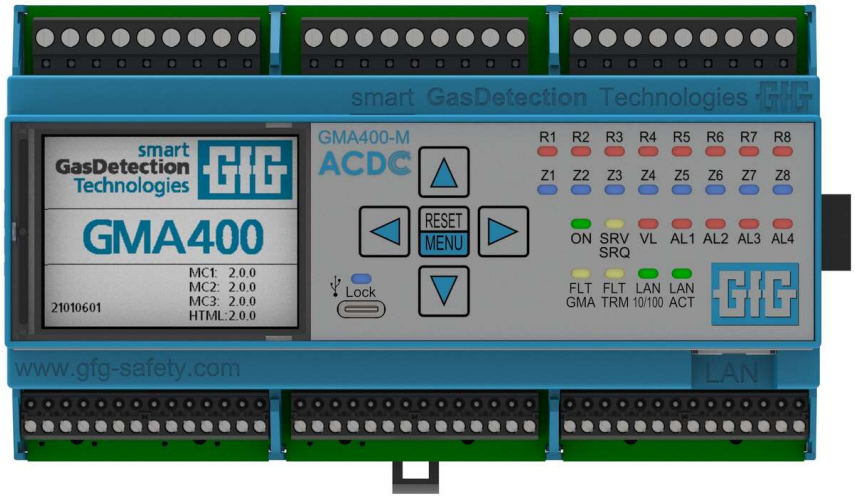
Appendix to the operation manual

GMA400 MT6/16

Modbus implementation

Version 2



Translation of the original appendix
236-000.36_AON_GMA400_Modbus

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1 Introduction

The GMA400 versions can be used to communicate via the following Modbus interfaces for data exchange:

- 2x Modbus/RTU (RS485, Slave Mode)
- 1x Modbus/TCP (Ethernet, TCP Server)

This document describes the structure of the telegrams and the transmission data and is only valid in conjunction with the current operating instructions [1].
For all Modbus interfaces, the data contents transmitted are as identical as possible. Differences will be explained in the appropriate places.

1.1 Revised designations

The Modbus protocol exchanges information between a master (client) and a slave (server) using a request-response mechanism. The master-slave principle is a model for a communication protocol in which one device (master) controls one or more other devices (slaves). The Modbus client ID was previously known as the master and the Modbus server ID was previously known as the slave. In the following, only the terms client and server will be used instead of master and slave.

2 Interfaces

Communication with the GMA400-M can be realized via three Modbus interfaces with the following functionality:

	Modbus RTU	Modbus TCP	Functionally safe	Description
GMA-Bus	X	-	X	restricted
COM-Bus	X	-	-	X
Ethernet	-	X	-	X

The telegram structures are defined the same for all interfaces. However, not all descriptions are available for the GMA bus. The designations of the relays, horns and digital inputs are not available there. This is explicitly pointed out again in the description of the transmission data.

2.1 Modbus RTU

A GMA400 features two Modbus RTU ports (RS-485) that can be used for data exchange with a PLC or a visualization tool (Modbus client) when configured accordingly in server mode (GMA bus and COM bus, see above).

2.1.1 Cabel

The bus connection between client and server is realized via a screened 2-core cable (terminal connection); e.g. bus cable 1x2x0.22mm² BUS-LD or bus cable Y(St)Y 2x2x0.8.

2.1.2 Bus structure

The maximum length of the bus must not exceed 1200 m (see RS-485 specification). A maximum of 64 servers can be connected to the Modbus. The transmission rate depends on the length of the cable and can be set to a maximum of 230400 baud.
The actual maximum cable length and the maximum transmission rate are also heavily dependent on the structure of the network. Star topologies in particular should be avoided due to the long stub lines that arise. A chain structure (daisy chain) is advantageous. The following table provides a rough guideline for the transmission rate based on the maximum baud rates in relation to the cable length.

line length	max baud rate
up to 500 m	230400 Baud
up to 1000 m	115200 Baud
up to 1200 m	57600 Baud

The bus levels are defined via the client. The bus is to be terminated on both sides with 120 Ω terminal resistors. The GMA400 has a terminal resistor internally on the Modbus connections, which can be switched on or off via an electronic switch during configuration.

2.1.3 Communication parameters

Bus address	1 … 247 (in server mode) Note: Specifying the address also simultaneously determines the operating mode of the bus node. Address 0 activates client operation and an address not equal to 0 activates server operation.
Transmission rate	9600, 19200, 38400, 57600, 115200, 230400 baud
Data format	8E1: 1 start bit, 8 data-bits, 1 parity-bit (*even parity*) with 1 stop bit 8O1: 1 start bit, 8 data-bits, 1 parity-bit (*odd parity*) with 1 stop bit 8N2: 1 start bit, 8 data-bits, 1 parity-bit (*no parity*) with 2 stop bits
bus termination	120 Ω terminating resistor on/off

The bus address, baud rate, data format and termination are set using the configuration program on the PC (see operating instructions [1]).

2.2 Modbus TCP

The GMA400 has an Ethernet connection (RJ-45 plug) and can therefore be used as a Modbus TCP server for data exchange with Modbus TCP clients if parameterized accordingly..

2.2.1 Cable

Suitable cables for Modbus TCP connection:

- Cat-5e shielded
- Cat-6 shielded
- Cat-6a shielded
- Cat-7 shielded

2.2.2 Bus structure

The permissible total length of the transmission path for copper lines is 100 m. This includes:

- 90 m installation cable
- 10 m patch cable (2 × 5m)
- 2 connectors (e.g. socket and patch panel)

Patch cables have poorer transmission properties. If the patch cables exceed 10 m in length, the permissible length of the installation cable is reduced by 1.5 m per meter of excess length. If the route consists only of patch cables, the permissible standard length is approx. 70 m.

2.2.3 Communication parameters

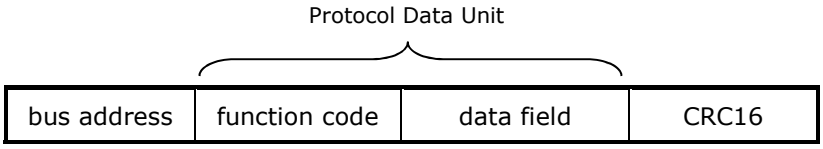
IP address	32-bit IPv4 network address
Subnet mask	32-bit IP address masking (for network and host portion)
IP address gateway	Optional IP address of a gateway in the network
Port number	02 by default for Modbus TCP
Connection timeout	1…255 minutes (typically 15 minutes)
Bus address	1 (fix, because the device is unambiguously addressed via the IP address)

The settings are made using the configuration program on the PC (see operation manual [1]).

3 Telegram structure

3.1 Modbus RTU

As shown in the figure below, each telegram starts with the bus address and the function code (each 1 byte) and ends with the CRC16 Modbus checksum (2 bytes). In between is the application-specific data field.



Structure of a Modbus frame (RTU)

The CRC16 checksum is Modbus-specific and has the polynomial 0xA001 (see specification [3]). Except for the checksum, all data is transmitted in big-endian format (MSB first), but the checksum is transmitted in little-endian format (LSB first).

3.2 Modbus TCP

With Modbus TCP, a TCP header with the following structure is added to the front of the RTU telegram (see section 3.1 above).

Byte index	Content	Description
0	0x00	Transaction number. This is not needed and can therefore always be set to zero.
1	0x00	
2	0x00	Fixed protocol identifier with the value zero.
3	0x00	
4	0x00	Byte length [n] of the Modbus telegram consisting of the bus address, function code and data area (without checksum).
5	[n]	

Structure of the Modbus TCP header

3.3 Modbus function codes

Data access via Modbus is based on mapped registers within the device, which can be accessed by the client for reading and/or writing via the following standard Modbus function codes [2].

- **Read Input Registers 04 (0x04)**
- **Write Multiple Registers 16 (0x10)**
- **Read/Write Multiple Registers 23 (0x17)**

The registers are 16-bit values with a 16-bit address range. The assignment of the transmission data to the register addresses is described in section 4. The telegram structure for the various function codes and the functionalities implemented in the device are described below.

3.3.1 Read Input Registers

In the request for reading registers, the client sends the start address and the number of registers. In the response, the server sends back the contents of the requested registers.

Request	Length	Content
Bus address	1 Byte	1 … 247
Function code	1 Byte	0x04
Start address	2 Bytes	0x0000 … 0xFFFA
Number of registers	2 Bytes	1 … N*
Modbus checksum	2 Bytes	(0x0000 … 0xFFFF)

Response	Length	Content
Bus address	1 Byte	1 … 247
Function code	1 Byte	0x04
Start address	1 Byte	2 x N*
Number of registers	N* x 2 Bytes	Data
Modbus checksum	2 Bytes	(0x0000 … 0xFFFF)

N* = Number of registers

3.3.2 Write Multiple Registers

In the request for writing to registers, the client sends the start address, the number and the content of the registers. The server sends the start address and the number of registers back as confirmation.

Request	Length	Content
Bus address	1 Byte	1 … 247
Function code	1 Byte	0x10
Start address	2 Bytes	0x0000 … 0xFFD2
Number of registers	2 Bytes	1 … N*
Number of bytes	1 Bytes	2 x N*
Register content	N* x 2 Bytes	Data
Modbus checksum	2 Bytes	(0x0000 … 0xFFFF)

Response	Length	Content
Bus address	1 Byte	1 … 247
Function code	1 Byte	0x10
Start address	2 Bytes	0x0000 … 0xFFD2
Number of registers	2 Bytes	1 … N*
Modbus checksum	2 Bytes	(0x0000 … 0xFFFF)

N* = Number of registers

3.3.3 Read/Write Multiple Registers

In its request, the client sends the start address and the number of registers to be read and the start address, number and contents of the registers to be written. In its response, the server returns the contents of the requested registers.

Request	Length	Content
Bus address	1 Byte	1 … 247
Function code	1 Byte	0x17
Start address (R)	2 Bytes	0x0000 … 0xFFFA
Number of registers (R)	2 Bytes	1 … N(R)*
Start address (W)	2 Bytes	0x0000 … 0xFFD2
Number of registers (W)	2 Bytes	1 … N(W)*
Number of bytes (W)	1 Bytes	2 x N(W)*
Register content (W)	N(W)* x 2 Bytes	Data
Modbus checksum	2 Bytes	(0x0000 … 0xFFFF)

(R) = read

(W) = write

Response	Length	Content
Bus address	1 Byte	1 … 247
Function code	1 Byte	0x17
Number of bytes	1 Byte	2 x N(R)*
Register content	N(R)* x 2 Bytes	Data
Modbus checksum	2 Bytes	(0x0000 … 0xFFFF)

N* = Number of registers

3.3.4 Exception code

If an error occurs while reading from or writing to the register, the server returns an exception code instead of the expected response and sets the most significant bit (MSB) in the function code.

Error response	Length	Content
Bus address	1 Byte	1 … 247
Function code	1 Byte	0x84 / 0x90 / 0x97
Exception code	1 Byte	0x01 ... 0x04, 0x0B
Modbus checksum	2 Bytes	(0x0000 … 0xFFFF)

The following exception codes are possible with the implemented function codes:

Exception code	**Designation**	**Fault description**
0x01	Illegal function	Invalid function code
0x02	Illegal data address	Invalid register address
0x03	Illegal data value	Invalid number of registers
0x04	Server device failure	Error accessing register
0x0B	Gateway target timeout	Gateway is not receiving a response from the target server

4 Transmitted data

4.1 Overview

The following table provides an overview of the individual data blocks and their start addresses.
The data contents and addresses of the individual data blocks are described in detail in the following chapters.

Start of register address	Content	Details
0x0000	Data for managing GMA400	Start compatible to GMA200
0x0100	Measurement point assignment (Activ, Zone, Group) 1-128	
0x0200	Measurement point assignment (Activ, Zone, Group) 129-160	
0x0A00	Alarm acknowledgment	
0x1000	Measurement point groups	Data
0x1100		Description 1, 2
0x1180		Description 3, 4
0x1200		Description 5, 6
0x1280		Description 7, 8
0x1300		Description 9, 10
0x1380		Description 11, 12
0x1400		Description 13, 14
0x1480		Description 15, 16
0x2000	Zone	Data
0x2100		Description 1, 2
0x2180		Description 3, 4
0x2200		Description 5, 6
0x2280		Description 7, 8
0x3000	Measuring points 1…16	Data 1…16
0x3100		Description 1, 2
0x3180		Description 3, 4
0x3200		Description 5, 6
0x3280		Description 7, 8
0x3300		Description 9, 10
0x3380		Description 11, 12
0x3400		Description 13, 14
0x3480		Description 15, 16
0x3500	Measuring points 17…32	Data 17…32
0x3600		Description 17, 18
0x3680		Description 19, 20
0x3700		Description 21, 22
0x3780		Description 23, 24
0x3800		Description 25, 26
0x3880		Description 27, 28
0x3900		Description 29, 30
0x3980		Description 31, 32
0x3A00	Measuring points 33…48	Data 33…48
0x3B00		Description 33, 34
0x3B80		Description 35, 36
0x3C00		Description 37, 38
0x3C80		Description 39, 40
0x3D00		Description 41, 42
0x3D80		Description 43, 44
0x3E00		Description 45, 46

0x3E80		Description 47, 48
0x3F00	Measuring points 49…64	Data 49…64
0x4000		Description 49, 50
0x4080		Description 51, 52
0x4100		Description 53, 54
0x4180		Description 55, 56
0x4200		Description 57, 58
0x4280		Description 59, 60
0x4300		Description 61, 62
0x4380		Description 63, 64
0x4400	Measuring points 65…80	Data 65…80
0x4500		Description 65, 66
0x4580		Description 67, 68
0x4600		Description 69, 70
0x4680		Description 71, 72
0x4700		Description 73, 74
0x4780		Description 75, 76
0x4800		Description 77, 78
0x4880		Description 79, 80
0x4900	Measuring points 81…96	Data 81…96
0x4A00		Description 81, 82
0x4A80		Description 83, 84
0x4B00		Description 85, 86
0x4B80		Description 87, 88
0x4C00		Description 89, 90
0x4C80		Description 91, 92
0x4D00		Description 93, 94
0x4D80		Description 95, 96
0x4E00	Measuring points 97…112	Data 97…112
0x4F00		Description 97, 98
0x4F80		Description 99, 100
0x5000		Description 101, 102
0x5080		Description 103, 104
0x5100		Description 105, 106
0x5180		Description 107, 108
0x5200		Description 109, 110
0x5280		Description 111, 112
0x5300	Measuring points 113…128	Data 113…128
0x5400		Description 113, 114
0x5480		Description 115, 116
0x5500		Description 117, 118
0x5580		Description 119, 120
0x5600		Description 121, 122
0x5680		Description 123, 124
0x5700		Description 125, 126
0x5780		Description 127, 128
0x5800	Measuring points 129…144	Data 129…144
0x5900		Description 129, 130
0x5980		Description 131, 132
0x5A00		Description 133, 134
0x5A80		Description 135, 136
0x5B00		Description 137, 138
0x5B80		Description 139, 140
0x5C00		Description 141, 142
0x5C80		Description 143, 144
0x5D00	Measuring points 145…160	Data 145…160
0x5E00		Description 145, 146
0x5E80		Description 147, 148
0x5F00		Description 149, 150
0x5F80		Description 151, 152
0x6000		Description 153, 154

0x6080		Description 155, 156
0x6100		Description 157, 158
0x6180		Description 159, 160
0xA000	Input/output states and status of the GMA400 and the relay modules	GMA400 + relay module 1 to 8
0xA020	Initial states and status of the display modules	display module 1 to 16
0xA040		alarm panel 1 to 64
0xAA00	Naming of digital inputs	Digital inputs 1, 2
0xAA52		Digital inputs 3, 4
0xAAA4		Digital inputs 5, 6
0xAAF6		Digital inputs 7, 8
0xAC00	Designations of the internal relays	Internal relays 1, 2
0xAC52		Internal relays 3, 4
0xACA4		Internal relays 5, 6
0xACF6		Internal relays 7, 8
0xAD48	Designations of the horn	Internal horn
0xB000	Designations of the relay modules incl. contacts	Modul, Hupe, Relais 1…16, Dig-In.
0xD000	Designations of the display modules incl. contacts	Modul, Hupe, Relais 1…4, Dig-In.
0xE000	Designations of the warning lights incl. contacts	Melder, Leuchte, Hupe

4.2 Telegram signature

For unambiguous telegram identification, a signature can be transmitted as register content in connection with the function code for reading and writing registers (Read/Write Multiple Register 0x17). For this purpose, each register block in chapter 4 starts with the signature register. The client sends a signature with the request to write the signature register and at the same time requests this signature together with further register values from the server, which are then sent back to the client as a response. The signature that is transmitted by the client for this purpose can, for example, be a counter value that is incremented before each request. By comparing the sent signature and the signature received from the server, the client can then recognize whether the received telegram is actually the response to the sent request.

After reading the signature, it is automatically decremented within the server. If the client repeatedly accesses only the signature and data in read mode (Read Input Registers 0x04), the automatic signature decrementing can still be used to recognize that the server's responses are telegrams that have been created and sent continuously.

4.3 Data format of the designations

The designations are UTF8-encoded. This means that a character can be up to four bytes long. That is, a string with 10 characters can be up to 40 bytes long, then without termination. If the string is shorter, a 0 termination is used. Two bytes are transferred per register.

Example string: „1€"

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
2. Characters, 3. Byte: 0xAC								2. Characters, 2. Byte: 0x82								2. Characters, 1. Byte: 0xE2								1. Character ‚1' (0x31)							
Byte 3								Byte 2								Byte 1								Byte 0							
Modbus register 1																Modbus register 0															

4.4 GMA400 Administrative data

Offset register address	Access info	Register type (16 Bit)	Parameters	Explanation	
0x0000	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).	
0x0001	Read	Unsigned	GMA type	Low Byte: encoding: 30: GMA400-MT16 31: GMA400-MT6 32: GMA400-MW16 High Byte: Structure version number, currently =0	
0x0002	Read	Unsigned	Connection ID	Low Byte: 01: Connection via Ethernet (Modbus/TCP) 02: Connection via COM-Bus (Modbus/RTU) 03: Connection via GMA-Bus (Modbus/RTU) 04…255: not assigned High Byte: unassigned	
0x0003	Read	Unsigned	GMA status	Low Byte: Bit0: Startup Bit1: Failure Bit2: Service Bit3: Service request Bit4: Configuration mode Bit5…7: not assigned	
				High Byte: 0…255: Configuration change counter Incremented with each change to the device configuration. The client should then reread and update parameter values that are read only initially and not cyclically.	
0x0004	Read	Unsigned	Digital entrances	Bit0: Din 1 Level Bit1: Din 2 Level Bit2: Din 3 Level Bit3: Din 4 Level Bit4: Din 5 Level Bit5: Din 6 Level Bit6: Din 7 Level Bit7: Din 8 Level	Bit8: Din 1 Error Bit9: Din 2 Error Bit10: Din 3 Error Bit11: Din 4 Error Bit12: Din 5 Error Bit13: Din 6 Error Bit14: Din 7 Error Bit15: Din 8 Error
0x0005	Read	Unsigned	FW Version Main 1 (FW = Firmware)	Bit 0…7: Main version number Bit 8…15: unassigned	
0x0006	Read	Unsigned	FW Version Main 1	Bit 0…7: Patch version number Bit 8…15: Sub version number	
0x0007	Read	Unsigned	FW Version Main 2	(see Register 0x0005)	
0x0008	Read	Unsigned	FW Version Main 2	(see Register 0x0006)	
0x0009	Read	Unsigned	FW Version Display	(see Register 0x0005)	
0x000A	Read	Unsigned	FW Version Display	(see Register 0x0006)	
0x000B	Read	Unsigned	Version HTML	(see Register 0x0005)	
0x000C	Read	Unsigned	Version HTML	(see Register 0x0006)	
Register address	**Access info**	**Register type (16 Bit)**	**Parameter**	**Explanation**	
0x0020	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).	
0x0021	Read	Unsigned	Serial number	10-digit (UTF8), max. 40 Byte	
…		Unsigned	Serial number		
0x0034	Read	Unsigned	Serial number		
Register Address	**Access info**	**Register type (16 Bit)**	**Parameter**	**Explanation**	
0x0050	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).	
0x0051	Read	Unsigned	GMA designation	20-digit (UTF8), max. 80 Byte	
…		Unsigned	GMA designation		
0x0078	Read	Unsigned	GMA designation		

4.5 Measurement point assignment (Activ, Zone, Group)

Offset Register address	Access info	Register type (16 Bit)	Parameter	Explanation	
0x0100	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).	
0x0101	Read	Unsigned	Measuring point 001	Bit 0…4	1 … 16 = group assignment 0 = no or invalid assignment
				Bit 5…7	unassigned
				Bit 8…11	1 … 8 = zone assignment 0 = no or invalid assignment
				Bit 12…14	unassigned
				Bit 15	1= measuring point activ, 0= inaktiv
0x0102	Read	Unsigned	Measuring point 002	See measuring point 001	
0x0103	Read	Unsigned	Measuring point 003	See measuring point 001	
…			Measuring point …	See measuring point 001	
0x0140	Read	Unsigned	Measuring point 064	See measuring point 001	
0x0180	Read/Write	Unsigned	Signature	Signatur zur Telegramm-Identifikation (wird nach dem Auslesen dekrementiert).	
0x0181	Read	Unsigned	Measuring point 065	See measuring point 001	
…			Measuring point …	See measuring point 001	
0x01C0	Read	Unsigned	Measuring point 128	See measuring point 001	

Register address	Access info	Register type (16 Bit)	Parameter	Explanation
0x0200	Read/Write	Unsigned	Signatur	Signature for telegram identification (decremented after reading).
0x0201	Read	Unsigned	Measuring point 129	See measuring point 001
…			Measuring point …	See measuring point 001
0x0220	Read	Unsigned	Measuring point 160	See measuring point 001

4.6 Alarm acknowledgment

Offset Register address	Access info	Register type (16 Bit)	Parameter	Explanation
0x0A00	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0x0A01	Write	Unsigned	Global alarm-acknowledgment	Bit0 1 = Acknowledge alarms for all measuring points Bit1:15 unassigned
0x0A10	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0x0A11	Write	Unsigned	Alarm acknowledgment for each measuring point	Confirmation of active alarms at individual measuring points. Each bit is assigned to a measuring point. When the bit is set, active alarms at the corresponding measuring point (MP) are confirmed. → Bit0:15 = MP1:16 Beispiel: 0x0001: Alarm acknowledgment measuring point 1 0x0010: Alarm acknowledgment measuring point 5 0xFFFF: Alarm acknowledgment measuring points 1-16
0x0A12	Write	Unsigned		Bit0:15 = MP17:32
0x0A13	Write	Unsigned		Bit0:15 = MP33:48
0x0A14	Write	Unsigned		Bit0:15 = MP49:64
0x0A15	Write	Unsigned		Bit0:15 = MP65:80
0x0A16	Write	Unsigned		Bit0:15 = MP81:96
0x0A17	Write	Unsigned		Bit0:15 = MP97:112
0x0A18	Write	Unsigned		Bit0:15 = MP113:128
0x0A19	Write	Unsigned		Bit0:15 = MP129:144
0x0A1A	Write	Unsigned		Bit0:15 = MP145:160

4.7 Measuring point groups

4.7.1 Group data

Register address	Access info	Register type (16 Bit)	Parameter	Explanation
0x0000	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
Group 1				
0x0001	Read	Signed	MRB	Start of measuring range in relation to scaling factor
0x0002	Read	Signed	MRE	End of measuring range in relation to scaling factor
0x0003	Read	Signed	Scaling factor	Scaling factor of the TRM measurement value −3: 0,001 −2: 0,01 −1: 0,1 0: 1
0x0004	Read	Unsigned	Unit / Gas	Bit0…7: Gas, please refer to GfG list (Chapter 5.2) Bit8…15: Unit, please refer to GfG list (Chapter **Fehler! Verweisquelle konnte nicht gefunden werden.**)
0x0005	Read	Unsigned	Monitoring of excess and deficiency	Bit0: Alarm threshold direction AL1 0=falling below 1=exceeding Bit1: Alarm threshold direction AL2, 0=falling below 1=exceeding Bit2: Alarm threshold direction AL3, 0=falling below 1=exceeding Bit3: Alarm threshold direction AL4, 0=falling below 1=exceeding Bit4: unassigned Bit5: unassigned Bit6…7: current, averge1, or average2 value AL1 Bit 8…9: current, averge1, or average2 value AL2 Bit 10…11: current, averge1, or average2 value AL3 Bit 12…13: current, averge1, or average2 value AL4 Bit 14…15: unassigned For Bits 6-7,8-9,10-11,12-13: 0= alarm based on the current value 1= alarm based on the average value 1 2= alarm based on the average value 2 3= alarm off.
0x0006	Read	Signed	AL1	alarm threshold 1
0x0007	Read	Signed	AL2	alarm threshold 2
0x0008	Read	Signed	AL3	alarm threshold 3
0x0009	Read	Signed	AL4	alarm threshold 4
0x000A	Read	Signed	unassigned	
0x000B	Read	Unsigned	Interval 1 of the measured values to be averaged	0…24 h in minutes (usually STEL 15 min)
0x000C	Read	Unsigned	Interval 2 of the measured values to be averaged	0…24 h in minutes (usually TWA 8 h)
0x000D	Read		unassigned	

Group 2				
0x000E	Read			
…				
0x001A	Read			

Group 3				
0x001B	Read			
…				
0x0027	Read			

Group 4				
0x0028	Read			
…				
0x0034	Read			

Group 5				
0x0035	Read			
…				
0x0041	Read			

Group 6				
0x0042	Read			
…				
0x004E	Read			

Group 7				
0x004F	Read			
…				
0x005B	Read			

Group 8				
0x005C	Read			
…				
0x0068	Read			

Register address	**Access info**	**Register type (16 Bit)**	**Parameter**	**Explanation**
0x0080	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
Group 9				
0x0081	Read			
…				
0x008D	Read			
Group 10				
0x008E	Read			
…				
0x009A	Read			
Group 11				
0x009B	Read			
…				
0x00A7	Read			
Group 12				
0x00A8	Read			
…				
0x00B4	Read			
Group 13				
0x00B5	Read			
…				
0x00C1	Read			
Group 14				
0x00C2	Read			
…				
0x00CE	Read			
Group 15				
0x00CF	Read			
…				
0x00DB	Read			
Group 16				
0x00DC	Read			
…				
0x00E8	Read			

4.7.2 Designations of the groups

The designations are each 20 characters or 80 bytes long (UTF8).

Register address	Access info	Register type (16 Bit)	Parameter	Explanation
0x0000	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0x0001	Read	Unsigned	Group 1	Designation Group 1
…		Unsigned		
0x0028	Read	Unsigned		
0x0029	Read	Unsigned	Group 2	Designation Group 2
…		Unsigned		
0x0050	Read	Unsigned		
0x0080	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0x0081	Read	Unsigned	Group 3	Designation Group 3
…		Unsigned		
0x00A8	Read	Unsigned		
0x00A9	Read	Unsigned	Group 4	Designation Group 4
…		Unsigned		
0x00D0	Read	Unsigned		
0x0100	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0x0101	Read	Unsigned	Group 5	Designation Group 5
…		Unsigned		
0x0128	Read	Unsigned		
0x0129	Read	Unsigned	Group 6	Designation Group 6
…		Unsigned		
0x0150	Read	Unsigned		
0x0180	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0x0181	Read	Unsigned	Group 7	Designation Group 7
…		Unsigned		
0x01A8	Read	Unsigned		
0x01A9	Read	Unsigned	Group 8	Designation Group 8
…		Unsigned		
0x01D0	Read	Unsigned		
0x0200	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0x0201	Read	Unsigned	Group 9	Designation Group 9
…		Unsigned		
0x0228	Read	Unsigned		
0x0229	Read	Unsigned	Group 10	Designation Group 10
…		Unsigned		
0x0250	Read	Unsigned		
0x0280	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0x0281	Read	Unsigned	Group 11	Designation Group 11
…		Unsigned		
0x02A8	Read	Unsigned		
0x02A9	Read	Unsigned	Group 12	Designation Group 12
…		Unsigned		
0x02D0	Read	Unsigned		

0x0300	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0x0301	Read	Unsigned	Group 13	Designation Group 13
…		Unsigned		
0x0328	Read	Unsigned		
0x0329	Read	Unsigned	Group 14	Designation Group 14
…		Unsigned		
0x03D0	Read	Unsigned		
0x0380	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0x0381	Read	Unsigned	Group 15	Designation Group 15
…		Unsigned		
0x03A8	Read	Unsigned		
0x03A9	Read	Unsigned	Group 16	Designation Group 16
…		Unsigned		
0x03D0	Read	Unsigned		

4.8 Zones

4.8.1 Zone data

Offset Register address	Access info	Register type (16 Bit)	Parameter	Explanation
0x0000	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
				Not yet used

4.8.2 Zone designations

The designations are each 20 characters or 80 bytes long (UTF8).

Offset Register address	Access info	Register type (16 Bit)	Parameter	Explanation
0x0000	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0x0001	Read	Unsigned	Zone 1	DesignationZone 1
…		Unsigned		
0x0028	Read	Unsigned		
0x0029	Read	Unsigned	Zone 2	DesignationZone 2
…		Unsigned		
0x0050	Read	Unsigned		
0x0080	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0x0081	Read	Unsigned	Zone 3	DesignationZone 3
…		Unsigned		
0x00A8	Read	Unsigned		
0x00A9	Read	Unsigned	Zone 4	DesignationZone 4
…		Unsigned		
0x00D0	Read	Unsigned		
0x0100	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0x0101	Read	Unsigned	Zone 5	DesignationZone 5
…		Unsigned		
0x0128	Read	Unsigned		
0x0129	Read	Unsigned	Zone 6	DesignationZone 6
…		Unsigned		
0x0150	Read	Unsigned		
0x0180	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0x0181	Read	Unsigned	Zone 7	DesignationZone 7
…		Unsigned		
0x01A8	Read	Unsigned		
0x01A9	Read	Unsigned	Zone 8	DesignationZone 8
…		Unsigned		
0x01D0	Read	Unsigned		

4.9 Measuring points

4.9.1 Data of the measuring points

Offset Register address	Access info	Register type (16 Bit)	Parameter	Explanation	
0x0000	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).	
Transmitter (N * 16) +1					
0x0001	Read	Unsigned	Status MP (#1)	Bit0: activated Bit1: latched Bit2: simulation Bit3: valid measured value Bit4: fault Bit5: service Bit6: service request Bit7: unassigned	Bit8: alarm 1 (GMA) Bit9: alarm 2 (GMA) Bit10: alarm 3 (GMA) Bit11: alarm 4 (GMA) Bit12: unassigned Bit13: unassigned Bit14: ACDC fallback Bit15: ambiguity
0x0002	Read	Unsigned	Status MP (#2)	Bit0: over-/underrange 0 Bit1: over-/underrange 1 Bit2: over-/underrange 2 0:normaler operation 1:underrange 2:underrange AD 3:underrange fault 4:overrange fault 5:overrange AD 6:overrange 7: undefined measurement Bit3: line short Bit4: FLT: gas pumping Bit5: VL0 (ventilation block) Bit6: VL1 (ventilation level 1) Bit7: VL2 (ventilation level 2)	Bit8: alarm 1 (TRM) Bit9: alarm 2 (TRM) Bit10: alarm 3 (TRM) Bit11: unassigned Bit12: status bits 0 Bit13: status bits 1 Bit14: status bits 2 Bit15: status bits 3 0:normal operation 1:startup 2:fault:FLT-TRM 3:communication error 4: inconsistent config. 5:fault: Gateway 6:service: SRV menu 7:service: SRV Zero 8:service: SRV SPAN 9:serivce: SRV config 10:service: general 11…15: unassigned
0x0003	Read	Signed	measured value	0…10000	
Transmitter (N * 16) +2					
0x0004	Read	Unsigned	Status MP (#1)	For contents, see transmitter (N * 16) +1	
0x0005	Read	Unsigned	Status MP (#2)		
0x0006	Read	Signed	measured values		
Transmitter (N * 16) +3					
0x0007	Read	Unsigned	Status MP (#1)	For contents, see transmitter (N * 16) +1	
0x0008	Read	Unsigned	Status MP (#2)		
0x0009	Read	Signed	measured values		
Transmitter (N * 16) +4					
0x000A	Read	Unsigned	Status MP (#1)	For contents, see transmitter (N * 16) +1	
0x000B	Read	Unsigned	Status MP (#2)		
0x000C	Read	Signed	measured values		
Transmitter (N * 16) +5					
0x000D	Read	Unsigned	Status MP (#1)	For contents, see transmitter	
0x000E	Read	Unsigned	Status MP (#2)		
0x000F	Read	Signed	measured values		
Transmitter (N * 16) +6					
0x0010	Read	Unsigned	Status MP (#1)	For contents, see transmitter (N * 16) +1	
0x0011	Read	Unsigned	Status MP (#2)		
0x0012	Read	Signed	measured values		
Transmitter (N * 16) +7					
0x0013	Read	Unsigned	Status MP (#1)	For contents, see transmitter (N * 16) +1	
0x0014	Read	Unsigned	Status MP (#2)		
0x0015	Read	Signed	measured values		
Transmitter (N * 16) +8					
0x0016	Read	Unsigned	Status MP (#1)	For contents, see transmitter (N * 16) +1	
0x0017	Read	Unsigned	Status MP (#2)		
0x0018	Read	Signed	measured values		

Transmitter (N * 16) +9				
0x0019	Read	Unsigned	Status MP (#1)	For contents, see transmitter (N * 16) +1
0x001A	Read	Unsigned	Status MP (#2)	
0x001B	Read	Signed	measured values	
Transmitter (N * 16) +10				
0x001C	Read	Unsigned	Status MP (#1)	For contents, see transmitter (N * 16) +1
0x001D	Read	Unsigned	Status MP (#2)	
0x001E	Read	Signed	measured values	
Transmitter (N * 16) +11				
0x001F	Read	Unsigned	Status MP (#1)	For contents, see transmitter (N * 16) +1
0x0020	Read	Unsigned	Status MP (#2)	
0x0021	Read	Signed	measured values	
Transmitter (N * 16) +12				
0x0022	Read	Unsigned	Status MP (#1)	For contents, see transmitter (N * 16) +1
0x0023	Read	Unsigned	Status MP (#2)	
0x0024	Read	Signed	measured values	
Transmitter (N * 16) +13				
0x0025	Read	Unsigned	Status MP (#1)	For contents, see transmitter (N * 16) +1
0x0026	Read	Unsigned	Status MP (#2)	
0x0027	Read	Signed	measured values	
Transmitter (N * 16) +14				
0x0028	Read	Unsigned	Status MP (#1)	For contents, see transmitter (N * 16) +1
0x0029	Read	Unsigned	Status MP (#2)	
0x002A	Read	Signed	measured values	
Transmitter (N * 16) +15				
0x002B	Read	Unsigned	Status MP (#1)	For contents, see transmitter (N * 16) +1
0x002C	Read	Unsigned	Status MP (#2)	
0x002D	Read	Signed	measured values	
Transmitter (N * 16) +16				
0x002E	Read	Unsigned	Status MP (#1)	For contents, see transmitter (N * 16) +1
0x002F	Read	Unsigned	Status MP (#2)	
0x0030	Read	Signed	measured values	
0x0031	Read	Signed	mean value 1	Transmitter (N * 16) +1
0x0032	Read	Signed	mean value 1	Transmitter (N * 16) +2
0x0033	Read	Signed	mean value 1	Transmitter (N * 16) +3
0x0034	Read	Signed	mean value 1	Transmitter (N * 16) +4
0x0035	Read	Signed	mean value 1	Transmitter (N * 16) +5
0x0036	Read	Signed	mean value 1	Transmitter (N * 16) +6
0x0037	Read	Signed	mean value 1	Transmitter (N * 16) +7
0x0038	Read	Signed	mean value 1	Transmitter (N * 16) +8
0x0039	Read	Signed	mean value 1	Transmitter (N * 16) +9
0x003A	Read	Signed	mean value 1	Transmitter (N * 16) +10
0x003B	Read	Signed	mean value 1	Transmitter (N * 16) +11
0x003C	Read	Signed	mean value 1	Transmitter (N * 16) +12
0x003D	Read	Signed	mean value 1	Transmitter (N * 16) +13
0x003E	Read	Signed	mean value 1	Transmitter (N * 16) +14
0x003F	Read	Signed	mean value 1	Transmitter (N * 16) +15
0x0040	Read	Signed	mean value 1	Transmitter (N * 16) +16
0x0041	Read	Signed	mean value 2	Transmitter (N * 16) +1
0x0042	Read	Signed	mean value 2	Transmitter (N * 16) +2
0x0043	Read	Signed	mean value 2	Transmitter (N * 16) +3
0x0044	Read	Signed	mean value 2	Transmitter (N * 16) +4
0x0045	Read	Signed	mean value 2	Transmitter (N * 16) +5
0x0046	Read	Signed	mean value 2	Transmitter (N * 16) +6
0x0047	Read	Signed	mean value 2	Transmitter (N * 16) +7
0x0048	Read	Signed	mean value 2	Transmitter (N * 16) +8
0x0049	Read	Signed	mean value 2	Transmitter (N * 16) +9
0x004A	Read	Signed	mean value 2	Transmitter (N * 16) +10
0x004B	Read	Signed	mean value 2	Transmitter (N * 16) +11
0x004C	Read	Signed	mean value 2	Transmitter (N * 16) +12
0x004D	Read	Signed	mean value 2	Transmitter (N * 16) +13
0x004E	Read	Signed	mean value 2	Transmitter (N * 16) +14
0x004F	Read	Signed	mean value 2	Transmitter (N * 16) +15
0x0050	Read	Signed	mean value 2	Transmitter (N * 16) +16

4.9.2 Designation of the measuring points

A measuring point has two designations, each of which is 10 characters or 40 bytes long (UTF8).

Offset Register address	Access info	Register-Typ (16 Bit)	Parameter	Explanation
0x0000	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0x0001	Read	Unsigned	Transmitter Base +0 Text 1	1. measuring point designation
…		Unsigned		
0x0014	Read	Unsigned		
0x0015	Read	Unsigned	Transmitter Base +0 Text 2	2. measuring point designation
…		Unsigned		
0x0028	Read	Unsigned		
0x0029	Read	Unsigned	Transmitter Base +1 Text 1	1. measuring point designation
…		Unsigned		
0x003C	Read	Unsigned		
0x003D	Read	Unsigned	Transmitter Base +1 Text 2	2. measuring point designation
…		Unsigned		
0x0050	Read	Unsigned		
0x0080	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0x0081	Read	Unsigned	Transmitter Base +2 Text 1	1. measuring point designation
…		Unsigned		
0x0094	Read	Unsigned		
0x0095	Read	Unsigned	Transmitter Base +2 Text 2	2. measuring point designation
…		Unsigned		
0x00A8	Read	Unsigned		
0x00A9	Read	Unsigned	Transmitter Base +3 Text 1	1. measuring point designation
…		Unsigned		
0x00BC	Read	Unsigned		
0x00BD	Read	Unsigned	Transmitter Base +3 Text 2	2. measuring point designation
…		Unsigned		
0x00D0	Read	Unsigned		

4.10 Status information

The logical switching states of the inputs/outputs are output. The physical state can differ depending on the configuration (quiescent/working current).

Maximum number	Number Relays	Number Horns	Device	Maximum contacts
1	8	1	GMA400 intern	9
8	16	1	GMA200-Rx	136
16	4	1	GMA22 as a display and relay module	80
64	1	1	Alarm panel with horn (relays = panel)	128

4.10.1 Input/output states and status of the GMA400 and relay modules

Offset Register address	Access info	Register type (16 Bit)	Parameter	Explanation
0xA000	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0xA001	Read	Unsigned	digital inputs GMA400	Bit 0: Logic state of digital input 1 Bit 1: Logic state of digital input 2 Bit 2: Logic state of digital input 3 Bit 3: Logic state of digital input 4 Bit 4: Logic state of digital input 5 Bit 5: Logic state of digital input 6 Bit 6: Logic state of digital input 7 Bit 7: Logic state of digital input 8 Bit 8…15: unassigned
0xA002	Read	Unsigned	Internal relays + status GMA400	Bit 0: unassigned Bit 1: horn Bit 2…4: unassigned Bit 5: service request GMA Bit 6: service GMA Bit 7: fault GMA Bit 8: Logical state of relay 1 Bit 9: Logical state of relay 2 Bit 10: Logical state of relay 3 Bit 11: Logical state of relay 4 Bit 12: Logical state of relay 5 Bit 13: Logical state of relay 6 Bit 14: Logical state of relay 7 Bit 15: Logical state of relay 8
0xA003	Read	Unsigned	Horn + status relay module 1	Bit 0: Logic state of digital input at the relay module Bit 1: horn Bit 2: activation Bit 3: virtual Bit 4: COM error Bit 5: service request relay module Bit 6: service relay module Bit 7: fault relay module Bit 8…15: frei
0xA004	Read	Unsigned	Relays of Relay module 1	Bit 0: Logical state of relay 1 Bit 1: Logical state of relay 2 Bit 2: Logical state of relay 3 Bit 3: Logical state of relay 4 Bit 4: Logical state of relay 5 Bit 5: Logical state of relay 6 Bit 6: Logical state of relay 7 Bit 7: Logical state of relay 8 Bit 8: Logical state of relay 9 Bit 9: Logical state of relay 10 Bit 10: Logical state of relay 11 Bit 11: Logical state of relay 12 Bit 12: Logical state of relay 13 Bit 13: Logical state of relay 14 Bit 14: Logical state of relay 15 Bit 15: Logical state of relay 16

0xA005	Read	Unsigned	Horn + status relay module 2	Contents as for relay module 1
0xA006	Read	Unsigned	Relays of relay module 2	Contents as for relay module 1
0xA007	Read	Unsigned	Horn + status relay module 3	Contents as for relay module 11
0xA008	Read	Unsigned	Relays of relay module 3	Contents as for relay module 1
0xA009	Read	Unsigned	Horn + status relay module 4	Contents as for relay module 1
0xA00A	Read	Unsigned	Relays of relay module 4	Contents as for relay module 1
0xA00B	Read	Unsigned	Horn + status relay module 5	Contents as for relay module 1
0xA00C	Read	Unsigned	Relays of relay module 5	Contents as for relay module 1
0xA00D	Read	Unsigned	Horn + status relay module 6	Contents as for relay module 1
0xA00E	Read	Unsigned	Relays of relay module 6	Contents as for relay module 1
0xA00F	Read	Unsigned	Horn + status relay module 7	Contents as for relay module 1
0xA010	Read	Unsigned	Relays of relay module 7	Contents as for relay module 1
0xA011	Read	Unsigned	Horn + status relay module 8	Contents as for relay module 1
0xA012	Read	Unsigned	Relays of relay module 8	Contents as for relay module 1

4.10.2 Initial states and status of the display modules

Offset Register address	Access info	Register type (16 Bit)	Parameter	Explanation
0xA020	Read/Write	Unsigned	Signature	Signatur zur Telegramm-Identifikation (wird nach dem Auslesen dekrementiert).
0xA021	Read	Unsigned	display module 1	Bit 0: unassigned Bit 1: horn display module 1 Bit 2: activation Bit 3: unassigned Bit 4: COM Error display module 1 Bit 5: service request display module 1 Bit 6: service display module 1 Bit 7: fault display module 1 Bit 8: Logical state of relay 1 Bit 9: Logical state of relay 2 Bit 10: Logical state of relay 3 Bit 11: Logical state of relay 4 Bit 12…15: unassigned
0xA022	Read	Unsigned	display module 2	Contents as for display module 1
0xA023	Read	Unsigned	display module 3	Contents as for display module 1
0xA024	Read	Unsigned	display module 4	Contents as for display module 1
0xA025	Read	Unsigned	display module 5	Contents as for display module 1
0xA026	Read	Unsigned	display module 6	Contents as for display module 1
0xA027	Read	Unsigned	display module 7	Contents as for display module 1
0xA028	Read	Unsigned	display module 8	Contents as for display module 1
0xA029	Read	Unsigned	display module 9	Contents as for display module 1
0xA02A	Read	Unsigned	display module 10	Contents as for display module 1
0xA02B	Read	Unsigned	display module 11	Contents as for display module 1
0xA02C	Read	Unsigned	display module 12	Contents as for display module 1
0xA02D	Read	Unsigned	display module 13	Contents as for display module 1
0xA02E	Read	Unsigned	display module 14	Contents as for display module 1
0xA02F	Read	Unsigned	display module 15	Contents as for display module 1
0xA030	Read	Unsigned	display module 16	Contents as for display module 1

4.10.3 Initial states and status of the alarm pannels

Offset Register address	Access info	Register type (16 Bit)	Parameter	Explanation
0xA040	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0xA041	Read		Alarm panels 1,2	Bit 0: Light alarm panel 1: Off = 0, On = 1 Bit 1: Horn alarm panel 1: Off = 0, On = 1 Bit 2: Activation of alarm panel 1 Bit 3: unassigned Bit 4: COM error alarm panel 1 Bit 5: service request alarm panel 1 Bit 6: service alarm panel 1 Bit 7: fault alarm panel 1 Bit 8: Light alarm panel 2: Off = 0, On = 1 Bit 9: Horn alarm panel 1: Off = 0, On = 1 Bit 10: Activation of alarm panel 2 Bit 11: unassigned Bit 12: COM error alarm panel 2 Bit 13: service request alarm panel 2 Bit 14: service alarm panel 2 Bit 15: fault alarm panel 2
0xA042	Read		Alarm panels 3,4	Contents as for alarm panels 1,2
0xA043	Read		Alarm panels 5,6	Contents as for alarm panels 1,2
0xA044	Read		Alarm panels 7,8	Contents as for alarm panels 1,2
0xA045	Read		Alarm panels 9,10	Contents as for alarm panels 1,2
0xA046	Read		Alarm panels 11,12	Contents as for alarm panels 1,2
0xA047	Read		Alarm panels 13,14	Contents as for alarm panels 1,2
0xA048	Read		Alarm panels 15,16	Contents as for alarm panels 1,2
0xA049	Read		Alarm panels 17,18	Contents as for alarm panels 1,2
0xA04A	Read		Alarm panels 19,20	Contents as for alarm panels 1,2
0xA04B	Read		Alarm panels 21,22	Contents as for alarm panels 1,2
0xA04C	Read		Alarm panels 23,24	Contents as for alarm panels 1,2
0xA04D	Read		Alarm panels 25,26	Contents as for alarm panels 1,2
0xA04E	Read		Alarm panels 27,28	Contents as for alarm panels 1,2
0xA04F	Read		Alarm panels 29,30	Contents as for alarm panels 1,2
0xA050	Read		Alarm panels 31,32	Contents as for alarm panels 1,2
0xA051	Read		Alarm panels 33,34	Contents as for alarm panels 1,2
0xA052	Read		Alarm panels 35,36	Contents as for alarm panels 1,2
0xA053	Read		Alarm panels 37,38	Contents as for alarm panels 1,2
0xA054	Read		Alarm panels 39,40	Contents as for alarm panels 1,2
0xA055	Read		Alarm panels 41,42	Contents as for alarm panels 1,2
0xA056	Read		Alarm panels 43,44	Contents as for alarm panels 1,2
0xA057	Read		Alarm panels 45,46	Contents as for alarm panels 1,2
0xA058	Read		Alarm panels 47,48	Contents as for alarm panels 1,2
0xA059	Read		Alarm panels 49,50	Contents as for alarm panels 1,2
0xA05A	Read		Alarm panels 51,52	Contents as for alarm panels 1,2
0xA05B	Read		Alarm panels 53,54	Contents as for alarm panels 1,2
0xA05C	Read		Alarm panels 55,56	Contents as for alarm panels 1,2
0xA05D	Read		Alarm panels 57,58	Contents as for alarm panels 1,2
0xA05E	Read		Alarm panels 59,60	Contents as for alarm panels 1,2
0xA05F	Read		Alarm panels 61,62	Contents as for alarm panels 1,2
0xA060	Read		Alarm panels 63,64	Contents as for alarm panels 1,2

4.10.4 Designations of the digital inputs

These data are NOT available via the GMA bus.

The designations are 20 characters or 80 bytes long (UTF8).

Offset Register address	Access info	Register type (16 Bit)	Parameter	Explanation
0xAA00	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0xAA01	Read	Unsigned		Designation digital input 1
…		Unsigned		
0xAA28	Read	Unsigned		
0xAA29	Read	Unsigned		Designation digital input 2
…		Unsigned		
0xAA50	Read	Unsigned		
0xAA52	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0xAA53	Read	Unsigned		Designation digital input 3
…		Unsigned		
0xAA7A	Read	Unsigned		
0xAA7B	Read	Unsigned		Designation digital input 4
…		Unsigned		
0xAAA2	Read	Unsigned		
0xAAA4	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0xAAA5	Read	Unsigned		Designation digital input 5
…		Unsigned		
0xAACC	Read	Unsigned		
0xAACD	Read	Unsigned		Designation digital input 6
…		Unsigned		
0xAAF4	Read	Unsigned		
0xAAF6	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0xAAF7	Read	Unsigned		Designation digital input 7
…		Unsigned		
0xAB1E	Read	Unsigned		
0xAB1F	Read	Unsigned		Designation digital input 8
…		Unsigned		
0xAB46	Read	Unsigned		

4.10.5 Designations of the internal relays and the horn

These data are NOT available via the GMA bus.

The designations are 20 characters or 80 bytes long (UTF8).

Offset Register address	Access info	Register type (16 Bit)	Parameter	Explanation
0xAC00	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0xAC01	Read	Unsigned		Designation internal relays 1
…		Unsigned		
0xAC28	Read	Unsigned		
0xAC29	Read	Unsigned		Designation internal relays 2
…		Unsigned		
0xAC50	Read	Unsigned		
0xAC52	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0xAC53	Read	Unsigned		Designation internal relays 3
…		Unsigned		
0xAC7A	Read	Unsigned		
0xAC7B	Read	Unsigned		Designation internal relays 4
…		Unsigned		
0xACA2	Read	Unsigned		

0xACA4	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0xACA5	Read	Unsigned		Designation internal relays 5
…		Unsigned		
0xACCC	Read	Unsigned		
0xACCD	Read	Unsigned		Designation internal relays 6
…		Unsigned		
0xACF4	Read	Unsigned		
0xACF6	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0xACF7	Read	Unsigned		Designation internal relays 7
…		Unsigned		
0xAD1E	Read	Unsigned		
0xAD1F	Read	Unsigned		Designation internal relays 8
…		Unsigned		
0xAD46	Read	Unsigned		
0xAD48	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0xAD49	Read	Unsigned		Designation internal horn
…		Unsigned		
0xAD70	Read	Unsigned		

4.10.6 Designations of the relay modules including contacts

Only the designations of the relay modules are available via the GMA bus and NOT the designations of the relays, the horn and the digital input.

Basis Register address	Access info	Register type (16 Bit)	Parameter	Explanation
0xB000				All texts of the relay module 1
0xB400				All texts of the relay module 2
0xB800				All texts of the relay module 3
0xBC00				All texts of the relay module 4
0xC000				All texts of the relay module 5
0xC400				All texts of the relay module 6
0xC800				All texts of the relay module 7
0xCC00				All texts of the relay module 8

The names are 20 characters or 80 bytes long (UTF8).
The following offset address is to be added for each module to the above base addresses:

Basis Register address	Access info	Register type (16 Bit)	Parameter	Explanation
0x0000	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0x0001	Read	Unsigned		Designation relay module
…		Unsigned		
0x0028	Read	Unsigned		
0x0029	Read	Unsigned		Designation horn
…		Unsigned		
0x0050	Read	Unsigned		
0x0052	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0x0053	Read	Unsigned		Designation relay contact 1
…		Unsigned		
0x007A	Read	Unsigned		
0x007B	Read	Unsigned		Designation relay contact 2
…		Unsigned		
0x00A2	Read	Unsigned		
0x00A4	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0x00A5	Read	Unsigned		Designation relay contact 3
…		Unsigned		
0x00CC	Read	Unsigned		
0x00CD	Read	Unsigned		Designation relay contact 4
…		Unsigned		
0x00F4	Read	Unsigned		
0x00F6	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0x00F7	Read	Unsigned		Designation relay contact 5
…		Unsigned		
0x011E	Read	Unsigned		
0x011F	Read	Unsigned		Designation relay contact 6
…		Unsigned		
0x0146	Read	Unsigned		
0x0148	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0x0149	Read	Unsigned		Designation relay contact 7
…		Unsigned		
0x0170	Read	Unsigned		
0x0171	Read	Unsigned		Designation relay contact 8
…		Unsigned		
0x0198	Read	Unsigned		

0x019A	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0x019B	Read	Unsigned		Designation relay contact 9
…		Unsigned		
0x01C2	Read	Unsigned		
0x01C3	Read	Unsigned		Designation relay contact 10
…		Unsigned		
0x01EA	Read	Unsigned		
0x01EC	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0x01ED	Read	Unsigned		Designation relay contact 11
…		Unsigned		
0x0214	Read	Unsigned		
0x0215	Read	Unsigned		Designation relay contact 12
…		Unsigned		
0x023C	Read	Unsigned		
0x023E	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0x023F	Read	Unsigned		Designation relay contact 13
…		Unsigned		
0x0266	Read	Unsigned		
0x0267	Read	Unsigned		Designation relay contact 14
…		Unsigned		
0x028E	Read	Unsigned		
0x0290	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0x0291	Read	Unsigned		Designation relay contact 15
…		Unsigned		
0x02B8	Read	Unsigned		
0x02B9	Read	Unsigned		Designation relay contact 16
…		Unsigned		
0x02E0	Read	Unsigned		
0x02E2	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0x02E3	Read	Unsigned		Designation digital input
…		Unsigned		
0x030A	Read	Unsigned		

4.10.7 Designations of the display modules including contacts

Only the designations of the display modules are available via the GMA bus, NOT the designations of the relays and the horn.

Basis Register address	Access info	Register type (16 Bit)	Parameter	Explanation
0xD000				All texts of the relay module 1
0xD100				All texts of the relay module 2
0xD200				All texts of the relay module 3
0xD300				All texts of the relay module 4
0xD400				All texts of the relay module 5
0xD500				All texts of the relay module 6
0xD600				All texts of the relay module 7
0xD700				All texts of the relay module 8
0xD800				All texts of the relay module 9
0xD900				All texts of the relay module 10
0xDA00				All texts of the relay module 11
0xDB00				All texts of the relay module 12
0xDC00				All texts of the relay module 13
0xDD00				All texts of the relay module 14
0xDE00				All texts of the relay module 15
0xDF00				All texts of the relay module 16

The names are 20 characters or 80 bytes long (UTF8).
The following offset address is to be added for each module to the above base addresses:

Basis Register address	Access info	Register type (16 Bit)	Parameter	Explanation
0x0000	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0x0001	Read	Unsigned		Designation display module
…		Unsigned		
0x0028	Read	Unsigned		
0x0029	Read	Unsigned		Designation horn
…		Unsigned		
0x0050	Read	Unsigned		
0x0052	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0x0053	Read	Unsigned		Designation relay contact 1
…		Unsigned		
0x007A	Read	Unsigned		
0x007B	Read	Unsigned		Designation relay contact 2
…		Unsigned		
0x00A2	Read	Unsigned		
0x00A4	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0x00A5	Read	Unsigned		Designation relay contact 3
…		Unsigned		
0x00CC	Read	Unsigned		
0x00CD	Read	Unsigned		Designation relay contact 4
…		Unsigned		
0x00F4	Read	Unsigned		

4.10.8 Designations of the alarm panals including contacts

Only the designations of the warning lights are available via the GMA bus, NOT the designations of the light and the horn.

Basis Register address	Access info	Register type (16 Bit)	Parameter	Explanation
0xE000				All texts of the alarm panel 1
0xE080				All texts of the alarm panel 2
0xE100				All texts of the alarm panel 3
0xE180				All texts of the alarm panel 4
0xE200				All texts of the alarm panel 5
0xE280				All texts of the alarm panel 6
0xE300				All texts of the alarm panel 7
0xE380				All texts of the alarm panel 8
0xE400				All texts of the alarm panel 9
0xE480				All texts of the alarm panel 10
0xE500				All texts of the alarm panel 11
0xE580				All texts of the alarm panel 12
0xE600				All texts of the alarm panel 13
0xE680				All texts of the alarm panel 14
0xE700				All texts of the alarm panel 15
0xE780				All texts of the alarm panel 16
0xE800				All texts of the alarm panel 17
0xE880				All texts of the alarm panel 18
0xE900				All texts of the alarm panel 19
0xE980				All texts of the alarm panel 20
0xEA00				All texts of the alarm panel 21
0xEA80				All texts of the alarm panel 22
0xEB00				All texts of the alarm panel 23
0xEB80				All texts of the alarm panel 24
0xEC00				All texts of the alarm panel 25
0xEC80				All texts of the alarm panel 26
0xED00				All texts of the alarm panel 27
0xED80				All texts of the alarm panel 28
0xEE00				All texts of the alarm panel 29
0xEE80				All texts of the alarm panel 30
0xEF00				All texts of the alarm panel 31
0xEF80				All texts of the alarm panel 32
0xF000				All texts of the alarm panel 33
0xF080				All texts of the alarm panel 34
0xF100				All texts of the alarm panel 35
0xF180				All texts of the alarm panel 36
0xF200				All texts of the alarm panel 37
0xF280				All texts of the alarm panel 38
0xF300				All texts of the alarm panel 39
0xF380				All texts of the alarm panel 40
0xF400				All texts of the alarm panel 41
0xF480				All texts of the alarm panel 42
0xF500				All texts of the alarm panel 43
0xF580				All texts of the alarm panel 44
0xF600				All texts of the alarm panel 45
0xF680				All texts of the alarm panel 46
0xF700				All texts of the alarm panel 47
0xF780				All texts of the alarm panel 48
0xF800				All texts of the alarm panel 49
0xF880				All texts of the alarm panel 50
0xF900				All texts of the alarm panel 51
0xF980				All texts of the alarm panel 52
0xFA00				All texts of the alarm panel 53
0xFA80				All texts of the alarm panel 54

0xFB00				All texts of the alarm panel 55
0xFB80				All texts of the alarm panel 56
0xFC00				All texts of the alarm panel
0xFC80				All texts of the alarm panel 58
0xFD00				All texts of the alarm panel 59
0xFD80				All texts of the alarm panel 60
0xFE00				All texts of the alarm panel 61
0xFE80				All texts of the alarm panel 62
0xFF00				All texts of the alarm panel 63
0xFF80				All texts of the alarm panel 64

The names are 20 characters or 80 bytes long (UTF8).
The following offset address is to be added for each module to the above base addresses:

Basis Register address	**Access info**	**Register type (16 Bit)**	**Parameter**	**Explanation**
0x0000	Read/Write	Unsigned	Signaturee	Signature for telegram identification (decremented after reading).
0x0001	Read	Unsigned		Designation alarm panel
…		Unsigned		
0x0028	Read	Unsigned		
0x0029	Read	Unsigned		Designation horn
…		Unsigned		
0x0050	Read	Unsigned		
0x0052	Read/Write	Unsigned	Signature	Signature for telegram identification (decremented after reading).
0x0053	Read	Unsigned		Designation alarm panel
…		Unsigned		
0x007A	Read	Unsigned		

5 GfG Coding Tables

5.1 Table of units

No.	Abbreviation	Designation	No.	Abbreviation	Designation
1	ppm	Parts per Million	**24**	°F	Degrees Fahrenheit
2	Vol%	Percent by volume	**25**	g	Gram
3	%LEL	lower explosion limit	**26**	kg	Kilogram
4	ppb	Parts per Billion	**27**	Pa	Pascal
5	µg	Microgram	**28**	kPa	Kilopascal
6	mg	Milligram	**29**	Bar	Bar
7	%	Percent	**30**	psi	Pound per square inch
8	%%	Per mille	**31**	s	Second
9	m/s	Meter per second	**32**	min	Minute
10	°C	Degrees Celsius	**33**	kB	Kilobyte
11	mV	Millivolt	**34**	MB	Megabyte
12	V	Volt	**35**	GB	Gigabyte
13	mA	Milliamperes	**36**	mg/l	Milligram per liter
14	A	Amper	**37**	Slpm	Standard liter per minute
15	Ohm	Ohm	**38**	µA	Microampere
16	Dig	Digit	**39**	W	Watt
23	Grd	Grad			

5.2 Table of gases and measured variables

No.	Additivity Formula	Gas (Substance)	No.	Additivity Formula	Gas (Substance)
1	C_3H_6O	Acetone	**34**	$C_3H_6Cl_2$	Dichloropropane
2	C_2H_3N	Acetonitrile	**35**	$C_4H_{11}N$	Diethylamine
3	C_2H_2	Acetylene	**36**	C_2H_6O	Dimethyl Ether
4	C_3H_3N	Acrylnitrile	**37**	C_3H_5ClO	Epichlorhydrin
5	C_3H_9N	Aminopropane	**38**	Nat.gas	Natural Gas
6	NH_3	Ammonia	**39**	C_2H_6	Ethane
7	$C_5H_{12}O$	Amyl alkohol	**40**	C_2H_6O	Ethanol
8	Benzine	Benzin 60/95	**41**	$C_4H_8O_2$	Ethyl acetate
9	Benzine	Benzin 80/110	**42**	C_2H_6O	Ethyl alcohol
10	Gasoline	Benzin 100/140	**43**	C_2H_4	Ethylene
11	C_6H_6	Benzene	**44**	C_2H_4O	Ethylene oxide
12	Cmb.gas	Combustible Gases and Vapors	**45**	Gemisch	FAM-Benzin 65/95
13	$CBrF_3$	Bromtrifluormethane	**46**	Gemisch	Flugbenzin 40/180
14	C_4H_6	1,3-Butadiene	**47**	CH_2O	Formaldehyde
15	C_4H_{10}	n-Butane	**48**	$CHClF_2$	R22 - Chlordifluoromethane
16	C_4H_{10}	i-Butane	**49**	He	Helium
17	$C_4H_{10}O$	Butanol (n)	**50**	C_7H_{16}	n-Heptane
18	C_4H_8O	MEK (Methyl ethyl ketone)	**51**	C_6H_{14}	n-Hexane
19	$C_6H_{12}O_2$	Butyl acetat (n)	**52**	C_6H_{14}	i-Hexane
20	$C_6H_{12}O_2$	Butyl acetat (i)	**53**	$C_6H_{12}O$	Hexanone
21	$C_4H_{10}O$	Butyl alcohol (n)	**54**	$C_6H_{12}O_2$	Isobutyl acetate
22	C_4H_8	Butene	**55**	CO_2	Carbon dioxid
23	CL_2	Chlorine	**56**	CO	Carbon monoxid
24	CH_3Cl	Chlormethane	**57**	$H_2+CH_4+N_2+CO+....$	Coke oven gas
25	HCl	Hydrogen Chloride	**58**	$N_2+O_2+CO_2+...$	Air
26	HCN	Hydrogen Cyanide	**59**	CH_4	Methane
27	C_6H_{12}	Cyclohexane	**60**	CH_4O	Methanol
28	C_5H_{10}	Cyclopentane	**61**	$C_3H_6O_2$	Methyl acetate
29	C_3H_6	Cyclopropane	**62**	CH_3OH	Methyl alcohol
30	R12	R12 - Dichlorodifluormethan	**63**	$C_6H_{12}O$	Butyl methyl ketone
31	$C_2H_4Cl_2$	Dichlorethan	**64**	CH_3Cl	Methyl chloride
32	R21	R21 - Dichlorodifluoromethane	**65**	CH_2Cl_2	Methylene chloride
33	CH_2Cl_2	Dichloromethane	**66**	$C_6H_{12}O$	MIBK Methyl isobutyl ketone

Continued on the next page.

No.	Additivity Formula	Gas (Substance)	No.	Additivity Formula	Gas (Substance)
67	C_4H_8O	Ethyl methyl keton	**125**	C_4H_8S (THT)	THT - Tetrahydrothiophene
68	$C_3H_8O_2$	Methyl glycol	**126**	TAL	ToxAlert
69	$C_5H_8O_2$	Methyl methacrylate	**127**	R365	R365 - Pentafluorbutane
70	$C_4H_{10}O$	Methylpropanol	**128**	$C_5H_{10}O_3$	Ethyl lactate
71	$CBrClF_2$	Bromchlorodifluoromethan	**129**	NH_4+	Ammonium
72	C_9H_{20}	n-Nonane	**130**	R11	R11 - Trichlorofluoromethane
73	C_8H_{18}	Octane (i)	**131**	R245fa	R245fa - Pentafluoropropane
74	C_8H_{18}	Octane (n)	**132**	C_3H_4	Propyne
75	C_5H_{12}	Pentane (i)	**133**	CS_2	Carbon disulfide
76	C_5H_{12}	Pentane (n)	**134**	BCl_3	Boron trichloride
77	$C_5H_{10}O$	Pentanone	**135**	BF_3	Boron trifluoride
78	C_5H_{10}	Pentene	**136**	CH_3Br	Bromomethane
79	$C_7H_{14}O_2$	Pentyl acetate	**137**	$C_4H_{10}O$	2-Butanol
80	C_2Cl_4	PER (Perchlorethylene)	**138**	CH_4+CO_2	Landfill gas
81	C_3H_8	Propane	**139**	$C_2H_4F_2$	R152a - Difluoroethane
82	C_3H_8O	Propanol (i)	**140**	$C_4H_8O_2$	1,4-Dioxane
83	$C_5H_{10}O_2$	Propyl acetate (i)	**141**	Gemisch	Kerosene (180/220)
84	$C_5H_{10}O_2$	Propyl acetate (n)	**142**	CH_5N	Methylamine
85	C_3H_8O	Propyl alcohol (n)	**143**	$SiCl_4$	Silicon tetrachloride
86	C_3H_8O	Propyl alcohol (i)	**144**	N_2	Nitrogen
87	C_3H_6	Propene	**145**	$C_2H_3F_3$	R143a - Trifluoroethane
88	$C_3H_6Cl_2$	Propylene dichloride	**146**	Gemisch	Diesel fuel
89	O_2	Oxygen	**147**	R404A	R404a (Refrigerant blend R125+R143a+R134a)
90	SO_2	Sulphur dioxide			
91	SF_6	Sulphur hexafluoride	**148**	Br_2	Bromine
92	H_2S	Hydrogen sulfide	**149**	VOC	VOC
93	$H_2+CH_4+N_2+CO+...$	Town gas	**150**	PID	PID (Synonym for PID-Sensor)
94	NO_2	Nitrogen dioxide			
95	NO	Nitrogen monoxide	**151**	R507	R507 (Refrigerant blend R125+R143a)
96	C_8H_8	Styrene			
97	$C_2H_2Cl_4$	Tetrachloroethene	**152**	$C_3H_6O_2$ (ETF)	ETF - Ethylformiat
98	C_7H_8	Toluol	**153**	Ar	Argon
99	$C_2H_3Cl_3$	Trichloroethane	**154**	R113	R113 -Trichlorotrifluoroethane
100	C_2HCl_3	TRI - Trichloroethylene	**155**	R1234yf	Refrigerant HFO-1234yf (2,3,3,3-Tetrafluorprop-1-en)
101	CHF_3	R23 - Trifluormethan			
102	$C_4H_6O_2$	Vinyl acetate	**156**	R407C	R407c (Refrigerant blend R32+R125+R134a)
103	C_2H_3Cl	Vinyl chloride			
104	H_2	Hydrogen	**157**	R410A	R410a (Refrigerant blend R32+R125)
105	$H_2+CO+...$	Watergas			
106	C_8H_{10}	Xylene	**158**	NF_3	Nitrogen trifluoride
107	O_3	Ozone	**159**	pH	pH
108	$COCl_2$	Phosgene	**160**	Redox	Redox
109	PH_3	Phosphine	**161**	TBM	TBM (tert-Butyl mercaptan)
110	SiH_4	Silane	**162**	HBr	Hydrogen bromide
111	AsH_3	Arsine	**163**	R438A	Refrigerant mixture (R125+ R134a+R32+nButan+Isopentan)
112	ClO_2	Chlorine dioxide			
113	B_2H_6	Diborane	**164**	R449A	Refrigerant mixture R449A (R134a+R125+R1234yf+R32a)
114	$C_2HCl_2F_3$	R123 – Dichloro trifluoroethane			
115	$C_4H_{10}O$	Diethyl ether	**165**	R1234ze	Refrigerant HFO-1234ze (1,3,3,3-Tetrafluorpropen)
116	N_2O	Nitrous oxide			
117	$C_2H_4O_2$	Acetic acid	**166**	R448A	Refrigerant mixture (R32+R125+ R134a+R1234yf+R1234ze)
118	F_2	Fluorine			
119	HF	Hydrogen fluoride	**167**	Isopar E	Solvent Isopar E, C8-9 Isoparaffin
120	GeH_4	Hydrogen germane			
121	N_2H_4	Hydrazine	**168**	R454B	Refrigerant mixture R454B (R32 + R1234yf)
122	C_6H_6O	Phenol			
123	C_3H_6O	Propylene oxide	**169**	R32	Refrigerant R32 (Difluormethan, CH_2F_2)
124	$C_2H_2F_4$	R134a - Tetrafluoroethane			

Fortsetzung siehe nächste Seite

No.	Additivity Formula	Gas (Substance)	No.	Additivity Formula	Gas (Substance)
170	R513A	Refrigerant mixture (R1234yf + R134a)	**184**	SiF_4	Tetrafluorosilane
			185	$C_2H_4Cl_2$	1,2-Dichloroethane (EDC)
171	R453A (RS-70)	Refrigerant mixture (R134a+R32 +R125+R227ea+R600+R601a)	**186**	C_5H_9NO	N-methyl-2-pyrrolidone (NMP)
172	R508B (C_2F_6 + CF_3)	R508B Refrigerant mixture (54%R116 + 46%R23)			
173	R454C	R454C Refrigerant mixture (78,5%R1234yf+21,5%R32)			
174	ClF_3	Chlorine trifluoride			
175	$C_6H_{19}NSi_2$	Hexamethyldisilazane (HMDS)	**224**	Pw	absolute humidity
176	H_2Se	hydrogen selenide	**225**	Sig.	Signal (universal)
177	$C_8H_{20}O_4Si$	Tetraethyl orthosilicate (TEOS)	**226**	Q	Volume flow
178	$C_3H_9BO_3$	Trimethyl borate (TMB)	**227**	P	Pressure
179	GeF_4	Germanium tetrafluoride	**228**	m	Mass
180	WF_6	Tungsten hexafluoride	**229**	Wdir	Wind direction
181	C_4F_6	Hexafluorobutadiene	**253**	T	Temperature
182	C_5F_8	Octafluorocyclopentene	**254**	Vair	Wind velocity
183	SiH_2Cl_2	Dichlorosilane (DCS)	**255**	rH	Relative humidity

6 References

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[3] MODBUS over Serial Line – Specification & Implementation Guide V1.02;
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