ENGINEERING
TOMORROW

User Guide

Danfoss Gas Detection
Modbus communication

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Part 1 - Modbus communication from the Danfoss Gas Detection Controller

Serial Modbus Interface at the X BUS

Please note:
Using standard Modbus Protocoll will not include the dedicated gas detection SIL safety communication Protocoll.
Safety aspect of SIL1/SIL2 is therefore not related to this kind of bus interface.

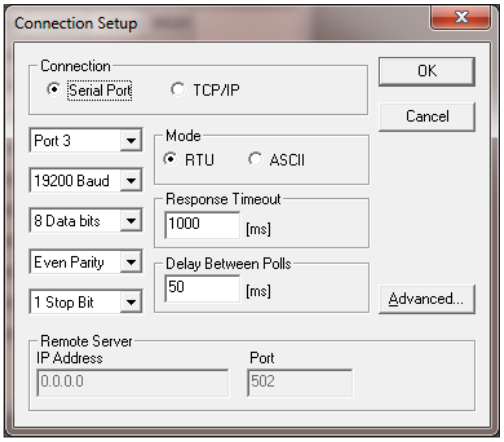
This functionality is available from display version 1.00.06 or higher.

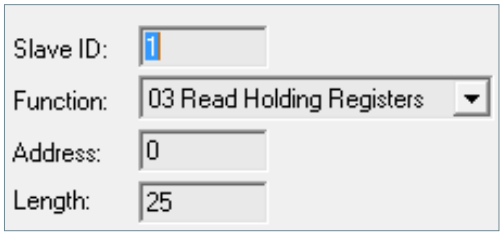
The standard protocol for an additional serial port of the gas controller X bus is ModBus RTU.

Definition of communication
The gas controller operates at the interface X bus only as **MODBUS slave**.
Controller Address = Slave ID default = 1,
(can be changed in Display Parameters).

Baud rate 19,200 baud (not changeable)
1 start bit, 8 data bits
1 stop bit, even parity

Address = Start address see descriptions below
Length = Number of Datawords
see descriptions below.





1.
Modbus Function 03

Read Holding Registers (reading of holding registers) are used to receive data from the Danfoss gas detection controller.
There are 9 data blocks.

1.1
Current value of digital sensors

Current value of digital sensors – sensor addresses 1 to 96d.

Available in MODBUS Start address.. 1001d to 1096d.

1.2
Current value of analog sensors

Current value of analog sensors – sensor addresses 1 to 32d.

Available in MODBUS Start address.. 2001d to 2032d.

Tx = 929: Err = 4: ID = 1: F = 03: SR = 100ms

	01000	01010	01020	01030	01040	01050	01060	01070	01080	01090
0		0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0
2	-20480	0	0	0	0	0	0	0	0	0
3	-32512	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	
8	0	0	0	0	0	0	0	0	0	
9	0	0	0	0	0	0	0	0	0	

Tx = 190: Err = 1: ID =

	02000	02010	02020	02030
0		0	0	0
1	-32512	0	0	0
2	-32512	0	0	0
3	-32512	0	0	
4	-32512	0	0	
5	0	0	0	
6	0	0	0	
7	0	0	0	
8	0	0	0	
9	0	0	0	

Representation of measured values:
The measured values are shown in the Integer format with a factor of 1, 10, 100 or 1000.
The factor depends on the respective measuring range and is used as follows:

Range	Factor
1 -9	1000
10-99	100
100-999	10
From 1000 on	1

If the value is below -16385, it is an error message and should be considered as a hexadecimal value in order to break the errors down.

1.3
Average value of digital sensors

Average value of digital sensors – sensor addr..
1 to 96d. Available in MODBUS Start address..
3001d to 3096d.

1.4
Average value of analog sensors

Average value of analog sensors- sensor addr..
1 to 32d. Available in MODBUS Start address..
4001d to 4032d.

Tx = 155: Err = 0: ID = 1: F = 03: SR = 100ms

	03000	03010	03020	03030	03040	03050	03060	03070	03080	03090
0		0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0
3	-32512	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	
8	0	0	0	0	0	0	0	0	0	
9	0	0	0	0	0	0	0	0	0	

Tx = 83: Err = 0: ID = 1: F =

	04000	04010	04020	04030
0		0	0	0
1	0	0	0	0
2	0	0	0	0
3	0	0	0	
4	0	0	0	
5	0	0	0	
6	0	0	0	
7	0	0	0	
8	0	0	0	
9	0	0	0	

1.5
Measuring range of digital sensors

Measuring range of digital sensors - sensor addr.
1 to 96d. Available in MODBUS Start address..
5001d to 5096d.

1.6
Measuring range of analog sensors

Measuring range of analog sensors - sensor addr..
1 to 32d. Available in MODBUS Start address..
6001d to 6032d

Tx = 414: Err = 0: ID = 1: F = 03: SR = 100ms

	05000	05010	05020	05030	05040	05050	05060	05070	05080	05090
0		0	0	0	0	0	0	0	0	0
1	300	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0
3	300	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	
8	0	0	0	0	0	0	0	0	0	
9	0	0	0	0	0	0	0	0	0	

Tx = 6: Err = 0: ID = 1: F =

	06000	06010	06020	06030
0		0	0	0
1	250	0	0	0
2	250	0	0	0
3	250	0	0	
4	250	0	0	
5	0	0	0	
6	0	0	0	
7	0	0	0	
8	0	0	0	
9	0	0	0	

1.7
Display of the alarms and the respective latching bits of digital sensors

Display of the local alarms generated by the gas detection controller as well as of the respective latching bits of digital sensors - sensor addresses 1 to 96d. Available in MODBUS Start address 1201d to 1296d.

1.8
Display of the alarms and the respective latching bits of analog sensors

Display of the local alarms generated by the gas detection controller as well as of the respective latching bits of analog sensors - sensor addresses 1 to 32d. Available in MODBUS Start address 2201d to 2232d

Tx = 13629: Err = 389: ID = 1: F = 03: SR = 1000ms

	01200	01210	01220	01230	01240	01250	01260	01270	01280	01290
0		0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
1	0x2030	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
2	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
3	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
4	0x0001	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
5	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
6	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
7	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	
8	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	
9	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	

Tx = 161: Err = 14: ID = 1: F

	02200	02210	02220	02230
0		0x0000	0x0000	0x0000
1	0x0000	0x0000	0x0000	0x0000
2	0x0000	0x0000	0x0000	0x0000
3	0x0000	0x0000	0x0000	
4	0x0000	0x0000	0x0000	
5	0x0001	0x0000	0x0000	
6	0x0000	0x0000	0x0000	
7	0x0000	0x0000	0x0000	
8	0x0000	0x0000	0x0000	
9	0x0000	0x0000	0x0000	

Here, the representation in the hexadecimal form is easier to read because the data are transmitted in the following form:

0xFFFF =

0x	F	F	F	F
0b	1111	1111	1111	1111
	Local latching	Controller latching	Local alarms	Controller alarms

There are four status bits for the four alarm stages each.
1 = alarm or latching active
0 = alarm or latching not active

The above example:
There are two local alarms at DP1, with the second being in latching mode.
The first alarm generated by the gas detection controller is present at DP4.
The first alarm generated by the gas detection controller is present at AP5.

1.9
Relay status of the signal relays

Relay status of the signal relays – signal relay address 1 to 96d. Available in MODBUS Start address.... 7001d to 7096d

1.10
Relay status of the alarm relays

Relay status of the alarm relays– alarm relay address 1 to 32d. Available in MODBUS Start address.... 8001d to 8032d

Tx = 11: Err = 0: ID = 1: F = 03: SR = 100ms

	07000	07010	07020	07030	07040	07050	07060	07070	07080	07090
0		0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	
8	0	0	0	0	0	0	0	0	0	
9	0	0	0	0	0	0	0	0	0	

Tx = 3: Err = 0: ID = 1: F =

	08000	08010	08020	08030
0		0	0	0
1	0	0	0	0
2	0	0	0	0
3	0	0	0	
4	0	0	0	
5	0	0	0	
6	0	0	0	
7	0	0	0	
8	0	0	0	
9	0	0	0	

The relay status of the controller's fault message relay is in register 8000d.

1.11
Gas detection controller Watch Outputs (WI), MODBUS addresses 50 to 57

In register 50d, all watch outputs are shown as a byte as used for evaluation in the gas detection controller.

In the Start address 51d – 57d the individual bit values are available as Integer values.

0d = No output set
1d = Switch on by clock
256d or 0x0100h = Switch on by Modbus
257d or 0x0101h = Switch on by Modbus and clock

DGC06_WI....

Tx = 6135: Err = 211: II

	Alias	00050
0	WI Byte	0x0006
1	WI 1	0x0000
2	WI 2	0x0001
3	WI 3	0x0001
4	WI 4	0x0000
5	WI 5	0x0000
6	WI 6	0x0000
7	WI 7	0x0000

1.12
Data block: Output

Start address 0d: My own slave MODBUS address at the X Bus

Address 1d: Relay information bits of the first module (Controller Module)
Relay 1 is bit 0 to relay 4 is bit 3

Address 2d: Relay information bits of the extension module address_1
Relay 5 is bit 0 to relay 8 is bit 3

Address 3d: Relay information bits of the extension module address_2
Relay 9 is bit 0 to relay 12 is bit 3

Address 4d: Relay information bits of the extension module address 3
Relay 13 is bit 0 to relay 16 is bit 3

Address 5d: Relay information bits of the extension module address_4
Relay 17 is bit 0 to relay 20 is bit 3

Address 6d: Relay information bits of the extension module address_5
Relay 21 is bit 0 to relay 24 is bit 3

Address 7d: Relay information bits of the extension module address_6
Relay 25 is bit 0 to relay 28 is bit 3

Address 8d: Relay information bits of the extension module address_7
Relay 29 is bit 0 to relay 32 is bit 3

The addresses 9d to 24d stand for hardware analog output 1 to analog output 16.

The definition of the values is done between 0 and 10000d (0 = 4mA Output; 10.000d = 20mA Output= full scale value of the sensor, 65535 mark as not used)..

	Alias	00000	Alias	00010	Alias	00020
0	my_address	1	An.Output 2	65535	An.Output 12	65535
1	Relay 1-4(GC)	3	An.Output 3	65535	An.Output 13	65535
2	Relay 5-8(EP1)	0	An.Output 4	65535	An.Output 14	65535
3	Relay 9-12(EP2)	0	An.Output 5	65535	An.Output 15	65535
4	Relay 13-16(EP3)	0	An.Output 6	65535	An.Output 16	65535
5	Relay 17-20(EP4)	0	An.Output 7	65535		
6	Relay 21-24(EP5)	0	An.Output 8	65535		
7	Relay 25-28(EP6)	0	An.Output 9	65535		
8	Relay 29-32(EP7)	0	An.Output 10	65535		
9	An.Output 1	65535	An.Output 11	65535		

2. **Modbus-Function 05**	Write Single Coil (writing of single states ON/OFF) is used to acknowledge the latching mode or the horns as well as to set clock outputs individually.	
2.1 *Acknowledgement of latching mode*	For this purpose, the command 05 is sent to the address of the gas detection controller with the indication of the respective register from 1.7 or 1.8 Display of the alarms and the respective latching bits	The acknowledgment only takes place when the value ON(0xFF00) has been sent.
2.2 *Acknowledgement of horn*	For this purpose, command 05 is sent to the address of gas detection controller and register 7000d.	The acknowledgment only takes place when the value ON(0xFF00) has been sent.
2.3 *Activation of the single Watch Output via Modbus*	For this purpose, the command 05 is sent to the address of the g as detection controller with the indication of the respective register from 1.11 Display of the Watch Outputs witch register 50 not being allowed.	
3. **Modbus Function 06**	Write Single Registers (writing of single registers) is used to write on individual registers in the gas detection controller. Currently, it is only possible to write on the own slave address. Modbus address 0 (see 1.12)	
4. **Modbus-Function 15**	Write Multiple Coil (writing multiple states OFF/ ON) is used to set all watch outputs at once. The command must be sent to gas detection controller address with the indication of register 50d with a maximum length of 7 bits.	
5. **Modbus Function 16**	Write Multiple Registers (writing of several registers) is used to write on several registers in the gas detection controller. Currently, it is only possible to write on the own slave address. Modbus address 0 (see 1.12)	All other parameter changes are not permitted for safety reasons; therefore, the data direction is clearly defined from the warning system to the open MODBUS side. Retroaction is not possible.

Part 2 - Modbus Communication guide for the Danfoss Gas Detection Units (Basic, Premium and Heavy Duty)

Serial Modbus Interface at the ModBUS

The standard protocol for an additional serial port of the gas controller Modbus is ModBus RTU.

Definition of communication:
The gas detection unit (Basic, Premium or Heavy Duty) operates at the RS 485 interface (Bus A, Bus B Terminals) only as **MODBUS slave**.

Parameter for communication:
Baud rate 19,200 baud
1 start bit, 8 data bits
1 stop bit, even parity

Periodic polling rate:
> 100 ms per address.
For polling rates < 550 ms it is essential to insert at least one pause of > 550 ms per polling cycle.

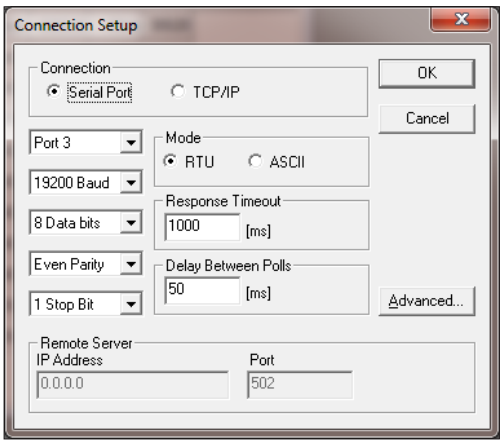


Fig 1: Settings for Modbus query

1. Modbus Function 03

Read Holding Registers (reading of holding registers) are used to receive data from the Gas Detection Controller system.

1.1 Measured Value Query (compressed form) from version 1.0

It is possible to query the **initial address 0** with a length of **exactly 10** information (words).
Example here SlaveID = Slave address = 3

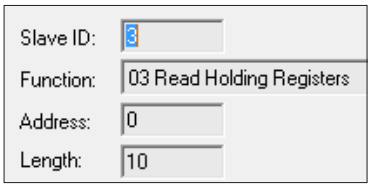


Fig 1.1a: Query values

Basic and Premium units:

In the ModBus query, the values are as follows:

offs	Register Addresses 0 - 9
0	Current Value Sensor 1
1	Average Sensor 1
2	Current Value Sensor 2
3	Average Sensor 2
4	Current Value Sensor 3
5	Average Sensor 3
6	Type + Range Sensor 1
7	Type + Range Sensor 2
8	Type + Range Sensor 3
9	Current Temperature °C

Table 1.1b: Registered values

0	curr_val_1	26
1	average_val_1	39
2	curr_val_2	139
3	average_val_2	138
4	curr_val_3	237
5	average_val_3	142
6	type+range_1	1065
7	type+range_2	60424
8	type+range_3	26706
9	temperature	26

Fig. 1.1c: Window section from Modbus query

Heav Duty units:

In the case of the Heavy Duty ModBus query, only the values of the first input are occupied, all others are shown with 0:

Dynamic resolution for the gas information is used, that means that
if the measuring range < 10, then the gas value is multiplied with 1000,
if the measuring range < 100 & >=10, then the gas value is multiplied with 100,
if the measuring range < 1000 & >=100, then the gas value is multiplied with 10,
if the measuring range >= 1000, then the gas value is multiplied with 1.
So in all cases a resolution of 1000 can be guaranteed.

1.2
Measured Values & Status Query (uncompressed form)

Two query options are available here:

A: Query all information via the base address of the device:
Fixed register (start) address 40d (28h) with variable length 1 to 48 d information (words)
Example here Slave ID = Slave Address = 3
(The other addresses 4 and 5 are not necessary because all information is transferred in a block)

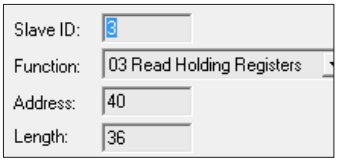


Fig.1.2a: Modbus query parameters for version A

B: Only query the corresponding sensor via the different individual addresses:
The start addresses are defined according to Table 1.2c, with a **fixed** length of 12 values

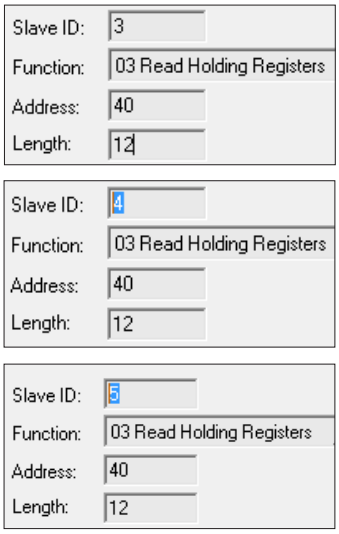


Fig. 1.2b: Sensor 1 - 3 Modbus query parameters for version B

The data are arranged in the following order:

offs	Sensor 1	Sensor 2	Sensor 3
	Device Base Address Register Addr. 40-51	**Device Base Address** Register Addr. 52-63	**Device Base Address** Register Addr. 64-75
	Device Base Address Register Addr. 40-51	**Device Base Address +1** Register Addr. 40-51	**Device Base Address +2** Register Addr. 40-51
0	gastype_1	gastype_2	gastype_3
1	range_1	range_2	range_3
2	divisor_1	divisor_2	divisor_3
3	current_value_1	current_value _2	current_value _3
4	average_value_1	average_value _2	average_value _3
5	error_1	error_2	error_3
6	alarm_1	alarm_2	alarm_3
7	di+relay	di+relay	di+relay
8	threshold_1a	threshold_2a	threshold_3a
9	threshold_1b	threshold_2b	threshold_3b
10	threshold_1c	threshold_2c	threshold_3c
11	threshold_1d	threshold_2d	threshold_3d

Table 1.2c: Arrangement of information

1.2
Measured Values & Status Query (uncompressed form)

Offs	Sensor 1	Values	Sensor 2	Values	Sensor 3	Values
	Sensor 1 Register addr 40-51		**Sensor 2** Register addr 52-63		**Sensor 3** Register addr. 64-75	
	Sensor 1 Register addr. 40-51		**Sensor 2** Register addr. 52-63		**Sensor 3** Register addr. 64-75	
0	gastype_1	1302	gastype_2	1177	gastype_3	1277
1	range_1	25	range_2	100	range_3	2500
2	divisor_1	100	divisor_2	10	divisor_3	0
3	current_value_1	314	current_value_2	306	current_value_3	1331
4	average_value_1	314	average_value_2	306	average_value_3	1331
5	error_1	0	error_2	0	error_3	0
6	alarm_1	0	alarm_2	0	alarm_3	112
7	di+relay	12	di+relay	12	di+relay	12
8	threshold_1a	1301	threshold_2a	501	threshold_3a	2400
9	threshold_1b	1402	threshold_2b	602	threshold_3b	3600
10	threshold_1c	1503	threshold_2c	703	threshold_3c	1600
11	threshold_1d	1604	threshold_2d	803	threshold_3d	80

Table 1.2e: Value example

Register description of measuring values for 1.2 A and 1.2 B

Addresses	offs	Parameter Name	Meaning
40,52,64	0	Gastype_x ui16	Gas type code of sensor 1, 2, 3 see table
41,53,65	1	Range_x ui16	Measuring range of sensor 1, 2, 3 (integer without translation)
42,54,66	2	divisor_x ui16	Divisor factor of sensor 1, 2, 3 (e.g. register value = 10 -> all measured values and alarm thresholds have to be divided by 10.
43,55,67	3	cur_val_x signed i16	Current value of sensor 1, 2, 3: Value presentation as integer (is multiplied with the divisor factor, therefore the actual gas value has to be divided by the divisor factor)
44,56,68	4	average_val_x signed i16	Average value of sensor 1, 2, 3: Value presentation as integer (is multiplied with the divisor factor, therefore the actual gas value has to be divided by the divisor factor)
45,57,69	5	error_x ui16	Error information, binary coded, see table 1.3f error codes
46,58,70	6	alarm_x ui16	Alarm status bits of sensor 1, 2, 3, binary coded, Alarm1(bit4) –Alarm4 (bit7), SBH (Self Hold Bit) information bits Alarm1(bit12)- Alarm4(bit15)
47,59,71	7	di+rel_x uii16	Alarm status bits of relay 1(bit0) – 5(bit4), and digital input states 1(bit8)-2 (bit9)
48,60,72	8	threshold_x y ui16	Threshold 1 of sensor 1, 2, 3, Value presentation as integer (is multiplied with the divisor factor, therefore the actual gas value has to be divided by the divisor factor)
49,61,73	9	threshold_x y ui16	Threshold 2 of sensor 1, 2, 3, Value presentation as integer (is multiplied with the divisor factor, therefore the actual gas value has to be divided by the divisor factor)
50,62,74	10	threshold_x y ui16	Threshold3 of sensor 1, 2, 3, Value presentation as integer (is multiplied with the divisor factor, therefore the actual gas value has to be divided by the divisor factor)
51,63,75	11	threshold_x y ui16	Threshold 4 of sensor 1, 2, 3, Value presentation as integer (is multiplied with the divisor factor, therefore the actual gas value has to be divided by the divisor factor)

Table 1.2f: Register description of measuring values for 1.2 A and 1.2 B

1.3
Operating data

Two query options are available here:

A: Query all information via the base address of the device:
Fixed register (start) address 200d (28h) with length 1 to 48 d information (words)
Example here: Slave ID = Slave Address = 3
(The other addresses 4 and 5 are not used here.)
Start Address always 200d.
Number of sensors: 1 2
Lengths: 18 36

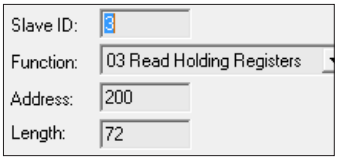


Fig.1.3a: Modbus query parameters Version A

B: Only query the corresponding sensor via the different individual addresses:
The start addresses are defined according to Table 1.2c, with a **fixed** length of 18 values

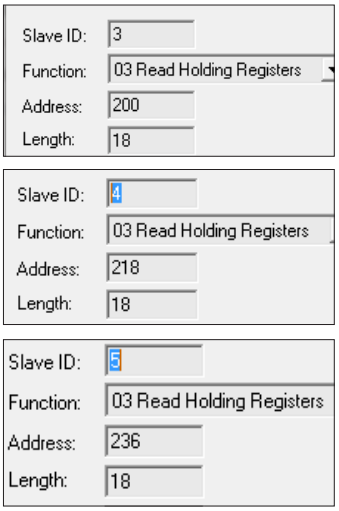


Fig. 1.3b: Sensor 1 - 3 Modbus operating data Modbus query parameters Version B

Arrangement of the data

offs	Sensor 1 (all devices)	Sensor 2 (Only Premium)
	Device base address Start address 200-217d	Device base address Start address 218-235d
	Device base address Start address 200-217d	Device base address +1 Start address 200-217d
0	prod_dd_mm_1	prod_dd_mm_1
1	prod_year_1	prod_year_2
2	serialnr_1	serialnr_2
3	unit_type_1	unit_type_2
4	operating_days_1	operating_days_2
5	days_till_calib_1	days_till_calib_2
6	opday_last_calib_1	opday_last_calib_2
7	calib_interv_1	calib_interv_2
8	days_last_calib_1	days_last_calib_2
9	sensibility_1	sensibility_2
10	cal_nr_1	cal_nr_2
11	tool_type_1	tool_type_2
12	tool_nr_1	tool_nr_2
13	gas_conz_1	gas_conz_2
14	max_gas_val_1	max_gas_val_2
15	temp_min_1	temp_min_2
16	temp_max_1	temp_max_2
17	free	free

Table 1.3c: Arrangement of the data

1.3
Operating data (Continued)

Register description of operating data acc. to 1.3 A and 1.3 B

Adresses	offset	bildname	Meaning
200,218,236	0	prod_dd_mm ui16	= Device manufacturing day + month, hex coded e.g. 14.3: 0x0E03h = 14 (day) 3 (month)(year)
201,219,237	1	prod_year ui16	Device manufacturing year e.g. 0x07E2h = 2018d
202,220,238	2	Serialnr ui16	Manufacturer's device serial number
203,221,239	3	unit_type ui16	Device type: 1 = Sensor Head 2 = Basic, Premium unit 3 = Gas Detection Controller
204,222,240	4	operating_days ui16	Number of current operating days
205,223,241	5	days_till_calib signed i16	Number of remaining operating days until next maintenance – negative values stand for exceeded maintenance time limit
206,224,242	6	opday_last_calib ui16	Operating days until last calibration
207,225,243	7	calib_interv ui16	Maintenance interval in days
208,226,244	8	days_last_calib ui16	Number of remaining operating days of the previous maintenance period until next maintenance
209,227,245	9	Sensibility ui16	Current sensor sensitivity in % (100% = new sensor)
210,228,246	10	cal_nr b ui16	Number of already performed calibrations
211,229,247	11	tool_type ui16	Manufacturer's serial number of calibration tool
212,230,248	12	tool_nr ui16	Manufacturer's ID number of calibration tool
213,231,249	13	gas_conz ui16	Average value of the gas concentration measured at the sensor over the time
214,232,250	14	max_gas_val signed i16	Highest gas concentration measured on the sensor
215,233,251	15	temp_min signed i16	Lowest temperature meassured on the sensor
216,234,252	16	temp_max signed i16	Highest temperature measured on the sensor
217,235,253	17	ui16	Not used

Table 1.3d: Register description of operating data acc. to 1.3 A and 1.3 B

1.3
Operating data (Continued)

Gas types and units

Gas Code	Type	Gas Type	Formula	Unit
1286	E-1125	Ammonia	NH3	ppm
1268	EXT	TempC	TempC	C
1269	EXT	TempF	TempF	F
1270	EXT	Humidity	Hum.	%rH
1271	EXT	Pressure	Press	mbar
1272	EXT	TOX	TOX	ppm
1273	EXT	Comb.	Comb	%LEL
1275	EXT	External		%
1276	EXT	Digital		%
1179	P-3408	Ammonia	NH3	% LEL
1177	P-3480	Propane	C3H8	% LEL
1266	S164	Carbon dioxide	CO2	% Vol
1227	S-2077-01	R134a	C2H2F4	ppm
1227	S-2077-02	R407a		ppm
1227	S-2077-03	R416a		ppm
1227	S-2077-04	R417a		ppm
1227	S-2077-05	R422A		ppm
1227	S-2077-06	R422d		ppm
1227	S-2077-07	R427A		ppm
1227	S-2077-08	R437A		ppm
1227	S-2077-09	R438A		ppm
1227	S-2077-10	R449A		ppm
1227	S-2077-11	R407f		ppm
1230	S-2080-01	R125	C2HF5	ppm
1230	S-2080-02	R32	CH2F2	ppm
1230	S-2080-03	R404a		ppm
1230	S-2080-04	R407c		ppm
1230	S-2080-05	R410a		ppm
1230	S-2080-06	R434A		ppm
1230	S-2080-07	R507A		ppm
1230	S-2080-08	R448A		ppm
1233	S-2125	R717	NH3	ppm

Table 1.3e: Table of gas types and units

Error codes occurring in the Modbus query
are the same as documented in the user guide
“Controller unit and Expansion module”.
They are bit coded and may occur combined.

„DP 0X Sensor Element“	0x8001h (32769d) Sensor element in the sensor head - error
„DP 0X ADC Error“	0x8002h (32770d) Monitoring of the amplifier and AD converter - error
„DP 0X Voltage“	0x8004h (32772d) Monitoring of the sensor and/or process power supply - error
„DP 0X CPU Error“	0x8008h (32776d) Monitoring of the processor function –error
„DP 0x EE Error“	0x8010h (32784d) Monitoring of the data storage – reports an error.
„DP 0X I/O Error “	0x8020h (32800d) Power ON / monitoring of the in/outputs of processor - error
„DP 0X Overtemp.“	0x8040h (32832d) Ambien temperature too high
„DP 0X Overrange“	0x8200h (33280d) Signal of sensor element at the sensor head is over range.
„DP 0X Underrange“	0x8100h (33024d) Signal of sensor element at the sensor head is under range.
„SB 0X Error“	0x9000h (36864d) Communication error from central unit to SB 0X
„DP 0X Error“	0xB000h (45056d) Communication error of SB to DP 0X sensor
„EP_06 0X Error“	0x9000h (36864d) Communication error to EP_06 0X module
„Maintenance“	0x0080h System maintenance is due.
„USV Error“	0x8001h (32769d) USV doesn’t work properly, can only be signalled by the GC.
„Power Failure“	0x8004h (32772d) can only be signalled by the GC.
„Horn Error“	0xA000h (40960d) can only be signalled by the GC/EP with hardware option.
„Warning Sign Error“	0x9000h (36864d) can only be signalled by the GC/EP with hardware option.
„XXX FC: 0xXXXX“	Occurs, if there are several errors from one measuring point.

Table 1.3f: Error Codes

2. Modbus Function 06

Write Single Registers (writing of single registers) is used to write on individual registers in the gas detection controller.

Currently, it is NOT possible to write any information.

3. Modbus Function 16

Write Multiple Registers (writing of several registers) is used to write on several registers in the gas detection controller.

This command is used to change the device addresses.

Attention:
They must be known in advance, and only one device with the same address may be on the bus, otherwise all devices will be readdressed.
This example changes device address 3 to address 12
Fixed start address 333d (0x14dh) with exact length 1 (1 word).

After writing this command, the device can only be reached with the new address!
All other parameter changes are not allowed for security reasons; therefore the data direction is clearly defined from the warning system side to the open MODBUS side. Retroaction is not possible.

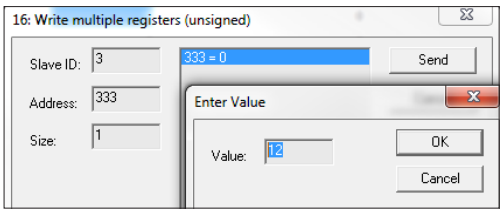


Fig. 3.1

4. Notes and General Information

It is important to read this user manual carefully in order to understand the information and instructions. The Danfoss GD gas monitoring, control and alarm system may only be used for applications in accordance to the intended use.

The appropriate operating and maintenance instructions and recommendations must be followed.

Due to permanent product developments, Danfoss reserves the right to change specifications without notice. The information contained herein is based on data considered to be accurate. However, no guarantee or warranty is expressed or implied concerning the accuracy of these data.

4.1 Intended Product Application

The Danfoss gas detection system is designed and manufactured for controlling, for saving energy and keeping OSHA air quality in commercial buildings and manufacturing plants.

4.2 Installer's Responsibilities

It is the installer's responsibility to ensure that all gas detection units are installed in compliance with all national and local regulations and OSHA requirements. All installation shall be executed only by technicians familiar with proper installation techniques and with codes, standards and proper safety procedures for control installations and the latest edition of the National Electrical Code (ANSI/NFPA70).

The equipotential bonding required (also e.g. secondary potential to earth) or grounding measures must be carried out in accordance with the respective project requirements. It is important to ensure that no ground loops are formed to avoid unwanted interference in the electronic measuring equipment.
It is also essential to follow strictly all instructions as provided in installation guide/user guide.

4.3 Maintenance

Danfoss recommend checking the GD gas detection system regularly. Due to regular maintenance differences in efficiency can easily be corrected. Re-calibration and replacement of parts can be realised on site by a qualified technician with the appropriate tools.