

# Deutschmann Module Unigate® CL-Profibus DP

Modbus - Profibus DP Programmer's Manual



# Profibus General Information

To use the Deutschmann Unigate® CL Module, the script must be programmed on the module. Additionally, the ID for the Profibus slave must be set correctly. The GSD file provided must be filed to the process control system for it to recognize the Module.

## Profibus Interface

### Overview

The following information is always available in the output buffer:

- Primary measurement channel 1 (sensor dependent, e.g. pH value)
- Primary measurement channel 6 (temperature)
- Sensor status (0 -> everything ok, else something is not ok)
- Interface warnings

### Input Buffer

The input buffer must be at least 18 bytes and contain the following information:

Byte	Type	Content
0	unit	Slave ID Sensor 1
1	unit	Function code Sensor 1
2	unit	Slave ID Sensor 2
3	unit	Function code Sensor 2
4	unit	Slave ID Sensor 3
5	unit	Function code Sensor 3
6	unit	Slave ID Sensor 4
7	unit	Function code Sensor 4
8	unit	Slave ID Kalibrierung
9	unit	Approval for Calibration *
10 ... 13	unit	CP1 Value
14 ... 17	unit	CP2 Value

\* 1 = Calibration Point 1  
2 = Calibration Point 2



## Output Buffer

The output buffer must be at least 120 bytes and contain the following information:

Byte	Type	Content	
0 ... 3	float	Primary Measurement Channel 1 (unit must be known)	Sensor 1
4 ... 7	float	Primary Measurement Channel 6 (unit must be known)	
8 ... 11	unit	Sensor status (see following table)	
12 ... 27	byte	Return value corresponding to the given function code	
28	byte	Used for communication errors (Profibus and Modbus®)	
30 ... 33	float	Primary Measurement Channel 1 (unit must be known)	Sensor 2
34 ... 37	float	Primary Measurement Channel 6 (unit must be known)	
38 ... 41	unit	Sensor status (see following table)	
42 ... 57	byte	Return value corresponding to the given function code	
58	byte	Used for communication errors (Profibus and Modbus®)	
60 ... 63	float	Primary Measurement Channel 1 (unit must be known)	Sensor 3
64 ... 67	float	Primary Measurement Channel 6 (unit must be known)	
68 ... 71	unit	Sensor status (see following table)	
72 ... 87	byte	Return value corresponding to the given function code	
88	byte	Used for communication errors (Profibus and Modbus®)	
90 ... 93	float	Primary Measurement Channel 1 (unit must be known)	Sensor 4
94 ... 97	float	Primary Measurement Channel 6 (unit must be known)	
98 ... 101	unit	Sensor status (see following table)	
102 ... 117	byte	Return value corresponding to the given function code	
118	byte	Used for communication errors (Profibus and Modbus®)	

**Note:** The script asks the sensor every second for a new measurement value and the values for the corresponding function code.

## Decoding the Return Values

### Characters

According to the Modbus convention, the characters are interchanged byte-wise. The char “01234567” will be transmitted as “10325476.”

### Float, Integers

According to the Modbus convention, the 4 byte values are interchanged word/2-byte-wise. For example: the float value 2.54 has the hex representation of 0x40228f5c. The sensor puts this value as 0x8f5c 4022 on the line.

### Bit Masks

When an interface error to the sensor occurs, the module makes a retry. If this retry fails, the module puts an error on byte 28. The PMC1 value will be -1.5, the PMC6 value -35, and the sensor status will be set to 0xFFFFFFFF.

Byte 28	Description
0x00	Everything ok
0x01	Sensor replies with an error (sensor replies correctly, but the answer contains an error code)
0x02	Wrong answer (no sensor available, sensor sends an invalid message or no message)

The sensor status looks like this:

Bit #	Hex Code	Description
0 (LSB)	0x01	Temperature out of measurement range
1	0x02	Temperature out of operating range
2	0x04	Calibration status not zero
3	0x08	Warning not zero
4	0x10	Error not zero

For more details about the sensor status, see the Programmer's Manual available at [www.hamiltoncompany.com](http://www.hamiltoncompany.com)



## Function codes

Code	Function	Return Value
0	No function	Bytes 12 ... 27: 0x0
1	Read sensor name	Bytes 12 ... 27: sensor name as char string
2	Read W/O	Bytes 12 ... 27: WO number as char string
3	Read W/O date	Bytes 12 ... 27: WO date as char string
4	Read sensor ID	Bytes 12 ... 27: sensor ID as char string
5	Measuring point	Bytes 12 ... 27: measuring point as char string
6	Read quality indicator	Bytes 12 ... 15: quality indicator as float
7	Read operating hours	Bytes 12 ... 15: operating hours as float
8	Read operating hours CP1	Bytes 12 ... 15: operating hours at CP1 as float
9	Read operating hours CP2	Bytes 12 ... 15: operating hours at CP2 as float
10	Read zero point (25°C) mV	Bytes 12 ... 15: zero point as float
11	Read slope (25°C)	Bytes 12 ... 15: slope as float
12	Read manufacturer calibration standard	Bytes 12 ... 27: calibration standard manufacturer as char string
13	Read R glass	Bytes 12 ... 15: R glass as float
14	CP1: calibration value	Bytes 12 ... 23: uses calibration buffer CP1 as float
15	CP1: temperature value	Bytes 12 ... 15: uses calibration temperature CP1 as float
16	CP1: effective calibration value	Bytes 12 ... 15: uses effective calibration buffer value CP1 as float
17	CP2: calibration value	Bytes 12 ... 23: uses calibration buffer for CP2 as float
18	CP2: temperature value	Bytes 12 ... 15: uses calibration temperature CP2 as float
19	CP2: effective calibration value	Bytes 12 ... 15: uses effective calibration buffer value CP2 as float
20	Warnings	Bytes 12 ... 27: warnings as bit mask
21	Errors	Bytes 12 ... 27: errors as bit mask
22	Password user	Bytes 12: Response Byte 0 0x03 12
23	Password administrator	Bytes 12: Response Byte 0 0x0C 12
24	Password specialist	Bytes 12: Response Byte 0 0x30 12

Available function codes for the different sensor types:

Code	pH	ORP	ODO	EDO	COND	PWSE
1	Sensor name	Sensor name	Sensor name	Sensor name	Sensor name	Sensor name
2	WO number	WO number	WO number	WO number	WO number	WO number
3	WO date	WO date	WO date	WO date	WO date	WO date
4	Sensor ID	Sensor ID	Sensor ID	Sensor ID	Sensor ID	Sensor ID
5	Measuring point	Measuring point	Measuring point	Measuring point	Measuring point	Measuring point
6	Quality indicator	Quality indicator	Quality indicator	Quality indicator	Quality indicator	Quality indicator
7	Operating hours	Operating hours	Operating hours	Operating hours	Operating hours	Operating hours
8	Operating hours CP1	Operating hours CP1	Operating hours CP1	Operating hours CP1	Operating hours CP1	Operating hours CP1
9	Operating hours CP2	Not available	Operating hours CP2	Operating hours CP2	Not available	Not available
10	Zero point	Offset	Phi 0	Zero current	Offset resistance	Offset resistance
11	Slope	Not available	CSV	Slope	Cell constant	Cell constant
12	Buffer manufacturer	Buffer manufacturer	Not available	DO standards	Standard manufacturer	Standard manufacturer
13	R glass	Not available	Not available	R cathode	Not available	Not available
14	Calibration value CP1	Calibration value CP1	Calibration value CP1	Calibration value CP1	Calibration value CP1	Calibration value CP1
15	Temperature value CP1	Temperature value CP1	Temperature value CP1	Temperature value CP1	Temperature value CP1	Temperature value CP1
16	Effective value CP1	Effective value CP1	Effective value CP1	Effective value CP1	Effective value CP1	Effective value CP1
17	Calibration value CP2	Not available	Calibration value CP2	Calibration value CP2	Not available	Not available
18	Temperature value CP2	Not available	Temperature value CP2	Temperature value CP2	Not available	Not available
19	Effective value CP2	Not available	Effective value CP2	Effective value CP2	Not available	Not available
20	Warnings	Warnings	Warnings	Warnings	Warnings	Warnings
21	Errors	Errors	Errors	Errors	Errors	Errors
22	Password User	Password User	Password User	Password User	Password User	Password User
23	Password Administrator	Password Administrator	Password Administrator	Password Administrator	Password Administrator	Password Administrator
24	Password Specialist	Password Specialist	Password Specialist	Password Specialist	Password Specialist	Password Specialist

**Note:** The function codes 16 and 19 can only be used if the password for operator level A is unchanged.



# Modbus Interface

## Configuration

The sensors need the following configuration for the Modbus (RS-485) interface to communicate with the Unigate® CL and the corresponding script:

- Parity: none
- 1 start bit
- 8 data bits
- 2 stop bits
- Baud rate: 19,200 bps
- Modbus address 1

## Modbus Requests

Permanent Modbus requests

Primary Measurement Channel 1 and Status		Output to bytes
<b>Register</b>	2090	
<b>Length [byte]</b>	20	
<b>Response</b>	Bytes 0 ... 3: unit (unit)	
	<b>Bytes 4 ... 7: PMC1 (float)</b>	<b>0 ... 3</b>
	<b>Bytes 8 ... 11: status (unit)</b>	<b>8 ... 11</b>
	Bytes 12 ... 15: minimum value (float)	
	Bytes 16 ... 19: maximum value (float)	

**Primary Measurement Channel 6****Output to bytes**

<b>Register</b>	2410	
<b>Length [byte]</b>	20	
<b>Response</b>	Bytes 0 ... 3: unit (unit) <b>Bytes 4 ... 7: PMC6 (float)</b> Bytes 8 ... 11: status (unit) Bytes 12 ... 15: minimum value (float) Bytes 16 ... 19: maximum value (float)	<b>4 ... 7</b>

## Selective Modbus Requests via Profibus DP

**Sensor Name (Code 1)****Output to bytes**

<b>Register</b>	1288	
<b>Length [byte]</b>	16	
<b>Response</b>	<b>Bytes 0 ... 15: sensor name (char)</b>	<b>12 ... 27</b>

**Work Order Number (Code 2)****Output to bytes**

<b>Register</b>	1296	
<b>Length [byte]</b>	16	
<b>Response</b>	<b>Bytes 0 ... 15: sensor name (char)</b>	<b>12 ... 27</b>

**Work Order Date (Code 3)****Output to bytes**

<b>Register</b>	1304	
<b>Length [byte]</b>	16	
<b>Response</b>	<b>Bytes 0 ... 15: sensor name (char)</b>	<b>12 ... 27</b>





**Sensor ID (Code 4)****Output to bytes**

<b>Register</b>	1360	
<b>Length [byte]</b>	16	
<b>Response</b>	<b>Bytes 0 ... 15: sensor ID (char)</b>	<b>12 ... 27</b>

**Measuring Point (Code 5)****Output to bytes**

<b>Register</b>	1600	
<b>Length [byte]</b>	16	
<b>Response</b>	<b>Bytes 0 ... 15: sensor ID (char)</b>	<b>12 ... 27</b>

**Quality Indicator (Code 6)****Output to bytes**

<b>Register</b>	4872	
<b>Length [byte]</b>	4	
<b>Response</b>	<b>Bytes 0 ... 3: quality indicator (float)</b>	<b>12 ... 15</b>

**Operating Hours (Code 7)****Output to bytes**

<b>Register</b>	4676	
<b>Length [byte]</b>	12	
<b>Response</b>	<b>Bytes 0 ... 3: operating hours (float)</b>	<b>12 ... 15</b>
	Bytes 4 ... 7: operating hours above maximum measurement temperature (float)	
	Bytes 8 ... 11: operating hours above maximum operating temperature (float)	

Operating Hours of CP1 (Code 8)Output to bytes

<b>Register</b>	5164	
<b>Length [byte]</b>	16	
<b>Response</b>	Bytes 0 ... 3: unit temperature (unit 32) Bytes 4 ... 7: temperature CP1 (float) Bytes 8 ... 11: number of calibrations CP1 (unit 32) <b>Bytes 12 ... 15: operating hours CP1 (float)</b>	<b>12 ... 15</b>

Operating Hours of CP2 (Code 9)Output to bytes

<b>Register</b>	5196	
<b>Length [byte]</b>	16	
<b>Response</b>	Bytes 0 ... 3: unit temperature (unit 32) Bytes 4 ... 7: temperature CP2 (float) Bytes 8 ... 11: number of calibrations CP2 (unit 32) <b>Bytes 12 ... 15: operating hours CP2 (float)</b>	<b>12 ... 15</b>

Offset and Slope of Calibration (Codes 10 and 11)Output to bytes

<b>Register</b>	5448	
<b>Length [byte]</b>	12	
<b>Response</b>	<b>Bytes 0 ... 3: offset (float) (code 10)</b> <b>Bytes 4 ... 7: slope (float) (code 11)</b> Bytes 8 ... 11: reference temperature (float)	<b>12 ... 15</b> <b>12 ... 15</b>

**Calibration Standard Set Manufacturer (Code 12)****Output to bytes**

<b>Register</b>	9504	
<b>Length [byte]</b>	16	
<b>Response</b>	<b>Bytes 0 ... 15: manufacturer of the calibration standard (char)</b>	<b>12 ... 27</b>

**Secondary Measurement Channel 1 – R-Glass (Code 13)****Output to bytes**

<b>Register</b>	2472	
<b>Length [byte]</b>	12	
<b>Response</b>	Bytes 0 ... 3: unit (unit) <b>Bytes 4 ... 7: SMC1 (float)</b> Bytes 8 ... 11: standard deviation (float)	<b>12 ... 15</b>

**Calibration Status CP1 (Code 14)****Output to bytes**

<b>Register</b>	5158	
<b>Length [byte]</b>	12	
<b>Response</b>	<b>Bytes 0 ... 3: calibration status (unit)</b> <b>Bytes 4 ... 7: unit (unit)</b> <b>Bytes 8 ... 11: calibrated buffer value (float)</b>	<b>12 ... 15</b> <b>16 ... 19</b> <b>20 ... 23</b>

**Calibration Parameters CP1 (Code 15)****Output to bytes**

<b>Register</b>	5164	
<b>Length [byte]</b>	16	
<b>Response</b>	Bytes 0 ... 3: unit (unit) <b>Bytes 4 ... 7: temperature value (float)</b> Bytes 8 ... 11: number of calibrations CP1 (unit) Bytes 9 ... 15: operating hours (float)	<b>12 ... 15</b>

**Effective Calibration Values CP1 (Code 16)****Output to bytes**

<b>Register</b>	5520	
<b>Length [byte]</b>	16	
<b>Response</b>	<b>Bytes 0 ... 3: effective calibration value pH (float)</b>	<b>12 ... 15</b>
	Bytes 4 ... 7: calibration voltage (float)	
	Bytes 8 ... 11: calibration temperature (float)	
	Bytes 9 ... 12: free (unit)	

**Calibration Status CP2 (Code 17)****Output to bytes**

<b>Register</b>	5190	
<b>Length [byte]</b>	12	
<b>Response</b>	<b>Bytes 0 ... 3: calibration status (unit)</b>	<b>12 ... 15</b>
	<b>Bytes 4 ... 7: unit (unit)</b>	<b>16 ... 19</b>
	<b>Bytes 8 ... 11: calibrated buffer value (float)</b>	<b>20 ... 23</b>

**Calibration Parameters CP2 (Code 18)****Output to bytes**

<b>Register</b>	5196	
<b>Length [byte]</b>	16	
<b>Response</b>	Bytes 0 ... 3: unit (unit)	
	<b>Bytes 4 ... 7: temperature (float)</b>	<b>12 ... 15</b>
	Bytes 8 ... 11: number of calibrations CP2 (unit)	
	Bytes 9 ... 15: operating hours (float)	

**Note:** The function codes 16 and 19 can only be used if the password for operator level A or higher is unchanged.



**Effective Calibration Values CP2 (Code 19)****Output to bytes**

<b>Register</b>	5528	
<b>Length [byte]</b>	16	
<b>Response</b>	<b>Bytes 0 ... 3: effective calibration value pH (float)</b>	<b>12 ... 15</b>
	Bytes 4 ... 7: calibration voltage (float)	
	Bytes 8 ... 11: calibration temperature (float)	
	Bytes 9 ... 12: free (unit)	

**Warnings (Code 20)****Output to bytes**

<b>Register</b>	4736	
<b>Length [byte]</b>	16	
<b>Response</b>	<b>Bytes 0 ... 3: warnings measurement (unit)</b>	<b>12 ... 15</b>
	<b>Bytes 4 ... 7: warnings calibration (unit)</b>	<b>16 ... 19</b>
	<b>Bytes 8 ... 11: warnings interface (unit)</b>	<b>20 ... 23</b>
	<b>Bytes 12 ... 15: warnings hardware (unit)</b>	<b>24 ... 27</b>

**Errors (Code 21)****Output to bytes**

<b>Register</b>	4800	
<b>Length [byte]</b>	16	
<b>Response</b>	<b>Bytes 0 ... 3: error measurement (unit)</b>	<b>12 ... 15</b>
	<b>Bytes 4 ... 7: error calibration (unit)</b>	<b>16 ... 19</b>
	<b>Bytes 8 ... 11: error interface (unit)</b>	<b>20 ... 23</b>
	<b>Bytes 12 ... 15: error hardware (unit)</b>	<b>24 ... 27</b>

**Setting Operator Level User (Code 22)****Output to bytes**

<b>Register</b>	4288	
<b>Length [byte]</b>	1	
<b>Response</b>	<b>0 = 0x03: User</b>	<b>12</b>

Setting Operator Level Administrator (Code 23)Output to bytes

<b>Register</b>	4288	
<b>Length [byte]</b>	1	
<b>Response</b>	<b>0 = 0x0C: Administrator</b>	<b>12</b>

Setting Operator Level Specialist (Code 24)Output to bytes

<b>Register</b>	4288	
<b>Length [byte]</b>	1	
<b>Response</b>	<b>Byte 0 = 0x30: Specialist</b>	<b>12</b>

For more details about the Modbus interface, see the Programmer's Manual available at [www.hamiltoncompany.com](http://www.hamiltoncompany.com)





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