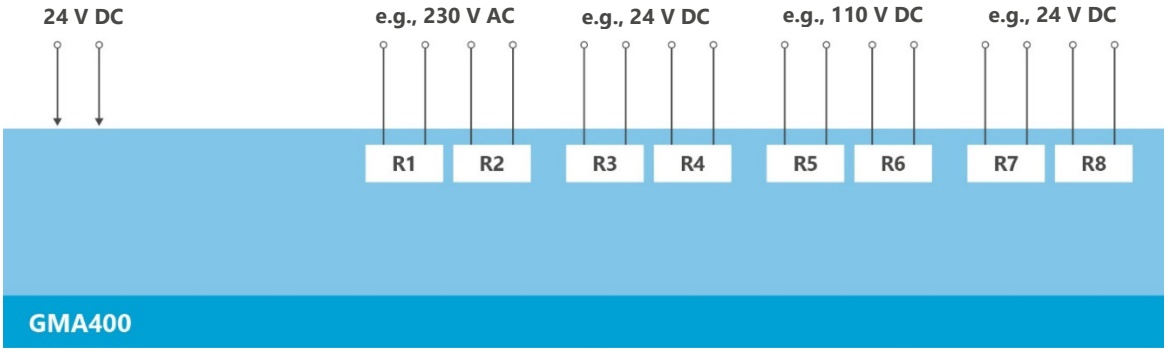


Figure 17: Connection of the potential-free relay contacts

Voltages that are dangerous to touch (e.g., 230 V AC) and protective extra-low voltages (e.g., 24 V DC) must not be connected to these adjacent relays at the same time.

Caution: Even if the GMA is disconnected from the 24 V DC supply, another voltage level at the relays may still carry a dangerous voltage. It must be ensured that dangerous voltages applied to the relays can be switched off. Overloading of the relay contacts must be prevented by suitable overcurrent protection devices.

4.3.5 Connecting the analog or ACDC® inputs

On the GMA400-MT16, the signal lines from up to 16 transmitters with an analog 4-20 mA or ACDC interface can be connected to terminals I_{IN1} through I_{IN16}. Only one input terminal (I_{IN}) is available per transmitter, so the transmitters must be powered separately via external terminals (*see Figure 9*).

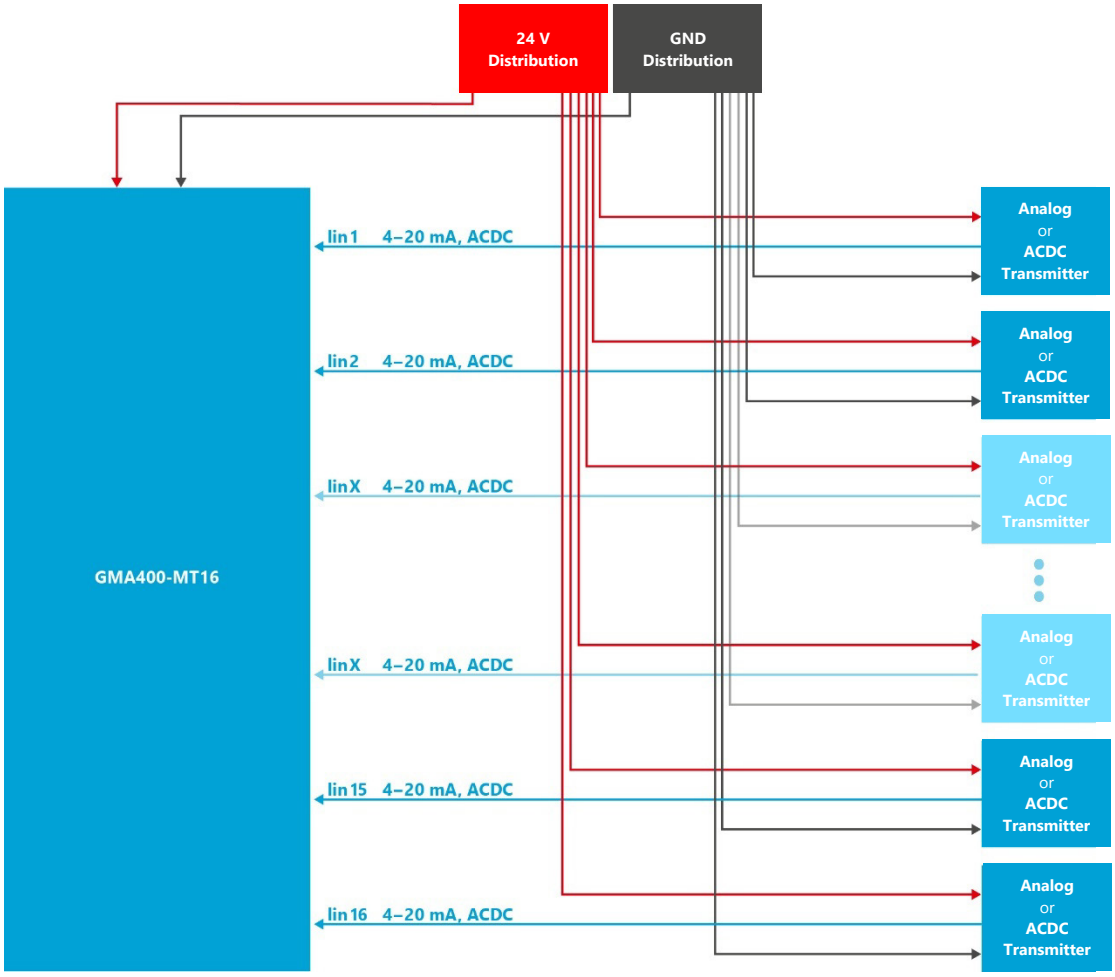


Figure 18: Transmitter connection GMA400-MT16 (analog / ACDC)

Note: If 24 V DC is accidentally connected to the I_{IN} connection terminals, the GMA400 detects a measured value exceedance, which is reported as a transmitter fault. The inputs are protected by electronic, reversible fuses, i.e., after the fault has been rectified, the inputs can be used again as usual.

Note: Please note that the bus addresses of the ACDC transmitters must correspond to the terminal numbers.

4.3.6 Connecting the digital RS-485 bus connections

Three connection terminals are available per RS-485 interface for the two differential data lines and the ground connection *(see table below)*. The polarity of the two data lines (D1+/A, D0-/B) must be observed when connecting. The 24 V DC power supply for the connected transmitters, relay and display modules or alarm panels must be provided separately via external terminals. The GMA bus is the only bus connection that is galvanically isolated (therefore DGND instead of GND).

RS-485 interfaces of the GMA400																	
COM bus			GMA bus (galvanically isolated)			TRM bus1			TRM bus2			TRM bus3			TRM bus4		
D1+	D0-	GND	D1+	D0-	DGND	D1+	D0-	GND	D1+	D0-	GND	D1+	D0-	GND	D1+	D0-	GND
A	B	-	A	B	-	A	B	-	A	B	-	A	B	-	A	B	-

For important information regarding data rates, cable lengths and cross-sections, bus termination of cycle times, and the maximum number of participants per bus: *See 2.3 Digital RS-485 bus connections*.

4.3.7 Connecting the digital inputs

The eight digital inputs are located at terminals D_{IN1} to D_{IN8}. External pushbuttons or switches can be connected there for various configurable functions (*see 2.4 Digital inputs*). The pushbuttons or switches can be connected using an external 24 V voltage (see figure below left) or, for increased safety up to SIL2, via the pulse outputs of the GMA at terminals D_{OUT1} and D_{OUT2} (*see **figure 20** below*). For increased safety up to SIL3, the digital inputs must be operated redundantly in conjunction with the pulse outputs, with two inputs for one function (*see **figure 21** below*).

The two pulse outputs supply a switched operating voltage of 24 V. At intervals of one second, the outputs are briefly switched off (1 ms) with a 180° phase shift in order to enable line monitoring even in redundant operation. In this way, short circuits in the connection cables can be detected and reported by a GMA fault.

Note: The evaluation of the test pulses requires that the digital inputs $D_{IN1,3,5,7}$ are connected to the pulse output D_{OUT1} and the digital inputs $D_{IN2,4,6,8}$ are connected to the pulse output D_{OUT2}.

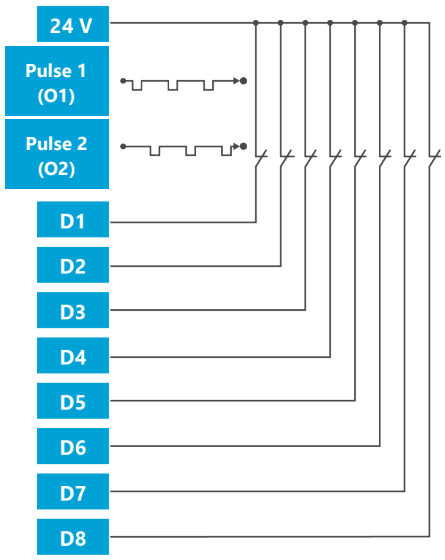


Figure 19: Eight digital inputs (up to SIL1)

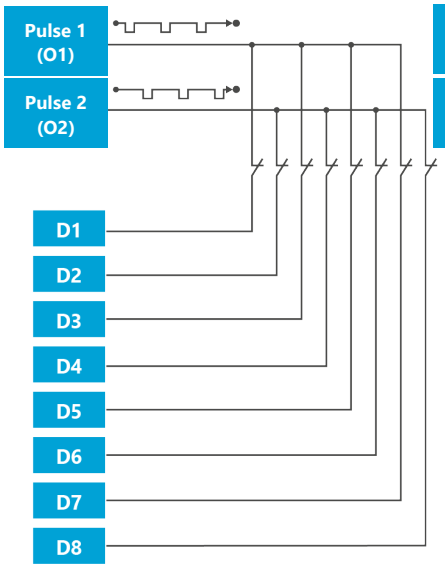


Figure 20: Eight digital inputs (up to SIL2)

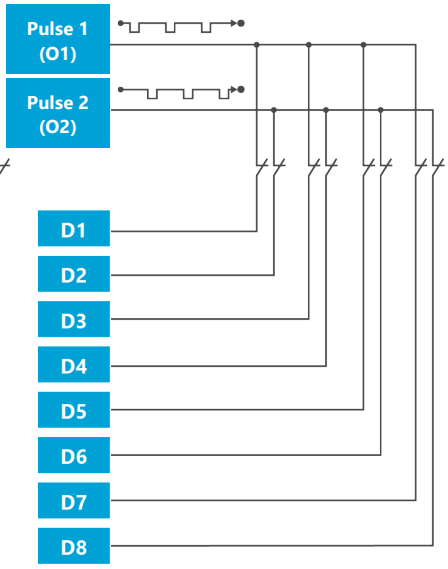


Figure 21: Four digital inputs (up to SIL3)

4.3.8 Connection to IT networks

The GMA has an Ethernet RJ45 socket to which a standard network cable can be connected. This connection can be used to connect to another device or to an extensive network.

It is possible to communicate with several different protocols simultaneously.

- The cable quality should be at least category 5 / 5e with at least two wire pairs. This can be a 1:1 or a crossed cable. The GMA400 supports the Auto MDI-X protocol, which automatically negotiates the transmit and receive wires. This allows the GMA to be connected directly to a PC or to a switch in a network infrastructure.
- The GMA supports transfer rates of 10 or 100 megabits per second.
- It should be noted that the standard maximum cable length from the GMA to the nearest network participant (switch, computer, etc.) must not exceed 100 meters. For example, this can be extended by another 100 meters using a switch located 100 meters away.
- Ethernet converters from copper to fiber optics are suitable for very long distances.
- It is also possible to use Ethernet converters from copper to WLAN. The relevant IT security requirements must be observed here.

4.4 Commissioning

Once the GMA400, all transmitters, and all additional control modules have been installed and the power supply has been ensured, commissioning can begin.

Gas detection devices must be checked for proper functioning by a qualified person after installation, but before starting monitoring operations (initial commissioning).

4.5 Examples of different system versions

Example of a system consisting of a GMA400-M connected to 128 transmitters, 8 relay modules, and 16 display and relay modules (transmitters, relay modules, and display and relay modules can also be mixed on the buses!):

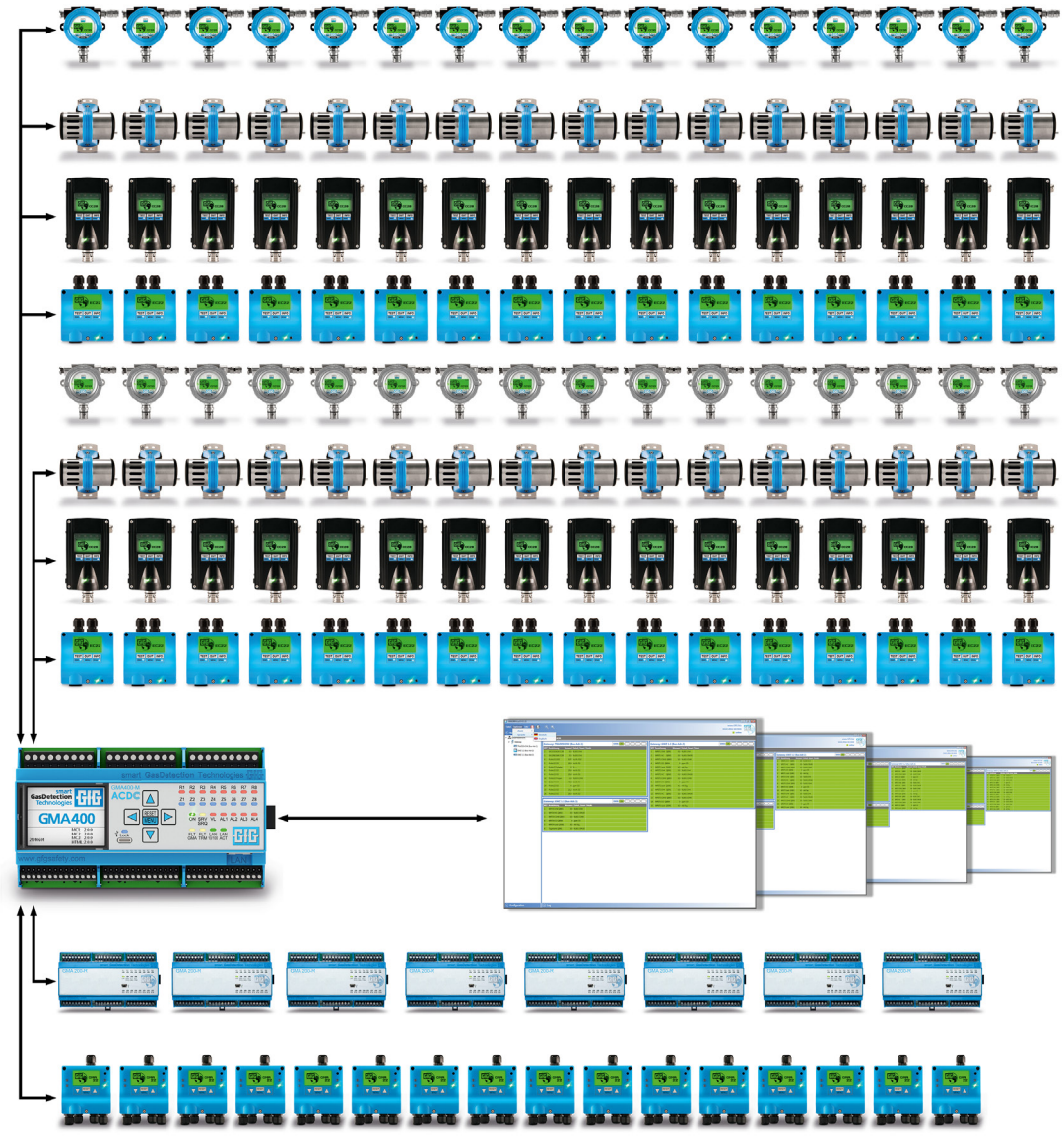


Figure 22: Example system consisting of GMA400, transmitters, relay modules, and relay and display modules

5 Operation

This chapter contains all the information you need to operate the GMA400 – from starting the device and the startup phase to monitoring operation, special states, and messages from the GMA and transmitters.

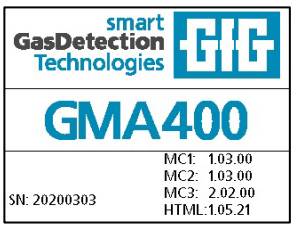
5.1 Keyboard and display

The GMA400 keyboard can be used to acknowledge alarms and messages on the display. The keyboard can be used to navigate in the main menu and service menu. Some configuration settings can even be changed in the service menu. The functions of the individual keys and menu navigation are described below:

Key	Function when pressed:
	Alarm acknowledgment for self-holding alarms (when key is pressed briefly) Activate main menu (when key is pressed for >3 seconds)
	Access to detailed information in the menu, change the measuring point display to the individual measuring point display, switch from the alarm display function to the display, select the position for entries in the service menu.
	Switch to other menu items, change measuring point(s) in the measuring point display, characters for entering data in the service menu
	Exit detailed information in the menu, exit the main menu, change the display to show all measuring points, switch from display function to alarm display function, select position for entries in the service menu
	Switch to other menu items, change the measuring point(s) when the measuring point is displayed, character for entering data in the service menu, activate the autoscroll function (10 sec. or 10 min., automatic switching of the display)

If the GMA400 is in monitoring mode, the menus can be accessed by pressing and holding the  button (approx. 3 seconds). The main menu is then displayed first. From there, you can switch to various submenus and also to the "Service menu."

5.2 System start



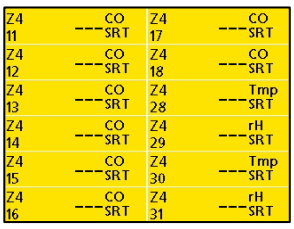
When the system starts, the GfG logo, the device name, and first the version numbers of the bootloader and then the version numbers of the firmware are displayed.

During this time, various internal self-tests are performed. After the internal tests are complete, a short test of the display, all LEDs, and the horn is performed.

If no errors occur during the internal self-tests, the device enters the special startup state (run-in time) or normal measurement mode.

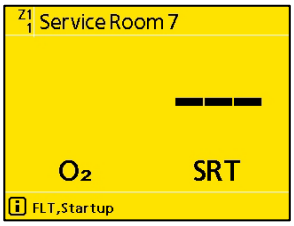
Note: Serial and version numbers may differ from the display on the left.

5.2.1 Startup (warmup time)



The connected transmitters usually require a warmup/startup time. To enable digital and ACDC® transmitters to start up themselves, the GMA400 waits 30 seconds after being switched on before addressing the transmitters with a digital interface.

Even if only transmitters with an analog interface are connected, the device waits for at least 30 seconds. Depending on the connected transmitter, the warmup time can be extended individually by up to a few minutes via a special analog level or by telegram. During this time, "SRT" or **"FLT, Startup"** is shown on the display for the individual measuring points.

	Depending on the transmitter or sensor type, normal measuring operation is started at different times. The "FLT/TRM" fault LED only turns off when all measuring points are ready for operation.

5.3 Monitoring operation

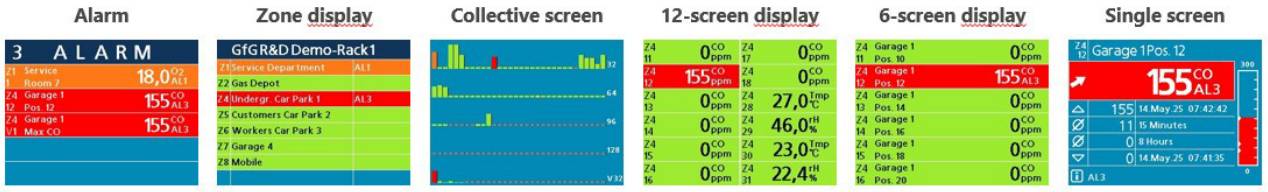
In monitoring mode, the measured values are continuously recorded and monitored for special conditions and alarms for each measuring point. Various transmitter statuses are displayed in the measured value screen with the corresponding color coding as shown in the following table.

Measuring point in the display	Color	Description
Normal	Green	The measuring point is operating without any abnormalities. No alarm or special status is active. The measured value is within the measuring range and is shown on the display.
Underrange	Green	Slight undershoot of the measuring range, still above the underrange fault level. When the underrange level is reached, the measured value is displayed alternately with downward arrows.
Overrange	Green	Slight overrange still below the overrange fault level. When the overrange level is reached, the measured value is displayed alternately with upward arrows.
Special condition	Yellow	Special status such as fault, service, or service request is active (e.g., when the measuring range falls below the underrange fault level).
Transmitter alarm	Dark green	A digital transmitter reports a self-evaluated local alarm. However, the GMA does not report an alarm for this transmitter.
Ventilation active	Blue	The measuring point is causing ventilation in a zone.
Alarm 1	Orange	The GMA400 reports an active alarm 1 (pre-alarm).
Alarm 2, 3, 4	Red	The GMA400 reports an active alarm 2, 3, 4 (main alarms).

In normal monitoring mode, most LEDs are not active and the ON indicator lights up green. The network LEDs light up according to the existing connection (*see 2.1.2 LED status indicators*).

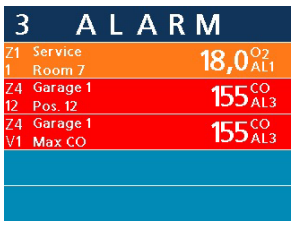
5.3.1 Measured value screens

In monitoring mode, the display shows the measuring points with numbers, designations, and the current measured values. You can switch between the collective and individual displays using the control buttons.
In the event of an alarm, the device automatically switches to the alarm screen. In addition, the internal alarm bar located to the left of the display is activated (*see figure 2 at 2.1 Device structure*).



Screens are only displayed if the maximum number of display positions in the next smaller display menu is exceeded. If fewer than or exactly 12 measuring points are active, the collective screen is not displayed.

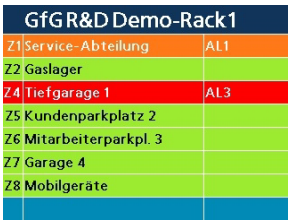
5.3.1.1 Alarm screen



All pending alarms are displayed in their assigned color (orange or red).

Caution: If a measuring point was in alarm status and is now in fault status with an invalid measured value (e.g., COM error with digital transmitter), the pending alarm remains and the measuring point is also displayed in yellow on the alarm screen.

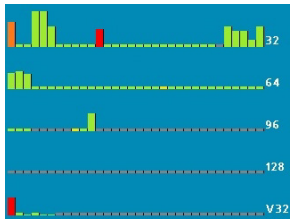
5.3.1.2 Zone screen



Displays the following information:

- Device designation
- Zone designation for all zones
- Color coding of the zone alarm status
  (orange/red: alarm, yellow: special status, green: other)

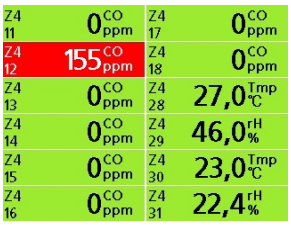
5.3.1.3 Collective screen



Displays all measuring points in an overview (only if more than 16 measuring points are parameterized!). The height and color of the bars allow the measured values to be roughly estimated. The top four lines refer to physical measuring points and the bottom line to virtual measuring points:

- Gray: Measuring point deactivated
- Orange/red: Alarm
- Yellow: Special status
- Green: Valid measured value

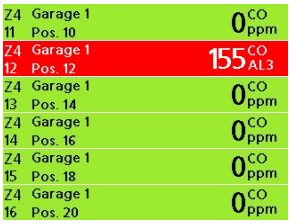
5.3.1.4 Screen with 12 measuring points



Only available for more than 6 parameterized measuring points with the following information:

- Zone + measuring point number
- Large display of the current measured value
- Color coding of the alarm status
  (orange/red: alarm, yellow: special status, green: other
- Gas measured value in the corresponding unit of measurement

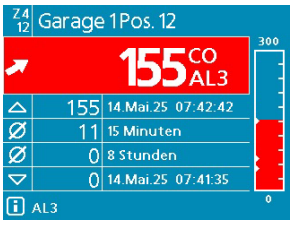
5.3.1.5 Screen with 6 measuring points



Only available if more than one measuring point is parameterized, with the following information:

- Zone + measuring point number
- Large display of the current measured value
- Color coding of the alarm status
  (orange/red: alarm, yellow: special status, green: other
- Gas measured value in the corresponding unit of measurement
- Measuring point designation

5.3.1.6 Single measuring point screen



- Zone + measuring point number
- Large display of the current measured value
- Color coding of the alarm status
  (orange/red: alarm, yellow: special status, green: other
- Gas reading in the corresponding unit of measurement
- Trend indicator
- Measuring point designation
- Maximum and minimum value with time indication
- Display of two average values
- Bar chart with start and end of measuring range, alarm thresholds
- If applicable: Detailed display of special status

5.3.1.6.1 Trend display

In the single measuring point screen, a trend indicator with an arrow to the left of the measured value is displayed. This allows easy assessment of the dynamic behavior of the previous measured value. The trend indicator shows a constant, rising, or falling gas concentration.

For evaluation, a reference to the mean value 1 is established:

- If the difference between the current measured value and the average value 1 is within three times the measuring range resolution, no arrow is displayed.
- If the difference between the current measured value and the mean value 1 is positive and greater than three times the measuring range resolution, an increasing concentration is reported (arrow pointing up to the right).
- If the difference between the current measured value and the mean value 1 is negative and greater than three times the measuring range resolution, a falling concentration is reported (arrow pointing down to the right).

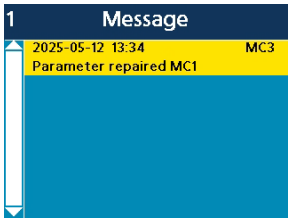
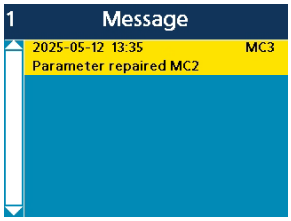
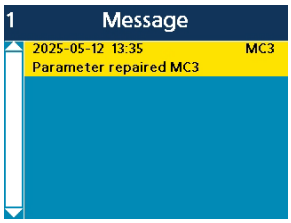
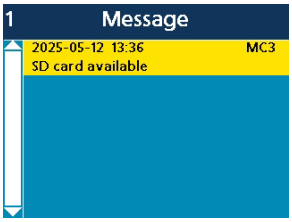
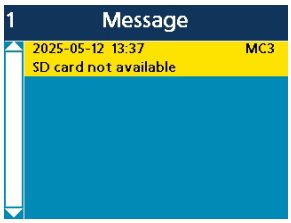
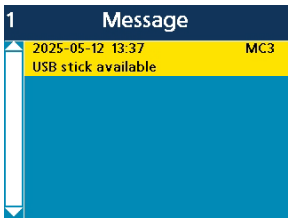
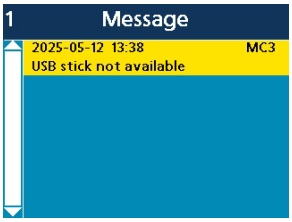
5.4 GMA400 messages

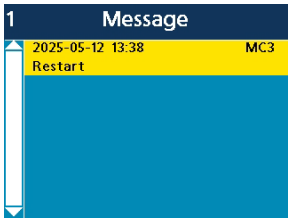
When certain system states occur, the GMA generates messages on the display. These are superimposed on the measured value screens and must be acknowledged by pressing the RESET button to return to the measured value display.

A distinction is made between messages relating to special states of the GMA (fault, maintenance, and maintenance request, *see 5.5 Special states of the GMA400)* on the one hand, and purely informative messages on the other.

After a message has been acknowledged, it can also be viewed retrospectively in the GMA menu *(see 6.2 State GMA400*).

The purely informative messages of the GMA are described below (*for messages in special status, see 7 Fault and 8 Maintenance and servicing*).

Messages (MSG)	Cause and remedy		MC		
			1	2	3
	**Working memory parameter has been repaired (MC1)**		-	-	X
	**Parameter memory has been repaired (MC2)**		-	-	X
	**Parameter RAM has been repaired (MC3)**		-	-	X
	**SD card**	**present**	-	-	X
		**removed**	-	-	X
	**USB stick**	**present**	-	-	X
		**removed**	-	-	X

Messages (MSG)	Cause and remedy	MC		
		1	2	3
	**Restart** Unexpected restart of one of the three microcontrollers; the memory address can be found in the event log. Possible causes include a strong EMC interference pulse or a software error. For further details, please contact your GfG service representative. Please have the firmware version number ready.	X	X	X

5.5 Special states of the GMA400

The device can be in the following special states:

- **Fault (FLT):**
  An acute fault has been detected that compromises proper operation. Immediate action is required, as the proper functioning of the gas detection system can no longer be ensured.
  For possible faults, *see 7 Fault*.
- **Service (SRV)**:
  The system or parts of the system are currently undergoing active maintenance. Maintenance personnel are on site and actively carrying out work.
  For information on the various aspects of maintenance, *see 8.2 Service (SRV)*.
- **Service request (SRQ)**:
  An impending malfunction has been detected but has not yet occurred. Service should therefore be carried out at short notice to prevent the impending malfunction.
  For information on possible service requests, *see 8.3 Service request (SRQ)*.

These special conditions are either activated directly by the GMA400 or triggered by a transmitter and forwarded to the GMA400.

As soon as faults or service requests are detected, they appear on the display. After acknowledgment, the device returns to the usual measuring point display. Faults and service requests that have already been acknowledged but are still active can be tracked in the menu system.

6 Menu system

The menu is activated by pressing and holding (>2 seconds) the RESET MENU button, after which the main menu list appears. Use the ▼ and ▲ buttons to select a different menu item. The ▶ button is available for this purpose, after which the submenu appears. Use ◀ to return to the higher level. Press ◀ in the main menu to return to the measurement screens.

The following is a tabular overview of the menu items.

Note: User identification and authentication (user ID and user PIN code) are required for the items in the service menu highlighted in yellow. Every attempt to access the service menu is logged internally.

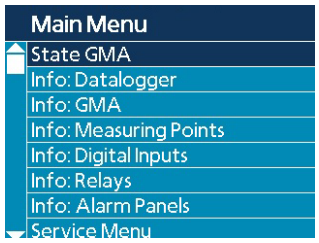
Upon delivery, a general user is created for configuration changes in the menu with PIN: "000" and ID: "0000". The PIN should be changed immediately by an authorized user via the service menu (*see 6.8.1.1 Password(PIN)*). Additional users with their own ID and PIN can also be created for unique user identification and authentication.

View mode: Content can only be viewed.
Edit mode: Changes can be made.

Overview of the GMA400-M On-Screen Menus			
Main menu	**Level 1**	**Level 2**	**Level 3**
State GMA	Fault		
	Service		
	Service Request		
	Message		
Info: Datalogger	Info: Intern Logging	Info: Event-Log	
		Info: Security-Log	
	Info: SD-Card		
	Info: USB-Stick		
Info: GMA	Info: Device		
	Info: GMA		
	Info: System	Int.measurements	
		Test: Display	
		Test: LEDs/Horn	
	Info: Buses	TRM-Bus1	
		TRM-Bus2	
		TRM-Bus3	
		TRM-Bus4	
		GMA-Bus	
		ACDC®	
		COM-Bus	
	Info: Network	IPv4	
		Modbus/TCP	
		Webserver	
		Network Configuration	

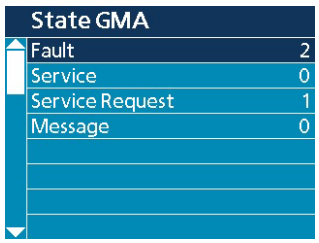
Info: Measuring Points	Info: Zones	Zone	
	Info: Transmitter Groups	Transmittergroup	
	Info: Measuring Points	Measuring Point	
Info: Digital Inputs	Digital Input		
Info: Relays	Info: Internal Relays		
	Info: Relay Modules	Relay Module State	
		Info: Relay	
	Info: Display Modules	Display module State	
		Info: Relay	
	Info: Alarm Panels	Alarm Panel State	
		Info: Light	
		Info: Horn	
Info: Alarm Panels			
Service Menu	System Settings	Password (PIN)	
		Time/Date	
		Language	
		Horn Volume	
		Next system check	
	Bus Settings	Bus Settings	
	Network Settings	IPv4	
	Measurement Point Settings	Transmitter Groups	
		Measuring Points	Enable
			Inhibit
			Settings
		Fine adjustment	
		Remote adjustment	
		Simulation	
	Relays	Relays	
		Test Relays	
		Time Control	
	Alarm Panels	Inhibit Outputs	
		Test Outputs	
Help	Abbreviations		

6.1 Main Menu



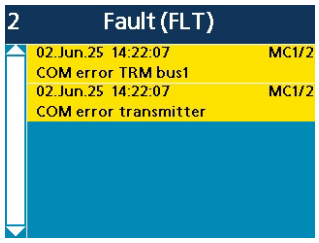
Main Menu:
The user is guided through the main menu using the buttons on the GMA400 (*see 5.1 Keyboard and display*). The dialogs described below apply to the display language "English."

6.2 State GMA400



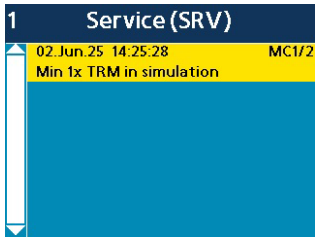
State GMA400:
The status of the GMA400 with all pending and acknowledged faults, service tasks, service requests, and messages can be viewed here. These status messages are automatically displayed on the screen and must be acknowledged.

6.2.1 Fault



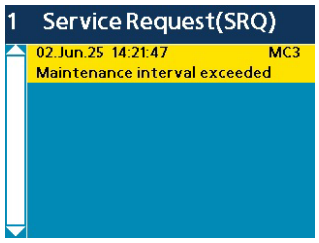
Fault (FLT):
A list of pending but already acknowledged fault messages can be accessed here. The number of messages in the list is displayed in the top left of the header.

6.2.2 Service



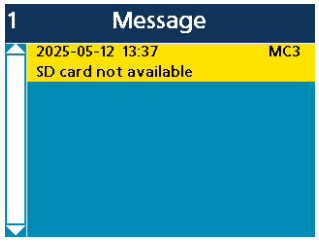
Service (SRV):
A list of pending but already acknowledged service tasks can be accessed here.

6.2.3 Service Request



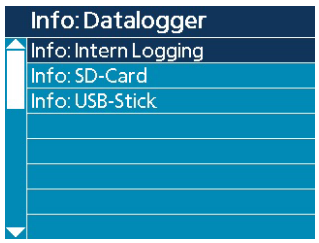
Service Request (SRQ):
A list of pending service requests that have already been acknowledged can be accessed here.

6.2.4 Message



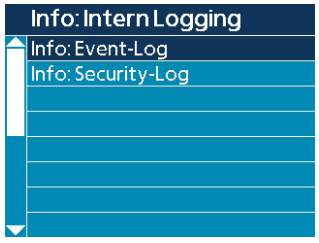
Message:
A list of other messages that are still pending but have already been acknowledged can be accessed here. The number of messages in the list is displayed at the top left of the header.

6.3 Info: Datalogger



Info: Datalogger:
Data is logged internally – and optionally externally – on an SD card and/or USB stick (configurable). Some information on this can be found in the corresponding submenus.

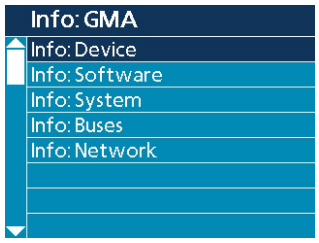
6.3.1 Info: Intern Logging



Info: Intern Logging:
The GMA logs a wide range of information with time stamps in an event and security log, which can be accessed in the following menu items.
The information is retained even when the power is off and is not deleted when the system is restarted.

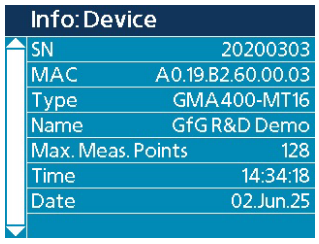
6.4 Info: GMA

Information about the GMA400 and its parameterization can be accessed in the following menu items.



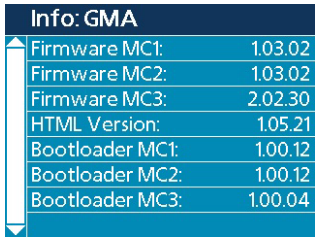
Info: GMA:
Submenu with important system settings for the GMA400

6.4.1 Info: Device



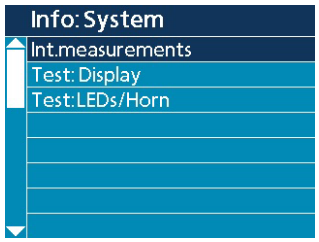
Info: Device:
Here the user can view various device information such as serial number, MAC address, GMA type and designation, number of activated measuring points, and date and time.

6.4.2 Info: Software



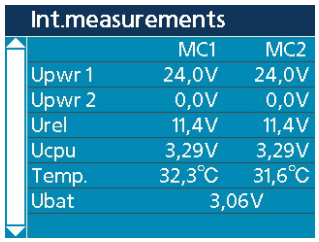
Info: Software:
Here the user can view the firmware versions of the application and bootloader for all processors and the HTML version.

6.4.3 Info: System



Info: System:
Here the user will find submenus for displaying internal measurements and for executing test functions (display, LEDs, and horn).

6.4.3.1 Internal measurements

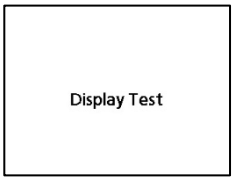
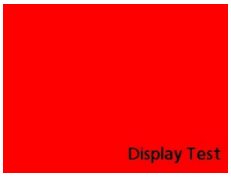
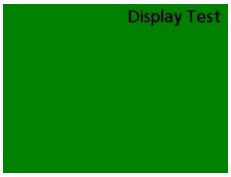


Internal measurements:
The following internal measurements are displayed here:

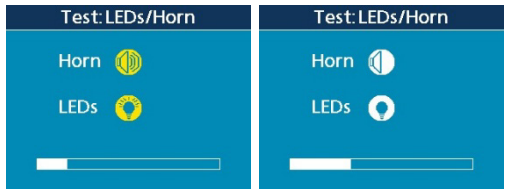
- Supply voltage Upwr 1
- Supply voltage Upwr 2
- Relay supply voltage Urel
- CPU supply voltage Ucpu
- Internal device temperature Temp.
- Buffer battery voltage Ubat

6.4.3.2 Test: Display

During the display test, the following color displays are shown one after the other. These can then be checked by the user for pixel errors.

White	Black	Red	Green	Blue
				

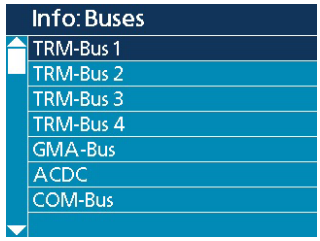
6.4.3.3 Test: LEDs/Horn



Test: LEDs/Horn:
The LEDs and the horn are switched on and off alternately three times in succession.

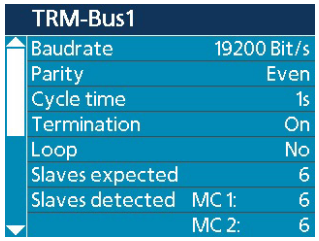
Caution: The two LAN LEDs are excluded from this test and cannot be tested!

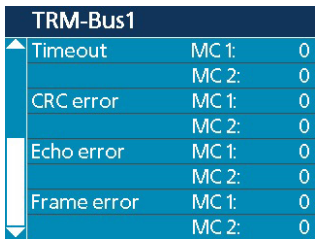
6.4.4 Info: Buses



Info: Buses:
There is a separate menu entry for each bus and the ACDC interface with the respective parameterization and status. For a detailed description of the parameters: *See 6.8.2 Bus Settings*.

6.4.4.1 TRM-Bus1 ,2, 3, 4, GMA-Bus, ACDC, COM-Bus





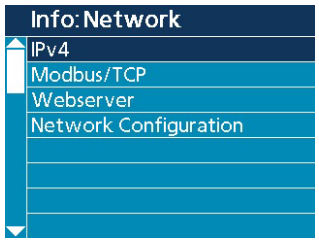
TRM-Bus1 ,2, 3, 4, GMA-Bus, ACDC, COM-Bus:
The parameter settings for the buses and the ACDC interface can be viewed here. In addition, the error counters are displayed, which represent the quality of the data transmission.

Timeout signals that a participant is not available.

CRC or frame errors signal, for example, interference pulses that have disrupted data transmission.

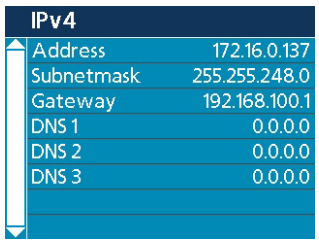
Echo errors mean that the GMA400 has failed to receive the telegrams it sent itself (echo). This indicates, for example, a short-circuited bus.

6.4.5 Info: Network



Info: Network:
The network parameters can be viewed in the submenus here.

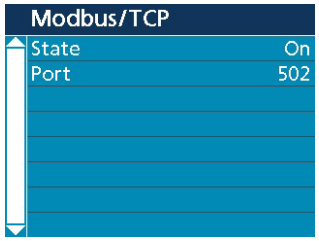
6.4.5.1 IPv4



IPv4:
The following parameters are displayed:

- IP address of the GMA
- IP network mask
- IP address of the gateway
- DNS1
- DNS 2
- DNS 3

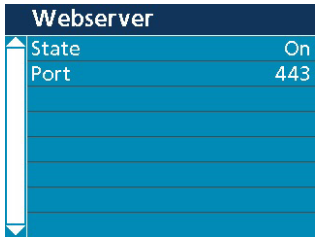
6.4.5.2 Modbus/TCP



Modbus/TCP:
The following parameters are displayed:

- State:
  - On / Off
  - Locked (requires unlocking)
- Port:
  - Port number (default = 502)

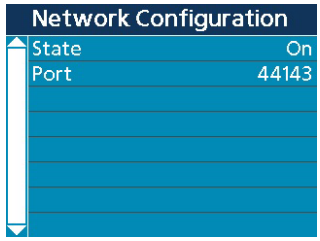
6.4.5.3 Webserver



Webserver:
The following parameters are displayed:

- State:
  - On / Off
  - Locked (requires activation)
- Port:
  - Port number

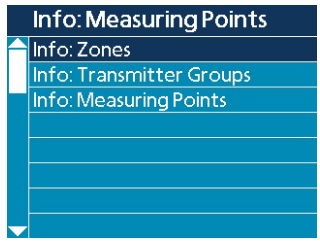
6.4.5.4 Network Configuration



Network Configuration:
The following parameters are displayed:

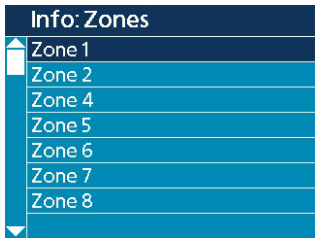
- State:
  - On / Off
- Port:
  - Port number

6.5 Info: Measuring Points



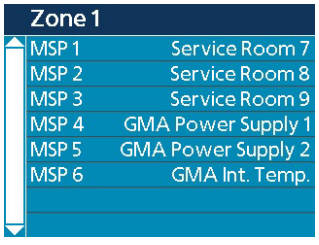
Info: Measuring Points:
The parameterization of all measuring points can be viewed in the following menu items. It is not possible to change the parameterization here; *see 6.8.4 Measuring Point Settings* for more information.

6.5.1 Info: Zones



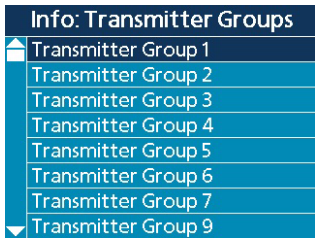
Info: Zones:
Select one of up to 8 active zones to display the assigned measuring points (Zone 3 is not activated in the example on the left!).

6.5.1.1 Zone



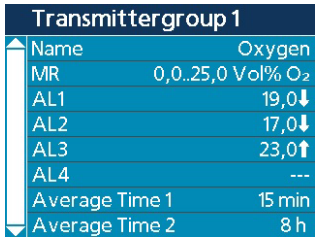
Zone:
The measuring points assigned to the selected zone are displayed with their numbers and names.

6.5.2 Info: Transmitter Groups



Info: Transmitter Groups:
Option to select one of up to 16 transmitter groups to display the parameterization

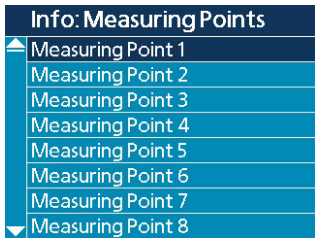
6.5.2.1 Transmittergroup

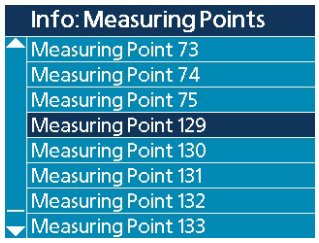


Transmittergroup 1:
Parameterization of the selected transmitter group:

- Designation
- Measuring range with gas type and unit
- Alarm thresholds 1 to 4:
  - Arrow next to the value: Indicates whether the alarm is triggered by exceeding or falling below the threshold
  - "Ø1" before value: Alarm based on average value 1
  - "Ø2" before value: Alarm based on average value 2
  - Without "Ø1" or "Ø2": Alarm based on the current value
  - "---": Alarm deactivated
- Average Times 1 and 2

6.5.3 Info: Measuring Points

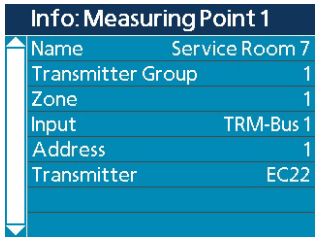


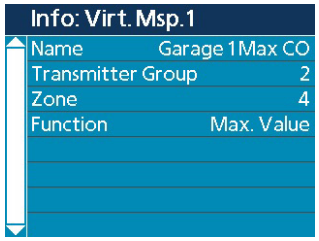


Info: Measuring Points:
Individual selection of up to 160 active measuring points to display the parameterization:

- 128 real measuring points (1 to 128)
- 32 virtual measuring points (129 to 160)

6.5.3.1 Info: Measuring Point





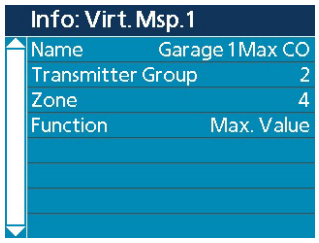
Info: (Virtual) measuring point 1:
Parameters of the physical measuring points:

- Designation
- Assignment to transmitter group and zone (number)
- Input assignment:
  - For digital: Bus assignment (TRM/GMA-Bus)
  - For internal: Assignment to internal measured value (Uin1, Uin2, Max of Uin1/2, temperature)
  - For analog: "4-20mA" with terminal number
  - For ACDC: "ACDC" with terminal number
- Address (only for digital and ACDC): Bus address
- Transmitter type (e.g., EC22)

Parameters of the virtual measuring points:

- Designation
- Assignment to transmitter group and zone (number)
- Function (absolute humidity, min, max, average)

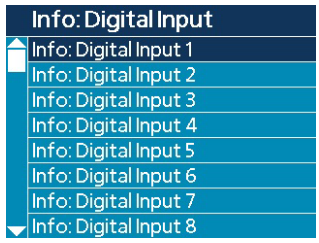
6.5.3.2 Info: Virtual Measuring Point



Info: Virtual measuring point 1
The following parameters are displayed:

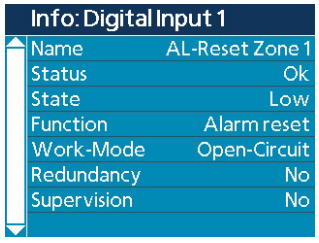
- Measuring point designation
- Assignment to transmitter group and zone (number)
- Function (absolute humidity, min., max., average value)

6.6 Info: Digital Inputs



Info: Digital Inputs:
Option to select one of the 8 digital inputs to display parameterization and status

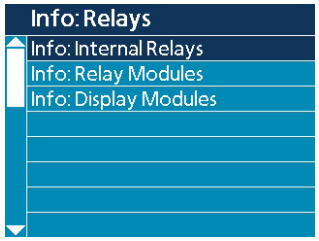
6.6.1 Info: Digital Input



Info: Digital Input 1:
Status and parameterization of the selected digital input:

- Designation
- Status (Ok or Fault)
- State (input level: Low or High)
- Function (Off, Alarm reset, Fire alarm, Ventilation, Relay timer start, Service, Relay test, Flow monitoring)
- Work-Mode (Closed-Circuit or Open-Circuit)
- Redundancy (Yes or No)
- Supervision (Yes or No)

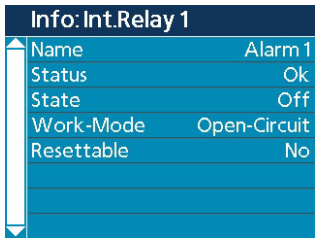
6.7 Info: Relays



Info: Relays
Selection of a relay group for further selection of a specific relay. Entries for relay modules and display modules are only shown if at least one relay or display module is activated.

6.7.1 Info: Internal Relays

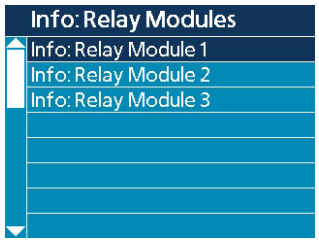
Info: Internal Relays:
Selection of one of the 8 internal relays to display the parameterization and status



Info: Int. Relay 1:
Status and parameterization of the selected internal relay:

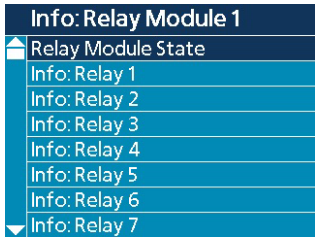
- Designation
- Status (Ok, Locked or Fault)
- State (On or Off)
- Work-Mode (Closed-Circuit or Open-Circuit)
- Resettable (Yes or No)

6.7.2 Info: Relay Modules

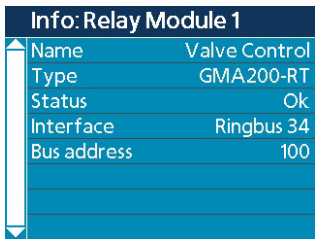


Info: Relay Modules:
Option to access one of up to 8 relay modules to select the status, parameterization, or a relay of this relay module. This menu is only available if at least one relay module is activated.

6.7.2.1 Relay Module State



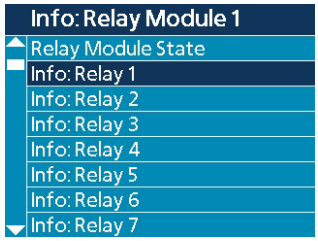
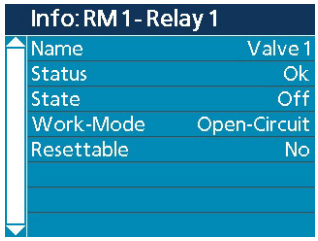
Info: Relay Module 1 / Relay Module State:
Option to select a relay module to display status or parameterization



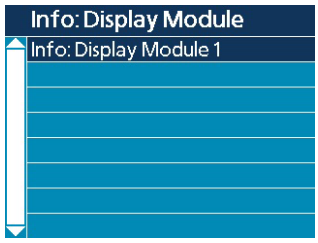
Info: Relay Module 1:
Status and parameterization of the relay module:

- Designation
- Type (GMA200-RT)
- Status (Ok / COM error / Fault / Service / Service request)
- Interface (bus assignment to TRM/GMA bus)
- Bus address

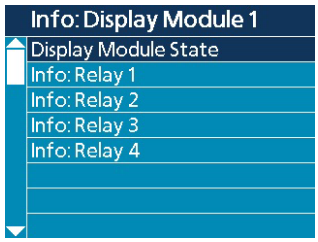
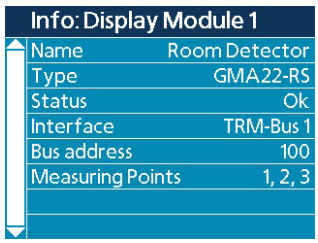
6.7.2.2 Info: Relay

	**Info: Relay 1** Option to select one of the 16 relays of the relay module to display status or parameterization
	**Info: Relay 1**: Status and parameterization of the selected relay module relay: • Designation • Status (Ok / Locked /Unknown in case of COM error) • State (On or Off) • Work-Mode (Closed-Circuit or Open-Circuit) • Resettable (Yes or No)

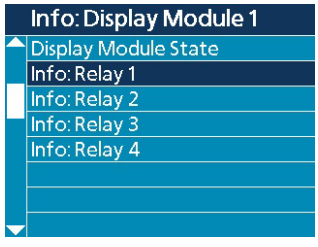
6.7.3 Info: Display Module

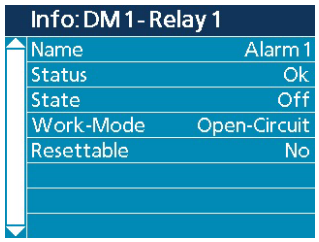
	**Info: Display Module:** Option to access one of up to 16 display modules to select the status, parameterization, or a relay of this display module. This menu is only available if at least one display module is activated.

6.7.3.1 Display Module State

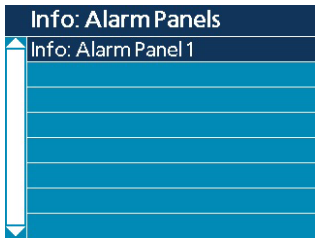
	**Display Module State:** Option to access one of the display modules to select the status or parameterization
	**Info: Display Module 1:** Status and parameterization of the display module: • Designation • Type (GMA22-RS/RW) • Status (Ok / COM error / Fault / Service / Service request) • Interface (bus assignment to TRM/GMA-Bus) • Bus address • Measurement points (IDs) assigned for display

6.7.3.2 Info: Relay

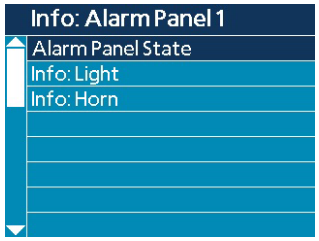
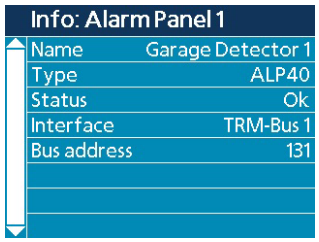
	**Info: Display Module / Relay 1:** Option to access one of the 4 relays of the display module to select the status or parameterization.

	**Info: Relay 1:** Status and parameterization of the selected display module relay: • Designation • Status (Ok / Locked /Unknown in case of COM error) • State (On or Off) • Work-Mode (Closed-Circuit or Open-Circuit) • Resettable (Yes or No)

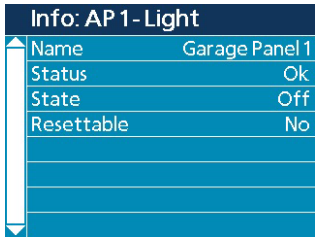
6.7.4 Info: Alarm Panels

	**Info: Alarm Panels:** Option to access one of up to 64 alarm panels to select the status, parameterization, or another output of this alarm panel (horn or light). The menu is only available if at least one alarm panel is activated.

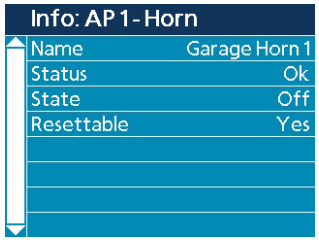
6.7.4.1 Alarm Panel State-Status

	**Alarm Panel State:** Option to select one of the alarm panels to display the status or parameterization
	**Info: Alarm Panel 1:** Status and parameterization of the selected alarm panel: • Designation • Typ (ALP30/40, M22 • Status (Ok / COM error / Fault / Service / Service request) • Interface (bus assignment to TRM/GMA-Bus) • Bus address

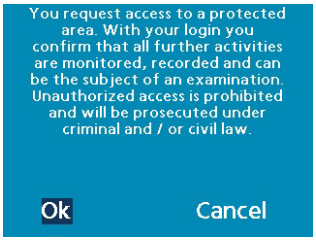
6.7.4.2 Info: Light

	**Info: Light:** Status and parameterization of the light output of the selected alarm panel: • Designation • Status (Ok / Locked / Unknown in case of COM error) • State (On or Off) • Resettable (Yes or No)

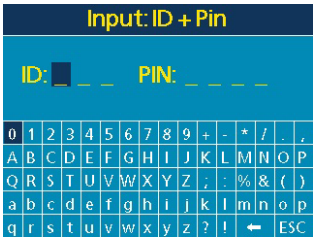
6.7.4.3 Info: Horn

	**Info: Horn:** Status and parameterization of the horn of the selected alarm panel: • Designation • Status (Ok / Locked / Unknown in case of COM error) • State (On or Off) • Resettable (Yes or No)

6.8 Service Menu



When opening the service menu, the user is informed in advance by an information text that access and any changes made there will be logged.

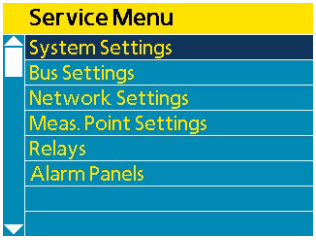


Access to the service menu:
Access to the service menu is protected and requires user identification (ID) and authentication (PIN). Each access or access attempt is logged in the device.

The entry is made by selecting the characters shown using the arrow buttons on the GMA400 and confirming with the Reset/Menu buttons.

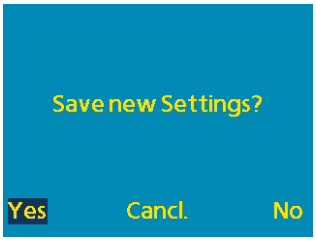
Select "ESC" to exit this menu.

Entries that have already been made can be corrected by selecting "←."



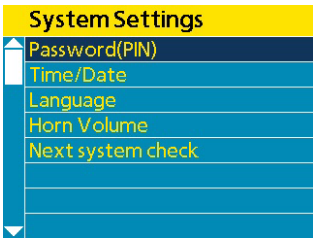
Service Menu:
Operating parameters can be changed in the service menu. To indicate this, the header and menu entries are displayed in yellow.

The menu entry "Warning lights" only appears if at least one alarm panel is active.



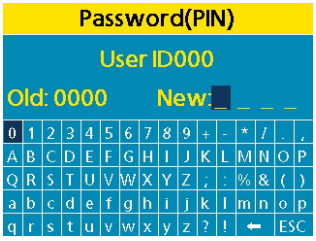
Saving changes:
If parameters have been changed in the respective submenus, the adjacent screen appears when you exit, asking whether the changed parameters should be saved or not. If you cancel, the user returns to the submenu for parameter changes so that adjustments can be made before saving. Selecting "No" discards the changes and selecting "Yes" saves them permanently.

6.8.1 System Settings



System Settings:
The system settings allow you to change basic parameters for the user or the GMA400.

6.8.1.1 Password(PIN)



Password(PIN):
You can change your own PIN in this menu item. It is not possible to change the user ID or PIN of another user.

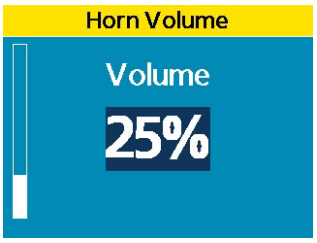
6.8.1.2 Time/Date

Time/Date:
The time and date of the GMA400 can be set here. The clock is battery-backed and therefore continues to run without power to the GMA. Settings therefore do not need to be reset after the power supply has been interrupted.

6.8.1.3 Language

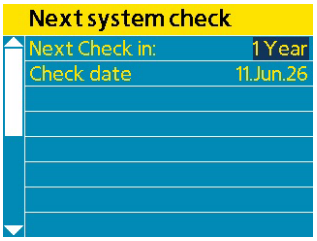
Language
Users can currently choose between German (Deutsch) and English as the display language.

6.8.1.4 Horn Volume



Horn Volume:
The volume of the internal horn can be adjusted between 0 and 100%.

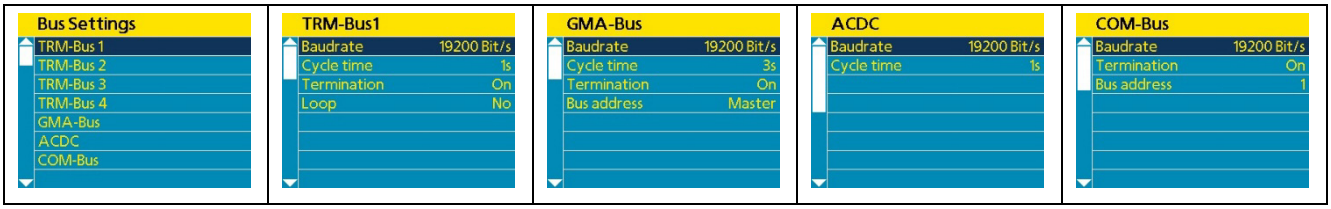
6.8.1.5 Next system check



Next system check:
The date of the next system check can be set as a fixed period after 3, 6, or 12 months **(Next check in)** or at any future date **(Check date)**.

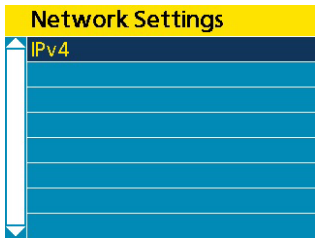
When the set date is reached, a maintenance request is reported or, optionally, a fault is reported 30 days after expiry (configurable).

6.8.2 Bus Settings



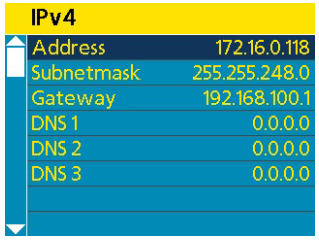
The basic bus settings can be viewed and, to a limited extent, changed in this menu item.

6.8.3 Network Settings



Network Settings:
The network settings can be configured here in the sub-items.

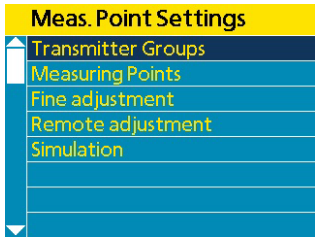
6.8.3.1 IPv4



IPv4 parameters:

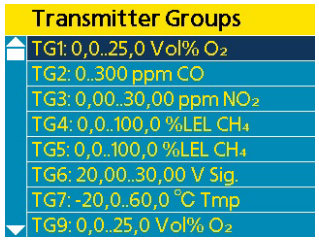
- IP address of the GMA
- IP network mask
- IP address of the gateway (currently not used)
- DNS 1 (currently not used)
- DNS 2 (currently not used)
- DNS 3 (currently not used)

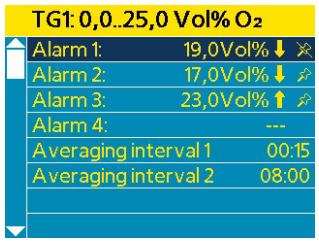
6.8.4 Measuring Point Settings



Measuring Point Settings:
The measured value-related parameterization of up to 160 measuring points – 128 real measuring points and 32 virtual ones – can be viewed here and modified to a limited extent. In addition, the measured value acquisition can be adjusted and measured values can be simulated.

6.8.4.1 Transmitter Groups





Transmitter Groups:
Alarm thresholds and averaging intervals for up to 16 transmitter groups can be modified here.

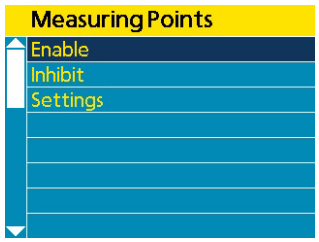
In addition to the abbreviation TG for transmitter group and the number, the selection list also displays the measuring range with gas type and unit.

For alarms, the following elements can be selected by pressing the Menu/Reset button:

- **Alarm threshold value:**
  The value can be changed using the up/down arrow buttons and the assignment to the current value or average value 1 or 2 can be selected using the right/left arrow buttons.
- **Arrow:**
  The up/down arrow buttons can be used to switch between alarms triggered by falling below or exceeding the threshold.
- **Pin:**
  The up/down arrow buttons can be used to switch between self-holding and non-self-holding.

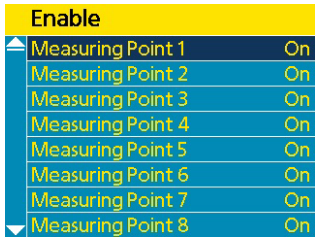
The Menu/Reset button is used to select minutes and hours for the average values; the up/down arrow buttons are used to adjust them.

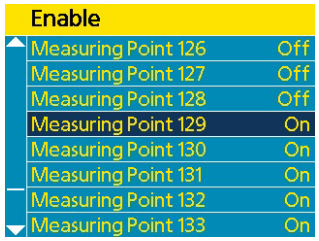
6.8.4.2 Measuring Points



Measuring Points:
The measured value-related parameterization of up to 160 measuring points – 128 real measuring points and 32 virtual measuring points – can be viewed here and changed to a limited extent.

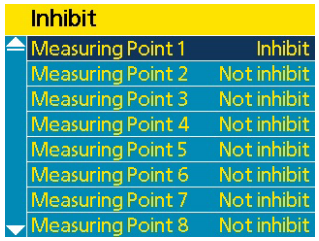
6.8.4.2.1 Enable

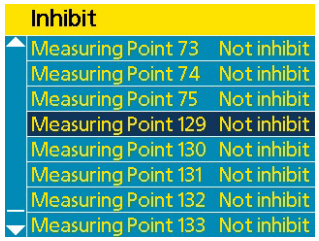




Activation of measuring points:
The 160 measuring points can be switched on or off here. The 32 virtual measuring points are listed after the 128 real measuring points (129 to 160).

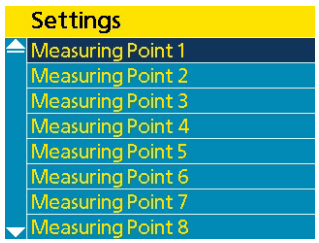
6.8.4.2.2 Inhibit



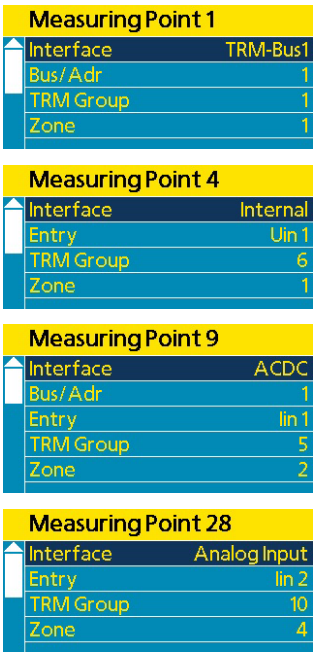


Inhibition of measuring points:
Here, the inhibition of up to 160 measuring points can be switched on or off. The 32 virtual measuring points are listed after the 128 real measuring points (129 to 160).

6.8.4.2.3 Settings



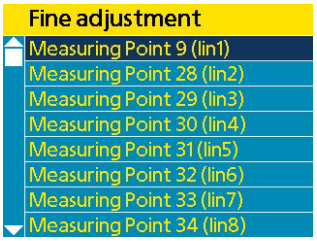
Settings
Here, one of up to 128 active, real measuring points can be selected to modify interface parameters or the assignment to a zone and transmitter group.



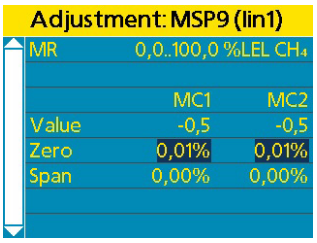
These menu items can be used to set the interface parameters and the assignment to zones and transmitter groups.

- **Interface**
  Assignment of the input interface
  - Bus connection (TRM/GMA-Bus)
  - Internal measured value
  - ACDC interface
  - Analog input
- **Bus address**
  Can only be set with bus connection or ACDC interface (1 to 247)
- **Input number**
  Only adjustable for analog and internal measured value
  - For analog: Analog input number (Iin1 to Iin16)
  - For internal: Internal measured value (Uin1, Uin2, Temp., Uin-Max)
- **TRM Group**
  Assignment to one of the transmitter groups 1 to 16, 0 = Undefined
- **Zone**
  Assignment to one of the zones 1 to 8, 0 = Undefined

6.8.4.3 Fine adjustment



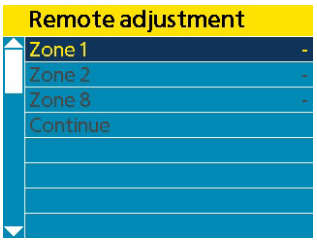
Fine adjustment:
Here, one of the up to 16 active measuring points with analog input can be selected for fine adjustment. Only analog measuring points with the analog input number Iin1 – in16 are listed in the selection window.



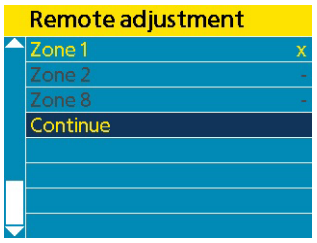
Fine adjustment settings:
The measured values of both processors are displayed side by side, together with the setting values for zero and span adjustment. The zero and span values can be selected and changed for both processors together or individually. For example, a basic adjustment can first be made for both processors together for a zero point deviation, and then the zero point can be set precisely for each processor individually.

The adjustment range for all values is: -1.28% to +1.27% of the measuring range

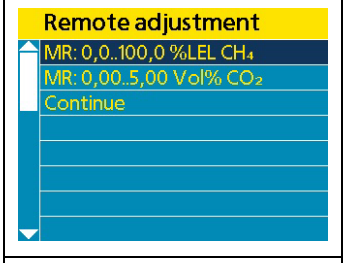
6.8.4.4 Remote adjustment

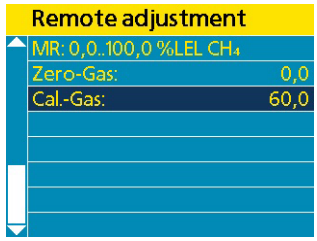


Remote adjustment, step 1: Select transmitter zones
Here, the user can first select up to 8 zones in which transmitters are to be adjusted. Only active zones are shown in the list. If a zone does not contain any digital transmitters that support remote adjustment, it is grayed out (i.e., the zone cannot be selected).



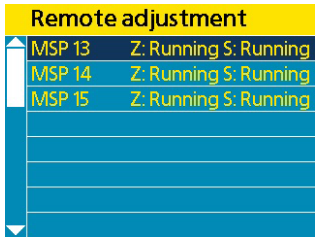
As soon as at least one zone has been selected with "x," the "Next" entry is enabled.

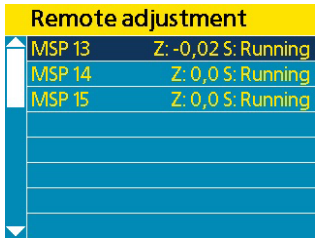




Remote adjustment, step 2: Select transmitter measuring ranges
The various measuring ranges of the transmitters for which remote adjustment is possible in the selected zones are then listed.

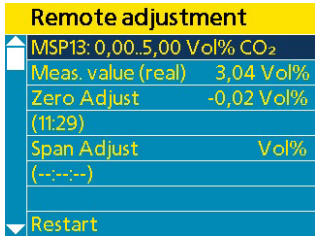
After selection, the zero gas and calibration gas concentrations for adjustment can be adjusted there. The back arrow button can be used to return to the measuring range list. The adjustment starts after selecting and confirming "Next."

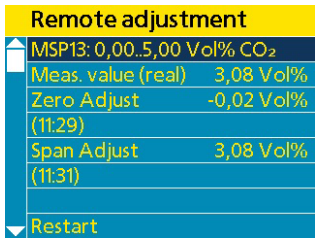




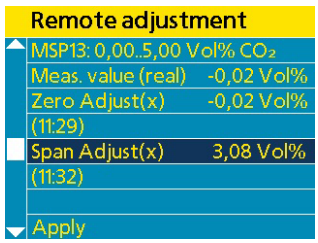
Remote adjustment, step 3: Adjustment status of the transmitters
An overview of the adjustment statuses of the transmitters follows. As soon as new zero and span values have been determined on the transmitter by entering the zero gas and calibration gas concentrations, these are displayed under "Z" and "S."

After selecting a measuring point, the user will be taken to a detailed view. If adjustment could not be started for a measuring point, it is grayed out with the status "N/A."

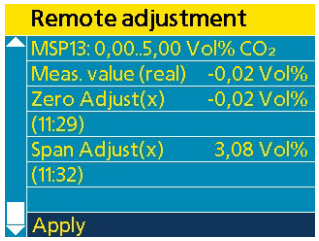




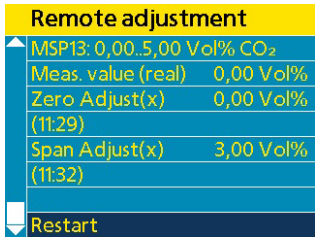
Remote adjustment, step 4: Display of values
The detail view shows the current measured value and the zero and span values determined for the selected measuring point, including the time. The adjustment can be restarted for the measuring point at any time by selecting and confirming "Restart."

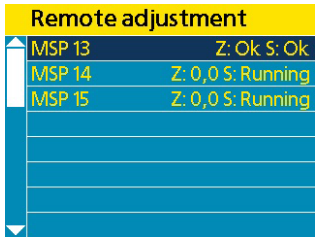


Remote adjustment, step 5: Selection of zero/span values
The determined zero/span values can be selected for transfer by marking them with "(x)."

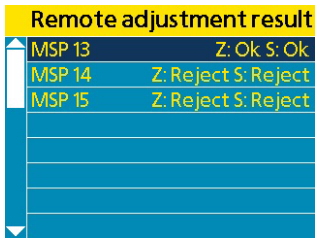


As soon as at least one value has been selected, the entry in the last line changes to "Apply." Selecting this line starts the transfer. Both values can be marked for transfer, or just one of the two.



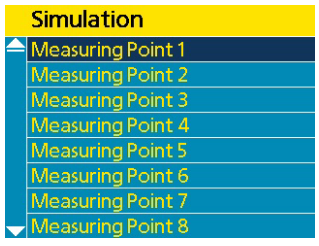


Remote adjustment, step 6: Transferring the values
After the transfer, the corrected zero/span values are displayed. In the last line, the adjustment for the measuring point can be restarted. The left arrow button returns to the overview, where successful transfer of the adjustment values is confirmed with "Ok." If an error has occurred, it is indicated accordingly and the adjustment must be repeated.



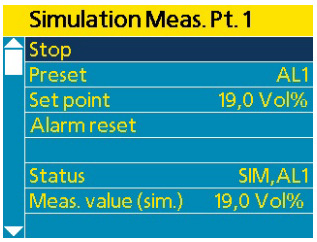
Remote adjustment, step 7: Finish and results overview
After confirming the query with "Yes," the adjustment can be ended for all measuring points using the left arrow button. An overview of the adjustment results follows. Adjustment values that have not been transferred are discarded, which is indicated by "Discard."

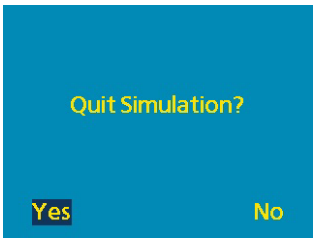
6.8.4.5 Simulation



Simulation: Selecting the measuring points
In the first step, one of up to 160 active measuring points is selected for simulation:

- Measuring points 1 to 128: Real measuring points
- Measuring points 129 to 160: Virtual measuring points





Simulation: Simulation screen

The simulation is started in the simulation window and one of the following target points is set:

- FLT+Underrange (fault at -7.5% of the measuring range)
- Underrange (at -5% of the measuring range)
- Start of measuring range (0% of measuring range)
- Alarms 1 to 4 (only activated alarms can be set)
- End of measuring range (100% of the measuring range)
- Overrange (at 105% of the measuring range)
- FLT overrange (fault at 112.5% of the measuring range)

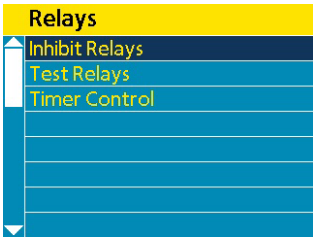
Alternatively, any setpoint value can be set.

Active alarms can be acknowledged via "Alarm reset" to, for example, switch off the acoustic alarm of the internal horn.

The status and simulated measured value are displayed in the lower part of the window. Simulation mode can be started for several measuring points in parallel.

Before exiting the simulation menu, a question appears asking whether the simulation should also be ended for all measuring points.

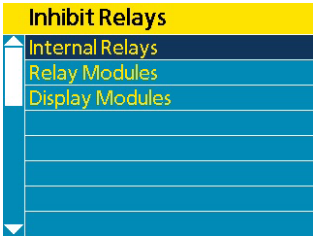
6.8.5 Relays



Relays:

The submenus for testing or locking the relays can be accessed here.
The relay time control is also started from this submenu.

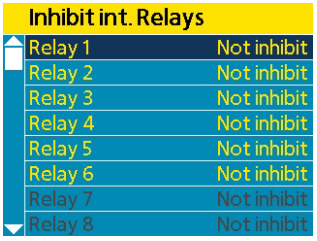
6.8.5.1 Inhibit Relays



Inhibit Relays, step 1: Inhibition selection
In the first step, the inhibition to be changed is selected.

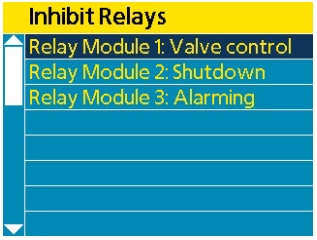
Entries for the relay and display modules are only shown if at least one corresponding module is active.

If internal relays are selected, the screen for inhibiting the relays opens directly.
For relay and display modules, an intermediate screen for selecting the specific module is shown first.

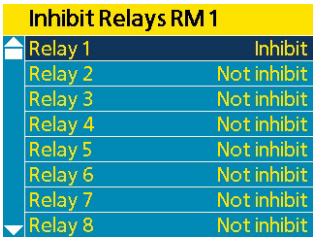


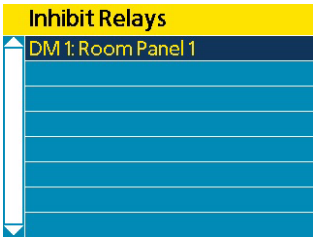
Inhibit int. Relays, step 2a: Relay selection
The fault and maintenance relays must not be interlocked for the internal relays (in the example on the left, these are relays 7 and 8). These relays are therefore grayed out and cannot be changed. Alternatively, a shared relay can be defined in the configuration for fault and maintenance, in which case only one relay would be grayed out.

The remaining relays can be changed and switched between "Not inhibit" and "Inhibit."

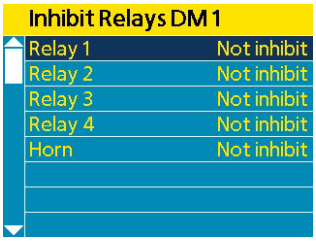


Inhibit Relays, step 2b: Relay module selection
Only active relay modules with a designation are listed in the on-screen menu for selecting the relay module. If the user selects a relay module, the screen for locking the relays is shown. There, all 16 relays and the horn of this relay module can be selected and the user can switch between "Not inhibit" and "Inhibit."

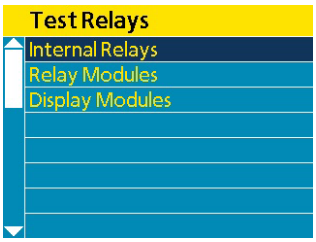




Inhibit Relays, step 2c: Display module selection
Only active display modules with their designations are listed in the window for selecting the display module. After selecting a display module, the user will be taken to the screen for inhibiting the relays. There, all 4 relays and the horn of this display module can be selected and switched between "Not inhibit" and "Inhibit."



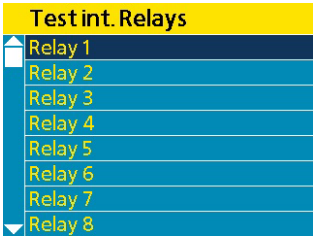
6.8.5.2 Test Relays



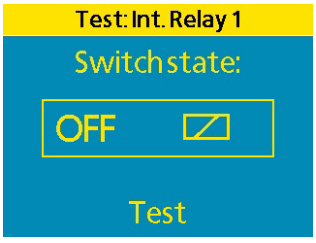
Test Relays, step 1: Relay selection for testing
First, the relay to be tested must be selected.

Entries for the relay and display modules are only shown if at least one corresponding module is active.

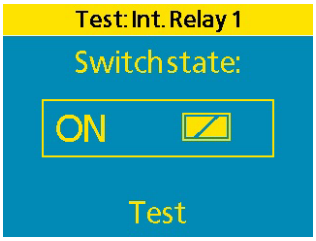
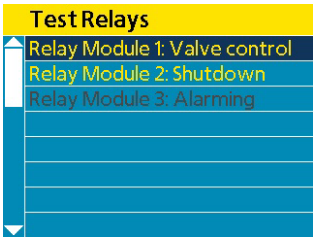
If internal relays are selected, the screen for selecting the relay opens directly. For relay and display modules, an intermediate screen for selecting the module appears first.

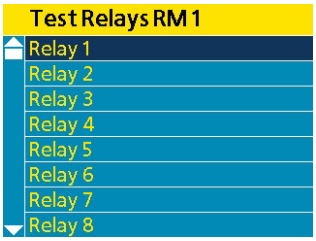


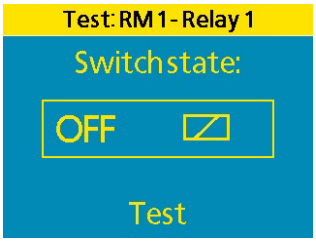
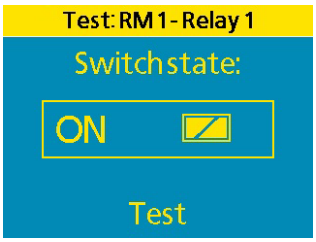
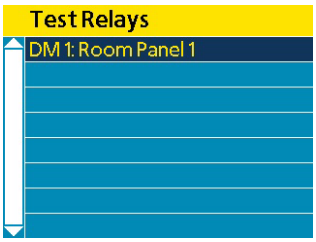
Test int. Relays, step 2a: Internal relay selection for testing
After selecting the internal relay to be tested, the user will be taken to the test screen.

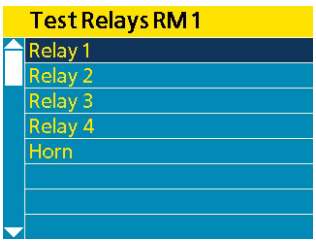


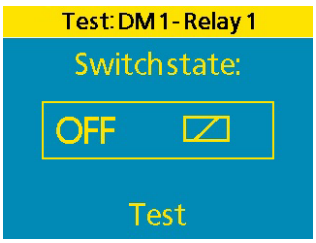
Here, the relay can be switched on or off using the Menu/Reset button.

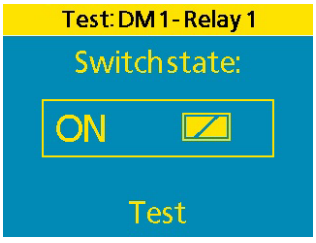
<table>
<tr><td> 
</td><td></td></tr>
<tr><td> 
</td><td>Test Relays, Step 2b: Relay module selection for testing
In the screen for selecting the relay module on which relays are to be tested, only active relay modules are listed with their designations. After selecting a relay module, the user will be taken to the screen for selecting the relay.

Relay modules that cannot exchange data due to a communication error are displayed as grayed out. Relay testing is not available for these modules.</td></tr>
<tr><td> 
</td><td>Test Relays, Step 2b-1: Selecting a relay module relay
The relay module relay to be tested is selected in this step.

This is followed by the test screen, where the relay can be switched on and off using the Menu/Reset button.</td></tr>
<tr><td> 
</td><td></td></tr>
<tr><td> 
</td><td></td></tr>
<tr><td> 
</td><td>Test Relays, Step 2c: Selecting a display module
In the selection screen for the display module whose relays are to be tested, only active display modules are listed along with their designation. After selecting a display module, the screen for selecting the relay opens.

Display modules with no data exchange due to a communication fault are shown grayed out. Relay testing is not possible for these modules.</td></tr>
<tr><td> 
</td><td>Test Relays, Step 2c-1: Selecting a display module relay
After selecting the display module relay to be tested, the test screen opens, where the relay can be switched on and off using the Menu/Reset button.</td></tr>
</table>



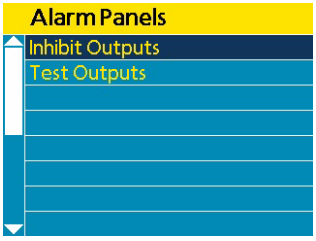


6.8.5.3 Time Control

Time Control:
After confirming the "Start" menu item with the Menu/Reset button, a new cycle of the relay time control is started (*see 6.8.5 Relays*).

A message screen appears briefly indicating that the relay time control has been started.

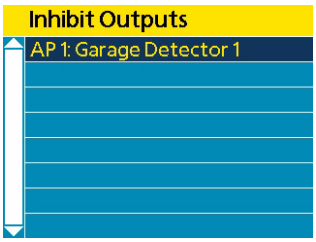
6.8.6 Alarm Panels



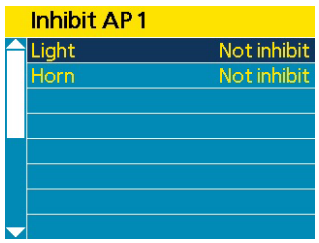
Alarm panel outputs:
In the first step, the basic task to be performed is selected:

- Inhibit Outputs
- Test Outputs

6.8.6.1 Inhibit Outputs

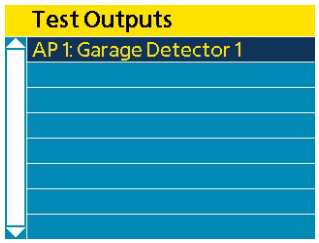


Inhibit Outputs:
In the selection screen for the alarm panels whose interlock setting is to be changed, only active alarm panels are listed along with their designation.

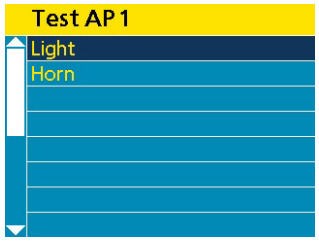


After selecting a specific alarm panel, the inhibition screen opens. In this screen, the light and horn can be selected, and the inhibition state can be toggled between "Not inhibit" and "Inhibit."

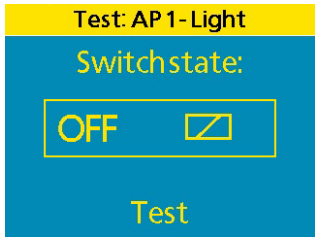
6.8.6.2 Test Outputs

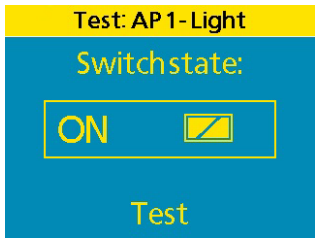


Test Outputs:
In the selection screen for the alarm panel (AP) whose outputs are to be tested, only active alarm panels are listed. The list shows the full designation of each active alarm panel.



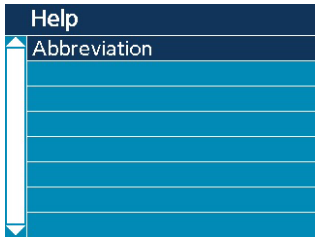
For each alarm panel, the assigned lights or horns can be selected.





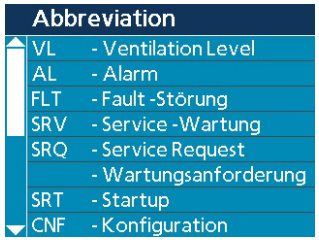
The test screen then allows the function of the selected light or horn to be checked. The device is switched on and off using the Menu/Reset button. The example on the left shows a light being tested.

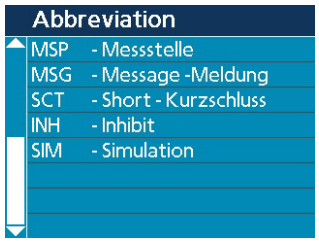
6.9 Help



Help
The Help menu provides users with information on important abbreviations used.

6.9.1 Abbreviation



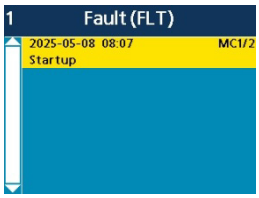
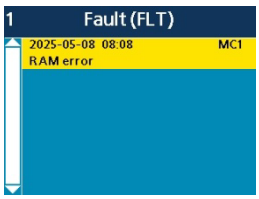
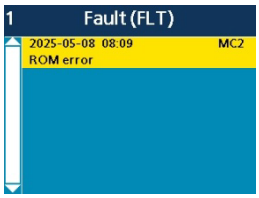
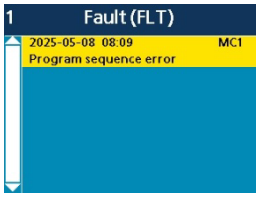
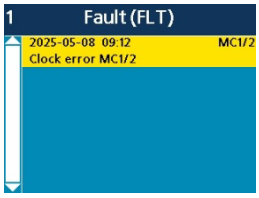
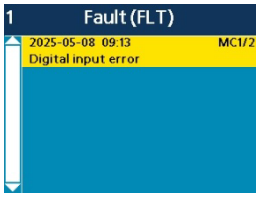


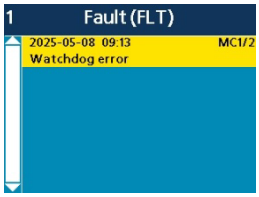
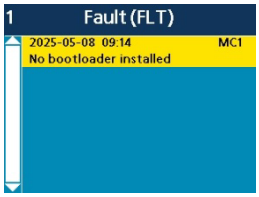
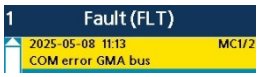
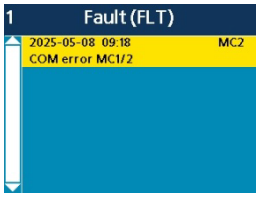
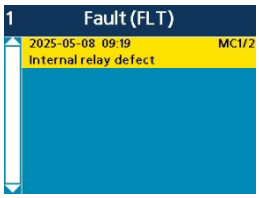
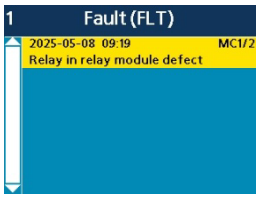
Abbreviation:
The abbreviations used in the on-screen menus are described here.

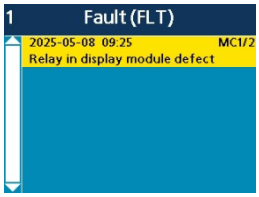
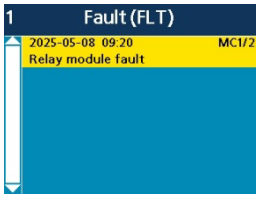
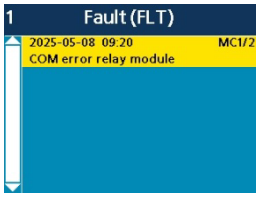
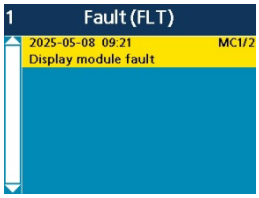
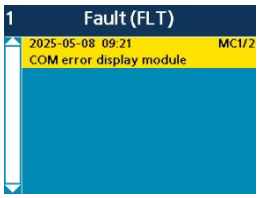
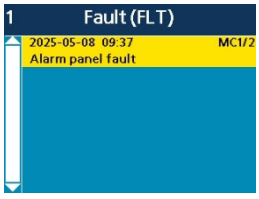
7 Fault

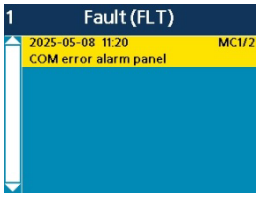
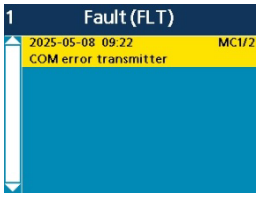
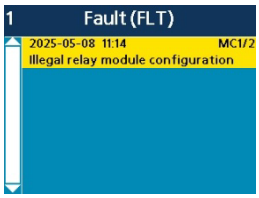
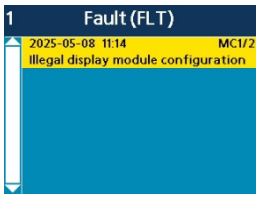
Fault messages are differentiated between the transmitter measuring point (yellow LED "FLT/TRM") and the GMA controller (yellow LED "FLT/GMA"). In the event of a fault, the corresponding yellow LED lights up continuously. Fault messages are not self-holding.

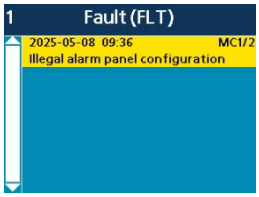
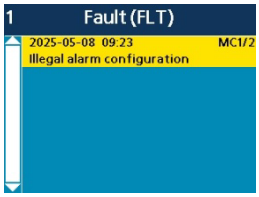
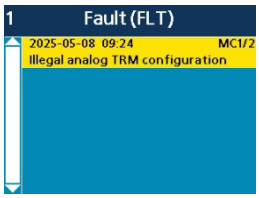
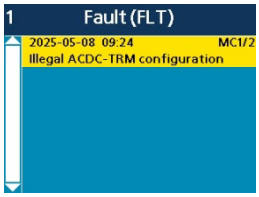
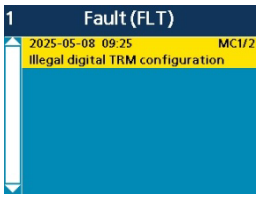
7.1 Fault messages from the GMA

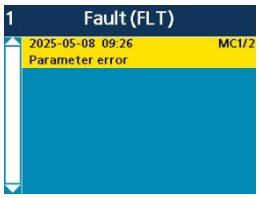
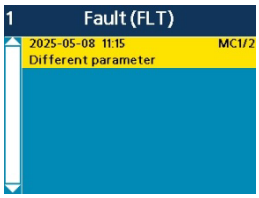
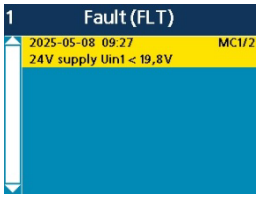
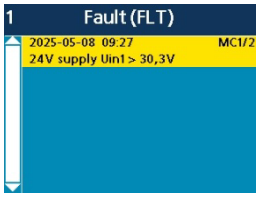
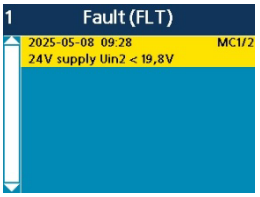
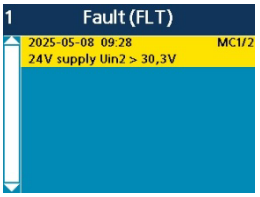
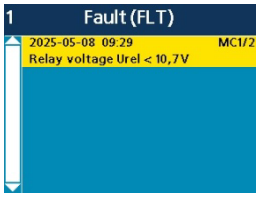
Fault (FLT/GMA)	Cause and remedy	MC		
		1	2	3
	**Startup** The processor is in the startup phase and is performing self-tests. Normally, this message only appears briefly after the device is switched on and disappears as soon as the self-tests are complete (<3 seconds). **Remedy:** If the message does not disappear on its own or appears repeatedly during operation, please contact GfG Service.	X	X	-
	**RAM error** The processor's RAM is defective. **Remedy**: The processor automatically restarts three seconds after this error occurs. If this error is reported again, the GMA must be replaced.	X	X	-
	**ROM error** The program in the processor's program memory (ROM) is faulty. **Remedy:** The processor automatically restarts three seconds after this error occurs. If the boot loader checks the program memory again and finds an error, a firmware update must be performed by a GfG service technician. If the error cannot be eliminated by the update, the GMA must be replaced.	X	X	-
	**Program sequence error** The normal program sequence of the processor is disrupted, so that the correct function of the GMA is no longer guaranteed. **Remedy:** The processor automatically restarts three seconds after this error occurs. If this error is reported again, the GMA must be replaced.	X	X	-
	**Clock error MC1/2** The clock generation for the processor or the reference clock is disrupted. **Remedy:** If this message appears repeatedly during normal operation, please contact GfG Service. If the message appears continuously, the GMA must be replaced.	X	X	-
	**Digital input error** An error has been detected in at least one digital input for which short-circuit monitoring in conjunction with the digital outputs is activated (*see 4.3.7 Connecting the digital inputs*). The digital inputs concerned can be identified via the info menu. **Remedy:** Check that the digital outputs are not being used incorrectly for the digital inputs and correct if necessary (DOUT1 only for DIN1,3,5,7 and DOUT2 only for DIN2,4,6,8). Check the connection cables for short circuits and correct if necessary. If no error is found, please contact GfG Service.	X	X	-

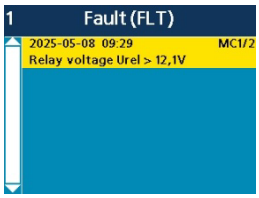
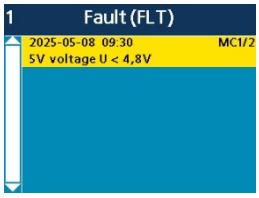
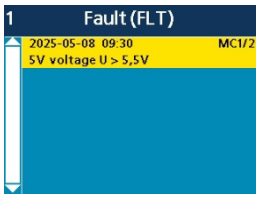
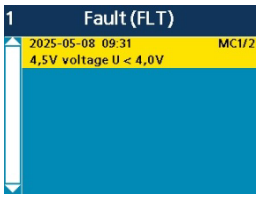
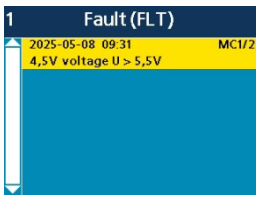
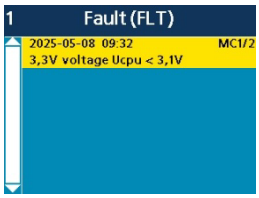
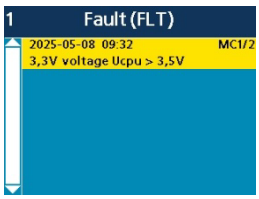
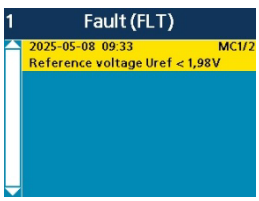
Fault (FLT/GMA)	Cause and remedy	MC		
		1	2	3
	**Watchdog error** A malfunction was detected when checking the external monitoring module on the mainboard. **Remedy:** If the error still occurs after restarting the GMA, the GMA must be replaced.	X	X	-
	**No boot loader installed** The processor's bootloader is not working properly due to a memory defect or was not installed correctly. **Remedy:** If the error still occurs after restarting the GMA, the GMA must be replaced.	X	X	-
	**COM errors** Communication error between the GMA400 and at least one client on the ACDC® interface (transmitter) or on the bus (transmitter/relay module/display module/alarm panel on the TRM/GMA bus). The clients concerned can be identified via the info menu. The cause could be a missing power supply to the client, an incorrect bus assignment, an incorrectly set bus address or data rate on the GMA or on the client. There could also be a hardware interruption in the communication line or the lines may have been connected incorrectly. However, a defect in the client could also cause the fault. **Remedy:** Check the power supply to the client, the correct bus assignment, the settings of the bus addresses and baud rates and correct them if necessary. Check the bus cabling and correct it if necessary.	X	X	-
		X	X	-
		X	X	-
		X	X	-
		X	X	-
		X	X	-
	**COM error MC 1/2** The internal communication between the processors is disrupted. **Remedy:** If the error still occurs after restarting the GMA, the GMA must be replaced.	X	X	-
	**Internal relay defect** At least one internal relay is faulty and the switching function may no longer be possible. The relays concerned can be identified via the info menu. This may be caused by a fault in the relay, a contact problem on the mainboard or a fault in the monitoring circuit. **Remedy:** If the error occurs again after a restart, the GMA must be replaced.	X	X	-
	**Relay in relay module defect** At least one relay of an external relay module GMA200-RT is faulty and the switching function may no longer be performed. The relays concerned can be identified via the info menu. This may be caused by a fault in the relay, a contact problem on the relay board, or a fault in the monitoring circuit. **Remedy:** If the error occurs again after restarting the external relay module, the relay module must be replaced.	X	X	-

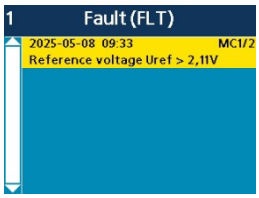
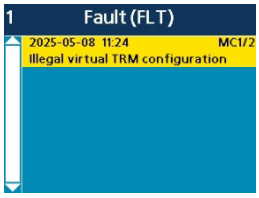
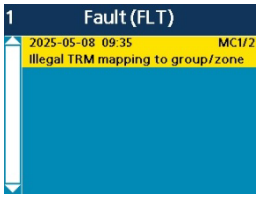
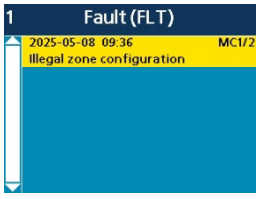
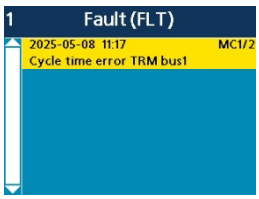
Fault (FLT/GMA)	Cause and remedy	MC		
		1	2	3
	**Relay in display module defect** At least one relay of an external display module GMA22-RW/-RS is faulty and the switching function may no longer be performed. The relays concerned can be identified via the info menu. This may be caused by a fault in the relay, a contact problem on the display board or a fault in the monitoring circuit. **Remedy:** If the error occurs again after restarting the external display module, the display module must be replaced.	X	X	-
	**Relay module fault** At least one external relay module GMA200-RT is reporting a fault. There can be many different causes for this (e.g., incorrect supply voltages, defective program memory, defective data memory, defective parameter memory, etc.). **Remedy:** If the relay module has a display, its display content can be read to narrow down the fault. If there is no display, first check the supply voltage and then connect to the GMA200-Config software via the USB port if necessary. If the cause cannot be found and eliminated, the relay module must be replaced.	X	X	-
	**COM error relay module** Communication error between the GMA and at least one external GMA200-R relay module. The relay modules concerned can be identified via the info menu. This may be caused by a lack of power supply to the relay modules, incorrectly set data rates or bus addresses on the GMA or on the relay modules. There may also be a hardware interruption in the communication line or the cables may be connected incorrectly. **Remedy:** Check the power supply to the relay modules, check the device assignment, and check the bus addresses and data rates and set them correctly if necessary. Check the bus wiring and correct it if necessary.	X	X	-
	**Display module fault** At least one external display module GMA22-RW/-RS is reporting a fault. There can be many different causes for this (e.g., incorrect supply voltages, defective program memory, defective data memory, defective parameter memory, etc.). **Remedy:** If necessary, the fault can be isolated via the display module display. If the cause cannot be found and rectified, the display module must be replaced.	X	X	-
	**COM error display module** Communication error between the GMA and at least one external GMA22-R display module. The display modules concerned can be identified via the info menu. The cause could be a lack of power supply to the display modules, incorrectly set data rates or bus addresses on the GMA or on the display modules. There may also be a hardware interruption in the communication line or the lines may be connected incorrectly. **Remedy:** Check the power supply to the display modules, check the device assignment, and check the bus addresses and data rates and adjust them if necessary. Check the bus wiring and correct it if necessary.	X	X	-
	**Alarm panel fault** At least one external alarm panel M22/ALP30/ALP40 is indicating a fault. There can be many different causes for this (e.g., incorrect supply voltages, defective program memory, defective data memory, defective parameter memory, etc.). **Remedy:** Check the power supply to the alarm panels and adjust it correctly if necessary. If the cause cannot be found and eliminated, the alarm panel must be replaced.	X	X	-

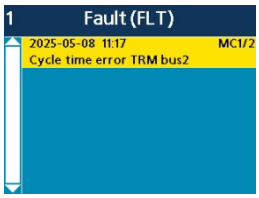
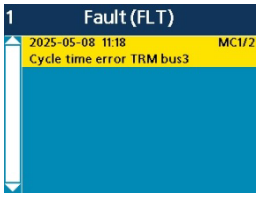
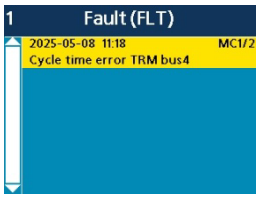
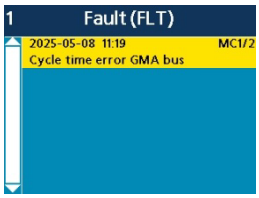
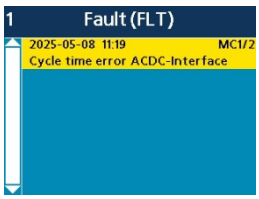
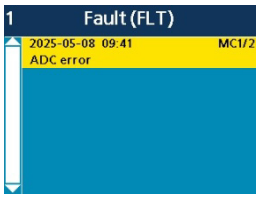
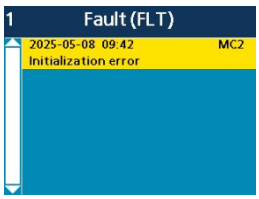
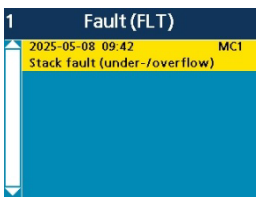
Fault (FLT/GMA)	Cause and remedy	MC		
		1	2	3
	**COM error alarm panel** Communication failure between the GMA and at least one external alarm panel M22/ALP30/ALP40. The alarm panels concerned can be identified via the info menu. The cause could be a lack of power supply to the alarm panels, incorrectly set data rates or bus addresses on the GMA or on the alarm panel. There may also be a hardware interruption in the communication line or the lines may be connected incorrectly. **Remedy:** Check the power supply to the alarm panels, check that the devices are assigned correctly, check the bus addresses and data rates and adjust them if necessary. Check the bus wiring and correct it if necessary.	X	X	-
	**COM error transmitter** Communication error between the GMA and at least one transmitter. The transmitters concerned can be identified via the measured value display. The cause could be a lack of power supply to the transmitters, incorrectly set data rates or bus addresses on the GMA or on the transmitters. There may also be a hardware interruption in the communication line or the cables may be connected incorrectly. **Remedy:** Check the power supply to the transmitters, check the device assignment, and check the bus addresses and data rates and adjust them if necessary. Check the bus wiring and correct it if necessary.	X	X	-
	**Illegal relay module configuration** The configuration for an external relay module is invalid for at least one of the following reasons: - Although the TRM buses are configured as a ring under "General" in "Bus communication," no TRM ring bus was configured for the bus connection for the external relay module. - Although the TRM buses are not configured as a ring under "General" in "Bus communication," a TRM ring bus has been configured for the bus connection for the external relay module. - Although the GMA bus address setting is not zero (no MASTER) under "General" in "Bus communication," the GMA bus was configured for the bus connection for the external relay module. - Multiple external relay modules on the same bus are assigned the same bus address. **Remedy:** Check and correct the configuration for the external relay modules using the GMA200-Config software. If necessary, contact GfG Service.	X	X	-
	**Illegal display module configuration** The configuration for an external display module is invalid for at least one of the following reasons: - Although the TRM buses are configured as a ring under "General" in "Bus communication," no TRM ring bus was configured for the bus connection for the display module. - Although the TRM buses are not configured as a ring under "General" in "Bus communication," the TRM ring bus was configured for the bus connection for the display module. - Although the GMA bus address setting is not zero (no MASTER) under "General" in "Bus communication," the GMA bus was configured for the bus connection for the display module. - Multiple external display modules on the same bus are assigned the same bus address. **Remedy:** Check and correct the configuration for the display modules using the GMA200-Config software. If necessary, contact GfG Service.	X	X	-

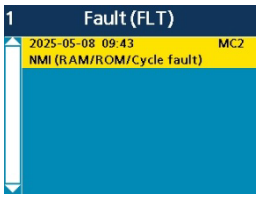
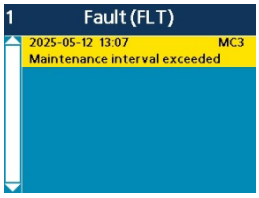
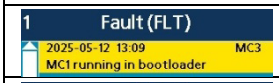
Fault (FLT/GMA)	Cause and remedy	MC		
		1	2	3
	**Illegal alarm panel configuration** The configuration for an external alarm panel is invalid for at least one of the following reasons: - Although the TRM buses are configured as a ring under "General" in "Bus communication," no TRM ring bus was configured for the bus connection for the alarm panel. - Although the TRM buses are not configured as a ring under "General" in "Bus communication," a TRM ring bus was configured for the bus connection for the external alarm panel. - Although the GMA bus address setting is not zero (no MASTER) under "General" in "Bus communication," the GMA bus was configured for the bus connection for the external alarm panel. - Multiple external alarm panels on the same bus are assigned the same bus address. **Remedy:** Check and correct the configuration for the external alarm panels using the GMA200-Config software. If necessary, contact GfG Service.	X	X	-
	**Illegal alarm configuration** Invalid relay or alarm configuration. An alarm has been configured at a measuring point that is not linked to a relay. **Remedy:** Check and correct the relay or alarm configuration for all measuring points using the configuration software. If necessary, contact GfG Service.	X	X	-
	**Illegal analog transmitter configuration** The configuration for transmitters with an analog interface is invalid for one of the following reasons: - At least one analog transmitter connection is assigned to multiple measuring points. - The number of analog transmitter connections dependent on the GMA type has been exceeded. - At least one linearization table is incorrectly assigned to a transmitter with an analog interface because the linearization table was changed after the assignment. **Remedy:** Check and correct the configuration for measuring points with analog interface using the configuration software. If necessary, contact GfG Service.	X	X	-
	**Illegal ACDC transmitter configuration** The configuration for transmitters with an ACDC interface is invalid because the first bus address on ACDC transmitters must match the terminal number on the GMA. **Remedy:** Check and correct the configuration for measuring points with ACDC interface using the GMA configuration software. If necessary, contact GfG Service.	X	X	-
	**Illegal digital transmitter configuration** The configuration for transmitters with a digital interface is invalid for at least one of the following reasons: - Although the TRM buses are configured as a ring under "General" in "Bus communication," no ring bus has been configured for the digital interface for a transmitter. - Although the TRM buses are not configured as a ring under "General" in "Bus communication," the TRM ring bus has been configured for the digital interface for a transmitter. - Multiple digital transmitters are assigned the same bus address on the same bus. **Remedy:** Check and correct the configuration for measuring points with a digital interface using the GMA-Config software. If necessary, contact GfG Service.	X	X	-

Fault (FLT/GMA)	Cause and remedy	MC		
		1	2	3
	**Parameter error** There is faulty data in the parameters in the working memory that cannot be automatically corrected due to a hardware defect on the mainboard. **Remedy:** If this message appears repeatedly during normal operation, please contact GfG Service.	X	X	-
	**Different parameter** The parameters in the working memory and in the backup copy are correct, but have different contents. This may be caused by a power failure during a configuration change. **Remedy:** The parameters are saved from the working memory to the backup copy by simply acknowledging this message. The configuration that is then valid can be checked with the GMA200-Config software and corrected if necessary.	X	X	-
	**24 V supply Uin1 < 19.8 V** - If the GMA is only supplied via the USB cable for configuration, this error is displayed; this is normal. - If this message appears during normal operation, check the power supply (power adapter). The power adapter used must be able to supply at least 20 V even under maximum load conditions (including load peaks).	X	X	-
	**24 V supply Uin1 >;30.3 V** This error message indicates that the GMA is being supplied with too high a voltage. This condition must be rectified as quickly as possible, as it may otherwise cause damage to the GMA.	X	X	-
	**24 V supply Uin2 < 19.8 V** - If the GMA is only supplied via the USB cable for configuration, this fault is displayed; this is normal. - If this message appears during normal operation, check the power supply (power adapter). The power adapter used must be able to supply at least 20 V even under maximum load conditions (including load peaks).	X	X	-
	**24 V supply Uin2 >;30.3 V** This error message indicates that the GMA400 is being supplied with too high a voltage. This condition must be rectified as quickly as possible, as it may otherwise cause damage to the GMA.	X	X	-
	**Relay voltage Urel < 10.7 V** - If the GMA is only supplied via the USB cable for configuration, this fault is displayed; this is normal. - If this message appears during normal operation, please contact GfG Service.	X	X	-

Fault (FLT/GMA)	Cause and remedy	MC		
		1	2	3
	**Relay voltage Urel > 12.1 V** If this message appears repeatedly during normal operation, please contact GfG Service.	X	X	-
	**5 V voltage U < 4.8 V** If this message appears repeatedly during normal operation, please contact GfG Service.	X	X	-
	**5 V voltage U > 5.5 V** If this message appears repeatedly during normal operation, please contact GfG Service.	X	X	-
	**4.5 V voltage U < 4.0 V** If this message appears repeatedly during normal operation, please contact GfG Service.	X	X	-
	**4.5 V voltage U > 5.5 V** If this message appears repeatedly during normal operation, please contact GfG Service.	X	X	-
	**3.3 V voltage Ucpu < 3.1 V** If this message appears repeatedly during normal operation, please contact GfG Service.	X	X	-
	**3.3 V voltage Ucpu > 3.5 V** If this message appears repeatedly during normal operation, please contact GfG Service.	X	X	-
	**Reference voltage Uref < 1.98 V** If this message appears repeatedly during normal operation, please contact GfG Service.	X	X	-

Fault (FLT/GMA)	Cause and remedy	MC		
		1	2	3
	**Reference voltage Uref > 2.11 V** If this message appears repeatedly during normal operation, please contact GfG Service.	X	X	-
	**Illegal virtual TRM configuration** The configuration for the virtual transmitters is invalid for at least one of the following reasons: ● No function is assigned to the active virtual transmitter ● For the function for calculating absolute humidity: ○ Absolute humidity is not set as the measured variable ○ The assigned measuring point for temperature is not active and/or does not measure temperature ○ The assigned measuring point for relative humidity is not active and/or does not measure relative humidity ● For the function for calculating the min. or max. value: ○ he assigned measuring points are not activated, either completely or partially, and/or are not configured identically (measuring range) **Remedy**: Check and correct the configuration using the GMA-Config software. Contact GfG Service if necessary.	X	X	-
	**Illegal TRM mapping to group/zone** At least one active transmitter is assigned to a non-activated transmitter group and/or a non-activated zone. **Remedy:** Check and correct the configuration using the GMA-Config software. If necessary, contact GfG Service.	X	X	-
	**Illegal zone configuration** The zone configuration is invalid for at least one of the following reasons: ● With active humidity-controlled ventilation: ○ Assigned measuring point for absolute humidity inside is not active and/or does not measure absolute humidity ○ Assigned measuring point for absolute humidity outside is not active and/or does not measure absolute humidity ○ Assigned measuring point for absolute humidity inside and outside are identical ○ Assigned measuring point for relative humidity inside is not active and/or does not measure relative humidity ○ Minimum difference for comparing absolute humidity is > 10% of alarm threshold 1 ● At least one relay is double assigned for ventilation control **Remedy**: Check and correct the configuration using the GMA-Config software. Contact GfG Service if necessary.	X	X	-
	**Cycle time error TRM bus1** Due to the large number of bus participants, the desired cycle time can no longer be guaranteed. - If the application allows it: Increase the cycle time. - If possible, increase the data rate.	X	X	-

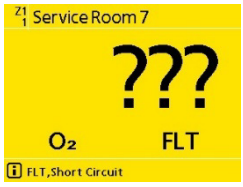
Fault (FLT/GMA)	Cause and remedy		MC		
			1	2	3
	**Cycle time error TRM bus2**	- Reduce the number of bus participants on the individual buses by distributing the participants across several buses.	X	X	-
	**Cycle time error TRM bus3**		X	X	-
	**Cycle time error TRM bus4**		X	X	-
	**Cycle time error GMA bus**		X	X	-
	**Cycle time error ACDC-Interface**		X	X	-
	**ADC error** If this message appears repeatedly during normal operation, please contact GfG Service.		X	X	-
	**Initialization error** If this message appears repeatedly during normal operation, please contact GfG Service.		X	X	-
	**Stack fault (under- /overflow)** If this message appears repeatedly during normal operation, please contact GfG Service.		X	X	-

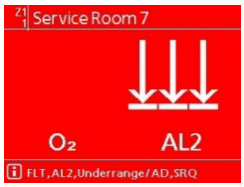
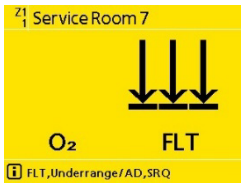
Fault (FLT/GMA)	Cause and remedy	MC		
		1	2	3
	**NMI (RAM/Flash/Cycle fault)** If this message appears repeatedly during normal operation, please contact GfG Service.	X	X	-
	**Maintenance interval exceeded (by more than 30 days if parameterized with error message)** The fault was triggered because the date for the system check was exceeded by at least 30 days. The fact that a fault was triggered for this reason has been configured as optional. **Remedy:** Perform system check and set a new date for the system check.	-	-	X
 	**MC1 / MC2 running in bootloader**	-	-	X
Yellow LED "FLT/GMA" is lit even though no fault is displayed under "Status-GMA"	If the GMA is working properly but the yellow "FLT/GMA" fault LED is lit continuously, there is an internal fault. If this message appears repeatedly during normal operation, please contact GfG Service.	X	X	-

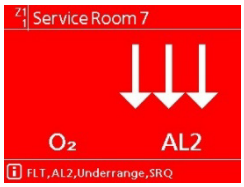
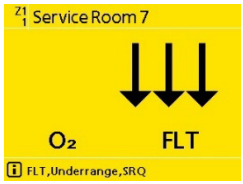
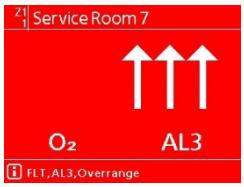
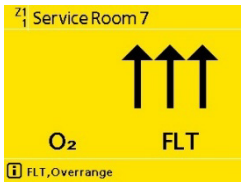
7.2 Transmitter fault messages

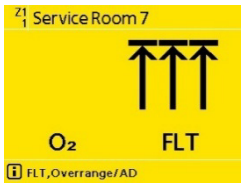
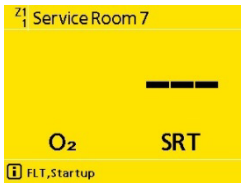
Attention: It is essential to observe the operation manuals of the connected transmitters!

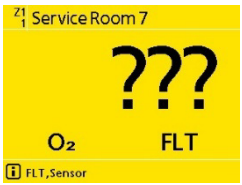
In most fault states, the measured value is no longer evaluated for alarms, but pending alarms are held (yellow display color). Exceptions to this are the various fault states in connection with overrange, underrange, and fallback, where the measured value continues to be evaluated for alarms, which is why alarms determine the display color.

Fault (FLT/TRM)	Cause and remedy	Analog	Digital	ACDC	Virtual
	**Short circuit** A line short circuit has been detected in the supply line at the analog input. The measured analog value is therefore no longer reliable. The analog current signal is not behaving as if it were coming from a current source. **Remedy:** • Use a current measuring device to check the current signal at the analog input of the GMA and at the transmitter output. • Check the cable routing from the transmitter to the GMA and repair if necessary.	x	-	x	-
	**Gas supply** An external monitoring system for measured gas flow has reported an error via a digital input of the GMA that is assigned to this measuring point. **Remedy:** Check the test gas supply and its monitoring.	x	x	x	x

 	**Underrange / AD – analog** The level of the transmitter signal at the analog input is below the current measuring range of the GMA400 (IIN=0 mA). Possible causes: A defective transmitter, no power supply to the transmitter, or a broken cable. **Remedy:** • Check the power supply to the transmitter. • Check the output signal directly at the transmitter; replace the transmitter if necessary. • Check the transmitter cabling and repair if necessary.	x	-	-	-
	Underrange / AD – digital The sensor signal in the transmitter has fallen below the measuring range of the transmitter electronics. There may be a gas with negative cross-sensitivity at the measuring point. Or the zero point signal has drifted due to aging of the sensor or environmental influences. **Remedy:** *See the transmitter operation manual!*	-	x	x	-

Fault (FLT/TRM)	Cause and remedy	Analog	Digital	ACDC	Virtual
 	**Underrange – analog** The level of the transmitter signal at the analog input falls below the measuring range of the transmitter to such an extent that the fault level has been reached or exceeded. The height of this fault level is transmitter-dependent (e.g., 2.8 mA). This could be caused by a drift in the sensor signal or a gas with negative cross-sensitivity. There may also be a technical fault in the transmitter's measuring electronics, which then explicitly sets the interference level. **Remedy:** • Check whether there is a technical fault in the transmitter (if necessary, via the display) and rectify the fault *(see also the transmitter operation manual)*. • If it can be ruled out that a gas with negative cross-sensitivity to the sensor is present at the measuring point, the zero point should be adjusted on the transmitter.	x	-	-	-
	Underrange – digital The sensor signal in the transmitter has fallen significantly below the transmitter measuring range (usually < -7.5%). A gas with negative cross-sensitivity may be present at the measuring point. Or the zero point signal has drifted due to aging of the sensor or environmental influences. **Remedy:** Zero point adjustment on the transmitter (*see transmitter operation manual*).	-	x	x	x
 	**Overrange – analog** The level of the transmitter signal at the analog input exceeds the measuring range of the transmitter to such an extent that the fault level is reached or exceeded. The magnitude of this fault level is transmitter-dependent (e.g., 22-24 mA). This could be caused by an excessive gas concentration at the transmitter or a gas with very high cross-sensitivity. The gas sensor or transmitter electronics may also be defective. **Remedy:** If you are sure that there is neither a high gas concentration nor a cross-interfering gas, the transmitter must be checked (*see transmitter operation manual the transmitter*).	x	-	-	x
	Overrange – digital The sensor signal in the transmitter has significantly exceeded the transmitter measuring range (usually > 112%). This could be caused by an excessive gas concentration at the transmitter or a gas with very high cross-sensitivity. The gas sensor or transmitter electronics may also be defective. **Remedy:** If you are sure that there is neither a high gas concentration nor a cross-gas, the transmitter must be checked (*see transmitter operation manual the transmitter*).	-	x	x	-
	Overrange / AD – analog The level of the transmitter signal at the analog input exceeds the current measuring range of the GMA (I_{IN}> 24 mA). This may be caused by an excessive gas concentration at the transmitter or a defect in the transmitter or the cable routing. **Remedy:** • First, check for a high gas concentration, then check the output signal directly at the transmitter. Replace the transmitter if necessary. • Third, check the transmitter cabling and repair it if necessary.	x	-	-	-
	Overrange / AD – digital The sensor signal in the transmitter has exceeded the measuring range of the transmitter electronics. This could be caused by an excessive gas concentration at the transmitter or a gas with very high cross-sensitivity. The gas sensor or the transmitter electronics may also be defective.	-	x	x	-

Fault (FLT/TRM)	Cause and remedy	Analog	Digital	ACDC	Virtual
 	**Remedy:** • First, check whether there is a high gas concentration or a cross gas. • Second, check the transmitter (*see transmitter operation manual*).				
	**Startup** The transmitter is in the startup phase. During this time, the sensor is running in or warming up. This run-in time depends on the transmitter and sensor and can take several minutes. Analog transmitters determine the standby delay either themselves via a corresponding analog signal level (e.g., 1.6 mA) or a fixed delay time can be parameterized in the GMA400. Digital transmitters always determine the standby delay themselves. When the GMA is started up, there is a fixed minimum delay time of 30 seconds for all transmitters. **Remedy:** The time must be waited for.	x	x	x	x
	**TRM-Error – system malfunction** There is a system malfunction in the digital transmitter. The supply voltage to the transmitter may be too low or too high, or there may be a defect in the transmitter itself. **Remedy:** • Check the power supply to the transmitter. • Check the transmitter (*see transmitter operation manual*).	x	x	x	x
	**COM error – Communication error** There is a communication error between the GMA and the transmitter. This could be caused by a lack of power supply to the transmitter, an incorrect bus assignment, an incorrectly set bus address or data rate on the GMA or transmitter. There may also be a hardware interruption in the communication line or the cables may have been connected incorrectly. However, a defect in the transmitter could also cause the error. **Remedy:** • Check the power supply to the transmitter, the correct bus assignment, the bus address settings, and the baud rates, and correct them if necessary. • Check the cable routing and correct if necessary. • Check the transmitter (*see transmitter operation manual*).	-	x	x	-
	**Config error – Configuration inconsistent** The type of transmitter connected is invalid or the configuration in the GMA does not match the configuration of the transmitter. In the latter case, there is at least one difference in the gas type, gas unit, measuring range (start/end) or number of decimal places. However, it may simply be that the transmitter is not assigned correctly due to an incorrectly set bus address.	-	x	x	-

Fault (FLT/TRM)	Cause and remedy	Analog	Digital	ACDC	Virtual
	Remedy: • Connect only valid transmitters. • Check the correct transmitter assignment and bus address. • Check the measuring range settings on the transmitter and change them if necessary. • If necessary, adjust the transmitter configuration in the GMA.				
	**Gateway malfunction** The transmitter is not connected directly to the GMA via the bus, but via a gateway for data conversion and forwarding (e.g., GMA400-AT24). Data transmission between the GMA400 and the gateway is OK, but there is a communication fault between the gateway and the transmitter. **Remedy:** • Check the communication connection between the transmitter and gateway. • Check the parameter settings (cable connection, bus address, baud rate) and correct them if necessary (*see transmitter and gateway operation manuals*). **Note**: This gateway malfunction has nothing to do with a network gateway connected to the Ethernet connection!	-	x	x	-
	**Sensor error** There is a sensor error on the transmitter. The sensor plug connection may be faulty or the sensor may be defective. **Remedy**: • Check the sensor plug connection. • Replace the sensor.	-	x	x	-
	**ACDC fallback** Digital communication between the GMA400 and the ACDC transmitter has been disrupted for at least eight hours. The measured values are therefore being recorded exclusively on the basis of the analog signal (fallback). This may be caused by an incorrectly set bus address or data rate on the GMA or on the transmitter. A defect in the transmitter could also lead to this fault. **Remedy:** • Check the bus address and baud rate settings and correct them if necessary. • Check the transmitter and rectify any faults.	-	-	x	-

8 Maintenance and servicing

Maintenance and servicing include regular visual inspections, functional checks, system checks, and repairs to the gas detection system.

8.1 Cleaning, inspections, and maintenance

External contamination of the device housing can be removed with a cloth moistened with water when the device is disconnected from the mains power supply. Do not use any solvents or cleaning agents!

Visual inspection

Visual inspections should be carried out regularly, at intervals of no more than one month, and should include the following activities:

- Check the operating display and status messages, e.g., operating display "On," alarm and fault indicators "Off."

- Check for visible mechanical damage from the outside

- Check the gas inlet openings, e.g., for dust or dirt

Functional check

The functional check can be carried out at intervals depending on the gas hazard to be monitored. For gas detection devices for toxic gases/vapors and oxygen, as well as for gas detection devices for explosion protection, maximum inspection intervals of 4 months are specified in accordance with the requirements of regulations T 021 and T 023 of the BG RCI professional association.

It includes the following activities:

- Visual inspection, see above under **Visual inspection**

- Checking and evaluating measured value displays

- Triggering of alarm thresholds

- Triggering test functions for display elements and visual and audible signal devices without triggering switching functions

- Checking stored messages, faults, and maintenance requests

- Triggering of digital inputs

System check (proof test)

The system check must be performed at regular intervals. The interval must not exceed 1 year. It includes the following activities:

- Function check according to section **Functional check**, see above

- Checking all safety functions, including the triggering of switching functions.

- Checking the parameterization by comparing the actual and target values

- Checking the signaling and recording devices

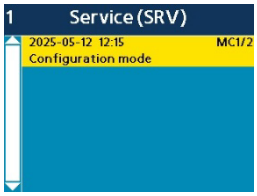
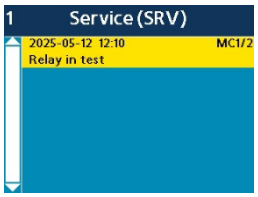
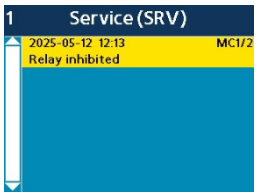
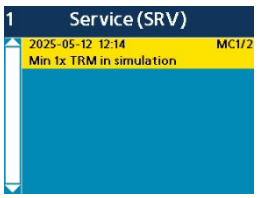
Repair

Repairs include all repair and replacement work. They may only be carried out by the manufacturer or by persons authorized by GfG Instrumentation. Only original spare parts and assemblies tested and approved by the manufacturer may be used.

8.2 Service (SRV)

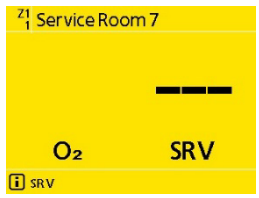
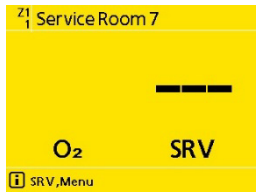
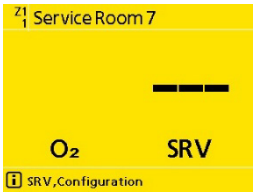
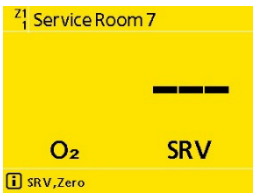
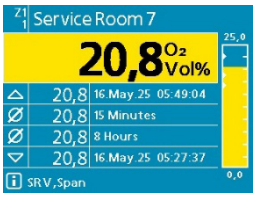
Service operation is reported when the safety function of the GMA is only partially available or no longer available due to deliberate intervention by an operator or service personnel. In any case, service is indicated by the yellow LED "SRV / SRQ" lighting up continuously and by the maintenance relay being activated. The following causes may lead to service operation:

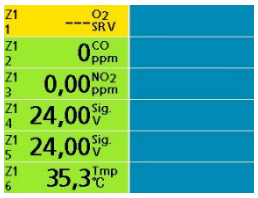
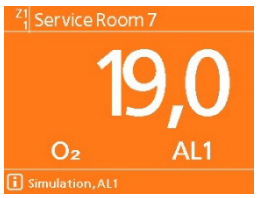
8.2.1 Service of the GMA400

Service (SRV/GMA)	Cause and remedy	MC		
		1	2	3
	**Configuration mode** The GMA is in configuration mode. To exit this service state, configuration mode must be terminated manually.	X	X	-
	**Relay in test** At least one relay is in test mode. To exit this service state, test mode must be ended manually.	X	X	-
	**Relay inhibited** At least one relay is locked. To exit this service state, the locking of all relays must be released.	X	X	-
	**Min 1x TRM in Simulation** At least one transmitter is in simulation mode. To exit this service state, simulation mode must be ended manually.	X	X	-

8.2.2 Service of the connected transmitters

Caution: Please observe the operation manuals of the connected transmitters!

Service (SRV/TRM)	Cause and remedy	Analog	Digital	ACDC	Virtual
	**SRV: Service mode** On a number of transmitters with an analog interface, the GMA400 is signaled via the current level (2.0 to 2.4 mA) that service work is being carried out on the transmitter. In this case, no measured value is displayed. The abbreviation "SRV" for "service" indicates service mode.	X	-	-	X
	**SRV: Menu / Configuration / Zero / Span** For transmitters with a digital interface (bus / ACDC®), the GMA400 is signaled that service work is being carried out on the transmitter. The abbreviation "SRV" for "Service" indicates service mode. The service status is shown in detail in the individual display: • "Menu" Settings are made in the service menu. • "**Configuration**" Configuration changes are made • "**Zero**" A zero point adjustment is performed. • "Span" A sensitivity adjustment is being performed Normally, no measured value is displayed in the service screens. Only in the single detail display is a measured value also displayed during zero point and sensitivity adjustment (Zero / Span) (*see bottom left*).	-	X	X	-
					
					
					

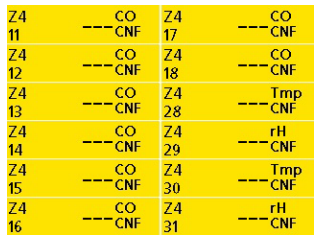
Service (SRV/TRM)	Cause and remedy	Analog	Digital	ACDC	Virtual
  	**SRV-INH / SRV-INH, COM error** If a transmitter is locked, this service state is displayed accordingly with "SRV-INH" on the single screen and the alternating abbreviation "SRV" on all screens. Fault states such as a communication fault on a digital transmitter are displayed but not reported as faults (*see top left*). The measured value or special character is displayed on the single screen if the measured value is not available (*see top left and center*). In contrast, no measured value is displayed in the collective screens, but "---" (*see bottom left*).	X	X	X	X
 	**Simulation (AL1)** In simulation mode, various special conditions such as alarms and over/under range can be simulated to test the detection chain. Simulation mode is indicated accordingly by "Simulation" on the single screen.	X	X	X	X

Depending on the cause of the service mode, only part of the safety function of the GMA400 may be disabled. In this case, the safety function would remain intact for the unaffected parts. However, the yellow SRV/SRQ LED will not turn off until all causes of the service mode have been eliminated.

8.2.3 Configuration via parameterization

The configuration of the GMA400 can only be changed to a very limited extent by changing parameters via the service menu on the device itself. However, the GMA400-MT can be fully configured using a PC and the GMA-Config configuration software from GfG through a USB connection. Once the configuration software has established a connection with the GMA, operation using the service menu is no longer possible.

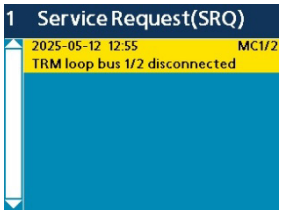
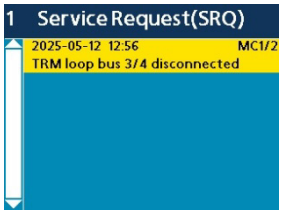
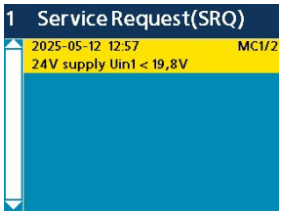
Note:
This point is only relevant for customers who have contractually agreed to configuration using GMA-Config. If necessary, please contact your contact person at GfG Service or Sales.

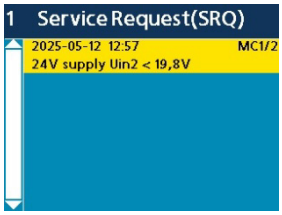
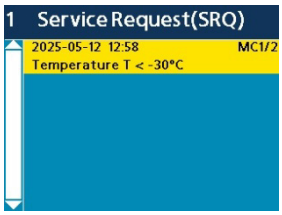
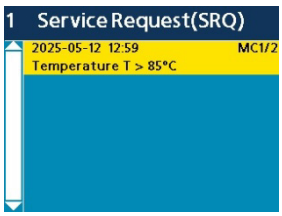
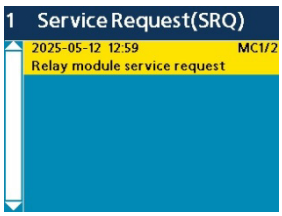
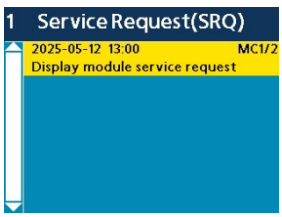
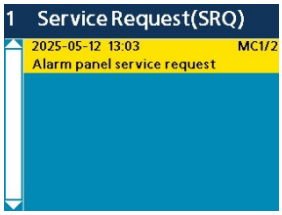
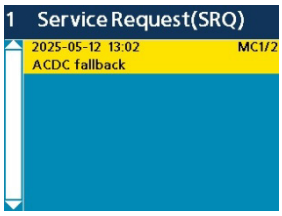
	**Configuration using GMA-Config:** If the GMA400 is in configuration mode – using the GMA-Config software from GfG – "CNF" is displayed on all measuring points. In this configuration phase, the special "Service" status is activated at the same time. Once the configuration phase is complete, the GMA400 returns to normal monitoring operation.

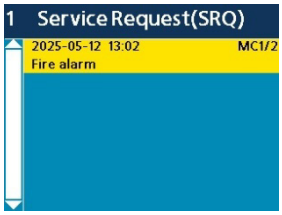
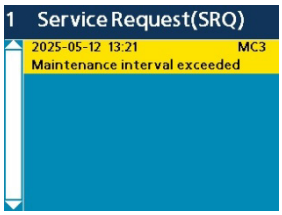
8.3 Service request (SRQ)

A service request (SRQ) can be triggered during normal monitoring operation. In this case, the yellow "SRV/SRQ" LED flashes and a corresponding message is shown on the display. Optionally, relays can be parameterized to switch when a service request is received. The maintenance request has no effect on normal monitoring operation unless a fault is also reported at the same time. The SRQ message on the display can be acknowledged by pressing the "RESET" button. The message can still be called up via the main menu under "State GMA" / "Service Request." The following options can trigger a service request:

8.3.1 GMA service requests

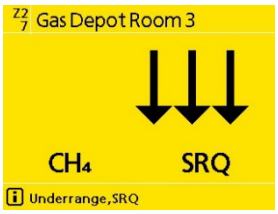
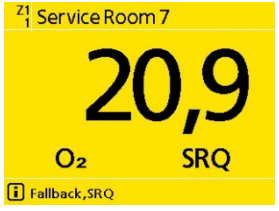
Service Request (SRQ/GMA)	Cause and remedy		MC 1	MC 2	MC 3
	TRM loop bus 1/2 disconnected	The ring bus is interrupted at one position. If no communication error is reported on any of the buses, all participants on the bus can still be addressed. The cable routing must be checked as soon as possible.	X	X	-
	RM loop bus 3/4 disconnected		X	X	-
	24 V supply Uin1 < 19.8 V	If a redundant power supply is parameterized and the voltage at a terminal is too low, this service request is issued for the respective terminal. **Info:** The GMA power supply can also be configured as a measuring point so that it can be viewed permanently.	X	X	-

Service Request (SRQ/GMA)	Cause and remedy		MC		
			1	2	3
	24 V supply Uin2 < 19.8 V	If a redundant power supply is parameterized and the voltage at a terminal is too low, this service request is issued for the respective terminal. **Info:** The GMA power supply can also be configured as a measuring point so that it can be viewed permanently.	X	X	-
	Temperature T < -30 °C	The temperature value displayed is outside the permissible range – in contrast to the actual temperature. Probable cause: a hardware defect on the GMA mainboard. **Remedy:** Normalize the temperature influence or contact GfG Service in the event of a defect. **Info:** The internal GMA temperature can also be configured as a measuring point so that it can be viewed permanently.	X	X	-
	Temperature T > 85 °C		X	X	-
	**Relay module service request:** Please refer to the operation manual for the relay module for the cause.		X	X	-
	**Display module service request:** Please refer to the operation manual for the display module for the cause.		X	X	-
	**Alarm panel service request:** Please refer to the operation manual for the alarm panel for the cause.		X	X	-
	**ACDC fallback** If digital communication to an ACDC transmitter is disrupted, the system switches to analog signal evaluation for a limited period of time and the adjacent message is displayed. This status then becomes a fault.		X	X	-

Service Request (SRQ/GMA)	Cause and remedy	MC		
		1	2	3
	**Fire alarm** An external fire alarm system generates an alarm due to a fire and triggers the shutdown of the zone ventilation.			
	**Maintenance interval exceeded** The deadline for the next system check, which must usually be carried out once a year, has been exceeded. **Remedy:** The system check should be performed as soon as possible. The date for the system check can only be changed using the GMA configuration software.	-	-	X

8.3.2 Transmitter service requests

Note: Observe the relevant information in the operation manuals of the connected transmitters!

Service Request (SRQ/TRM)	Cause and remedy	Analog	Digital	ACDC	Virtual
 	**Underrange, SRQ:** The signal zero point on the transmitter has drifted negatively, so that the measuring range of the transmitter is significantly undershot (typical underrange: < –5% of the measuring range). The measured value changes with arrows (alternating every second at the top left and bottom left). **Remedy:** The zero point should be adjusted on the transmitter.	x	x	x	x
	**SRQ:** Service request for a transmitter with digital RS-485 interface. In this example, the sensor must be replaced because it will soon be worn out. A corresponding message or signal is sent to the transmitter. **Remedy:** • Contact GfG service • Replace sensor if necessary	-	x	x	X
	**Fallback, SRQ:** Digital communication between the GMA and the ACDC transmitter is disrupted and the measured values are recorded exclusively on the basis of the analog signal (fallback). This may be caused by an incorrectly set bus address or data rate on the GMA or on the transmitter. A defect in the transmitter may also cause the fault. After 8 hours, the status changes from maintenance request to fault. **Remedy:** • Check the bus address and baud rate settings and correct them if necessary.	-	-	x	-

Service Request (SRQ/TRM)	Cause and remedy	Analog	Digital	ACDC	Virtual
	• Check the transmitter and rectify any faults				
	**ACDC-Diff, SRQ:** The level of the analog input signal does not match the digitally transmitted measured value of the ACDC transmitter (deviation > 2% for more than 5 s). The analog output of the transmitter may be defective or simply needs to be adjusted. **Remedy:** • Check the analog output of the transmitter with a multimeter • Adjust if necessary	-	-	x	-

9 Appendix

9.1 Technical data

Type designation:	GMA400-MT16
Display & controls	2.4" color graphic display (320 x 240 pixels) and 5 keys 28 status LEDs for alarms, operating and relay statuses 1 alarm bar to the left of the LC display
Ambient conditions	
For storage:	-13 to +131 °F / -25 to +60 °C | 0 to 99% RH (recommended: +32 to +36 °F / 0 to +30 °C | 40 to 60% RH)
for operation:	-4 to +122 °F / -20 to +50 °C | 0 to 99% RH
Installation location:	Indoors, e.g., in a control cabinet or wall housing On TS35 DIN rail in accordance with DIN EN 60715 up to a height of 6,561 ft / 2,187 yrds / 2,000 m above sea level
Power supply	
External supply with:	stabilized SELV or PELV power supply
Operating voltage Ue:	24 V DC (20 to 30 V DC permissible)
Power consumption:	max. 5 W
Fuses:	Electronic maintenance-free fuses
Transmitter connections	
Supply outputs:	Not available
Analog input signals IIN:	16x 4 to 20 mA Measurement tolerance[1-] : ±0.3% MR@4 to 20 mA (MR = measuring range) Load approx. 50 to 100 Ω, permanently reverse polarity protected with 24 V
Digital signals TRM bus 1+2+3+4:	RS-485; half-duplex; max. 230,400 baud
Measured value processing	
Update time:	1 s (can be increased to up to 8 s via parameterization (*see 2.3.5 Cycle times*)
Standby delay:	< 40 s (plus transmitter warmup times)
RS-485 outputs	
TRM bus 1+2+3+4, COM bus:	RS-485; half-duplex; max. 230,400 bits/s
GMA bus:	RS-485; half-duplex; galvanically isolated; max. 230,400 bits/s
COM bus and GMA bus (optional):	RS-485; half-duplex; max. 230,400 bits/s: for control panel, PC, PLC or gateway
Relay outputs Contacts:	8 relays, each with one normally open contact

	Contact rating:	3 A / 250 V AC or 3 A / 30 V DC
	Minimum switching current:	10 mA
	Minimum switching voltage:	5 V
	Switching frequency:	max. 100 per year (per relay contact)
	Insulation distances:	Basic insulation between relays: 1 & 2, 3 & 4, 5 & 6, 7 & 8 Double insulation between relays: 2 & 3, 4 &; 5, 6 & 7
Digital inputs		D_{IN} 1 to 8: 0 – 30 V DC / Test pulses <= 1.5 ms are ignored / Response time = 1.5 s
Digital outputs		D_{OUT} 1, D_{OUT} 2: 24 V each max. 250 mA
USB		USB Type C socket for device configuration with a PC, USB 2.0 compatible
Ethernet		RJ45 socket, 10 / 100 Mbit/s
Housing	Mounting:	On TS 35 DIN rail according to EN 60715
	Protection:	IP 20
	Material:	Plastic
	Weight:	Approx. 14.46 oz / 410 g
	Dimensions:	6.37 x 3.81 x 2.44 in / 162 x 97 x 62 mm (W x H x D)
Connection terminals	Top:	3x 9-pin for 0.14 – 1.5 mm^2 with ferrules or 0.14 – 2.5 mm^2 without ferrules
	Bottom:	3x 14-pin for 0.14 – 0.75 mm^2 with wire end ferrules or 0.14 – 1.5 mm^2 without wire end ferrules
	Side:	2x 3-pin for 0.22 – 1.5 mm^2 with wire end ferrules or 0.22 – 2.5 mm^2 without wire end ferrules
Connection cable		2 to 4-wire 0.5 – 1.5 mm^2 LiYY, NYM (for GMA400-MT supply)
		2 to 4-wire 0.5 – 1.5 mm^2 LiYY, LiYCY (for transmitters with additional terminals)
		2-wire 1x2x0.22 mm^2 BUS-LD (for GMA bus with length >10 m)
Approvals/tests		
	Electromagnetic compatibility:	Interference emission: EN 55016-2-1, EN 61000-6-3, EN 55016-2-3, EN 55022
		Immunity: EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6
	Electrical safety:	EN 61010-1:2010 (pollution degree 2, overvoltage category III for relay contacts)

[1] This refers only to the measurement tolerance of the GMA400. The transmitters are not taken into account.

9.2 License information

Software components from market-leading ISVs (ISV = Independent Software Vendor) are used in the manufacture of the GMA400-MT16. Further information on the current licensing terms for the respective software can be obtained directly from the ISVs (as of August 2025):

FatFS: https://elm-chan.org/fsw/ff/doc/appnote.html#license

FreeRTOS: https://www.freertos.org/Documentation/02-Kernel/01-About-the-FreeRTOS-kernel/04-Licensing

LwIP: https://savannah.nongnu.org/projects/lwip/

9.3 Compatible system components

The following components are compatible with the GMA400-M:

Component from GfG mbH	Example	SW version	Please note
Analog transmitter			
Digital transmitter			
ACDC transmitter			
Relay module	GMA200-RT	From 2.20	Protocol version V2 must be activated for GMA200-RT !!!
Display module	GMA22-RW		
ACDC-TRM bus gateway	GMA400-AT24		

9.4 Spare parts and accessories

	Design	Item
1.	36 W power supply unit for mounting on DIN rails (Input: 85-264 V AC Output: 24 V DC / 1.5 A)	1000271
2.	60 W power supply unit for mounting on DIN rails (Input: 88-264 V AC Output: 24 V DC / 2.5A)	1000272
3.	100 W power supply unit for mounting on DIN rails (Input: 88-264 V AC Output: 24 V DC / 4.2 A)	1000273
4.	GMA200-BC Connection terminals for GMA bus connector	2200200
5.	microSD card 2 GB	2200202
6.	Flat ribbon cable for GMA200-MT/-RT (L=22 cm)	2200309
7.	9-pin plug-in terminal	
8.	7-pin plug-in terminal	

9.5 Trade restrictions

The cryptography software used in the GMA400-MT16 is subject to the export restrictions for dual-use goods applicable in the European Union in accordance with EU Regulation (EU) 2021/821.
In the event of resale of the products purchased from GfG, the buyer undertakes to comply with all currently applicable provisions applicable to dual-use products. GfG accepts no liability for costs and claims of third parties resulting from resale by the customer.

The Export Control Classification Number (ECCN) applicable to cryptography software is 5A002.

Resellers can find more information in their contract or should contact their GfG sales representative if necessary.

10 Disposal

Further information is available directly from your GfG service contact.

11 Declaration of Conformity

EU Declaration of Conformity

GMA400-MT6
GMA400-MT16

Edited: 05.06.2023 Amended:

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GfG Gesellschaft für Gerätebau mbH develops, produces and distributes gas sensors and gas warning devices in accordance with the **Quality Management System:** DIN EN ISO 9001. The production of electrical devices in equipment groups I and II, categories M1, M2, 1G and 2G for gas sensors, gas measuring instruments, gas warning systems in the ignition and flameproof enclosures, increased safety, encapsulation and intrinsic safety and their measuring function is supervised by a quality assurance system monitored by the notified body, DEKRA Testing and Certification GmbH (0158).

The Controller **GMA400-MT6** and **GMA400-MT16** are in compliance with multiple directives, including: **2014/30/EU** for electromagnetic compatibility, with directive **2014/35/EU** for electrical safety and **2011/65/EU** (RoHS) on the restricted use of certain hazardous substances in electrical and electronic equipment.

Labelling CE

The directive 2014/30/EU is observed in compliance with the following standard:

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

The EMC test laboratory AKUVIB Engineering and Testing GmbH at Bochum has tested and certified the electromagnetic compatibility.

The directive 2014/35/EU is observed in compliance with the following standards:

- Safety requirements for electrical equipment for measurement, control and laboraty use. General requirements. — EN 61010-1: 2010 + A1:2019 + A1:2019/AC2019

The company cetecom advanced GmbH at Essen has tested and certified the electrical safety.

The directive 2011/65/EU is observed in compliance with the following standard:

- Technical documentation for the assessment of electrical and electronic products concerning the restriction of hazardous substances — EN 50581 : 2012

Dortmund, 06 June 2023

i. V. .....

B. Siebrecht
QMB

ATEX EU-Kon069-2/Siebrecht

12 Contact

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