Modbus Manual Version 1.04

Modbus Manual for Clean Room Panel CRP5

This manual is for persons who will use the Clean Room Panel Modbus protocol. It describes how messages are constructed and how transactions take place using Modbus protocol.

Table of contents

1 Modbus protocol

The Clean Room Panel (CRP5) can handle Modbus RTU (asynchronous communication over RS485) and Modbus TCP (client-server communication over Ethernet). Modbus ASCII is not supported.

For detailed information about Modbus protocol see:
(http://modbus.org/docs/Modbus_Application_Protocol_V1_1b3.pdf).

Attention!
Changes to register content (especially Holding Registers) in the CRP5 can change the functionality of the CRP5. This may cause the CRP5 to become inoperable.
Changes of register contents should only be made with the necessary knowledge of the Modbus protocol.

1.1 *Structure of the Modbus protocol*

1.1.1 Modbus RTU / TCP

1.1.1.1 Modbus RTU

Modbus RTU is an asynchronous communication protocol. The CRP5 handles Modbus RTU over the included RS485 interface. The communication parameters are 19200 Baud, 8-bit data, no parity and cannot be changed.

Note!
Modbus RTU Address of the CRP5 is always the CRP5 RS485 Network Address + 1!

1.1.1.2 Modbus TCP

Modbus TCP is a client-server communication protocol over Ethernet. The CRP5 handles Modbus TCP over the port 502 and cannot be changed.

Modbus TCP needs a Modbus Application Protocol Header (MBAP 7 Bytes) in front of the Protocol Data Unit (PDU).
Modbus commands are integrated in PDU. Every Modbus command has his own PDU.

1.1.1.3 Difference between Modbus RTU and TCP

A Modbus RTU message looks like:

Modbus RTU Message			
Slave ID	Command	Data	CRC
	PDU		

A Modbus TCP message includes a MBAP-Header and looks like:

Modbus TCP Message					
Transaction ID	Protocol ID	Length	Unit ID	Command	Data
MBAP-Header				PDU	

For detailed information look at (http://modbus.org/docs/Modbus_Application_Protocol_V1_1b3.pdf).

1.2 *Modbus Data Format*

The Modbus protocol only specifies the 16-bit integer data type and is declared as “Big-Endian” protocol.

1.2.1 16-bit Integer Value

16-bit Integer for Modbus Devices

Modbus Field N	
MSB	LSB
12	34
Byte x	Byte x+1

For other data types, as 32-bit floating point, there is no specification how they should be mapped to the Modbus address range. It is up to the device manufacturer to specify this format.

1.2.2 32-bit Float corresponding to IEEE 754

MSB			LSB
SEEEEEEE	EMMMMMMM	MMMMMMMM	MMMMMMMM

S – Sign
E – Exponent
M - 23 bit Mantissa

32-bit Float for Rotronic Modbus Devices

The 32-Bit Float value is represented by two 16-bit registers. The 4 Bytes have to be mapped to the Modbus address range as shown below

Modbus Field N		**Modbus Field N+1**	
	LSB	MSB	
MMMMMMMM	MMMMMMMM	SEEEEEEE	EMMMMMMM
Byte x	Byte x+1	Byte x+2	Byte x+3

1.2.3 32-bit Integer Value

Example: Integer Value 0x12345678

MSB			LSB
12	34	56	78

32-bit Integer for Rotronic Modbus Devices

The 32-Bit Integer value represents two 16-bit registers. The 4 bytes of the 32-bit Integer value have to be mapped to the Modbus address range as shown below.

Modbus Field N		**Modbus Field N+1**	
	LSB	MSB	
56	78	12	34
Byte x	Byte x+1	Byte x+2	Byte x+3

Because there is no standard and it is mostly a matter of personal preference, it is configurable how the four bytes are being mapped to the two registers.

1.2.4 Selectable Swap Modes for Rotronic Devices

Selectable swap modes (see Device Settings -> *Modbus Operation Mode*) only for 32-bit Float and 32-bit Integer values based on Little Endian memory organisation.

Swap Mode	Source Bytes a,b,c,d	Target Bytes a,b,c,d
No change	[a b] [c d]	[a b c d]
byte and word swap	[a b] [c d]	[d c b a]
byte swap	[a b] [c d]	[b a d c]
word swap **(Rotronic Default)**	[a b] [c d]	[c d a b]

2 CRP5 Modbus Fields and Mapping

2.1 *CRP5 Modbus Fields*

Primary Tables	Type	Read / Write	Coils / Registers	Function Code	
Coils	Bit	Read/Write	1 … 9'999	0x01	Read Coils
				0x05	Write Single Coil
				0x0F	Write Multiple Coils
Discrete Inputs	Bit	Read Only	10'001 … 29'999	0x02	Read Discrete Inputs
Input Registers	16-bit	Read Only	30'001 … 39'999	0x04	Read Input Register
Holding Registers	16-bit	Read/Write	40'001 … 49'999	0x03	Read Holding Registers
				0x06	Write Single Register
				0x10	Write Multiple Registers

Attention!
Coils and registers in Modbus are addressed starting at zero. Therefore coils numbered 1…16 are addressed as 0…15 or registers numbered e.g. 10'001…10'016 are addressed as 10'000…10'015!

Note!
The content of not specified coils/registers are undefined!

2.2 *Device Specific Coils*

With Modbus **Coils** you can get the state of one or more coils or activate/deactivate one or more coils.

Assisted Modbus commands are *Read Coils* (0x01), *Write Single Coil* (0x05) and, for the CRP5, in some cases *Write Multiple Coils* (0x0F).

2.2.1 Relays 1 to 6

Commands to energize/de-energize the relays of the CRP5 manually.

Attention!
If in Relay Settings the flag *Relay x Alarm OFF* is set, it is not possible to energize the relay x manually. The relay will be de-energized every measuring cycle, when alarm is off!

Coil	Name	Type	Description
1	Relay 1	*!	• Get state of relay 1 • Switch relay 1 ON/OFF
2	Relay 2	*!	• Get state of relay 2 • Switch relay 2 ON/OFF
3	Relay 3	*!	• Get state of relay 3 • Switch relay 1 ON/OFF
4	Relay 4	*!	• Get state of relay 4 • Switch relay 4 ON/OFF
5	Relay 5	*!	• Get state of relay 5 • Switch relay 5 ON/OFF
6	Relay 6	*!	• Get state of relay 6 • Switch relay 6 ON/OFF

7	Reserved		• Undefined
8	Reserved		• Undefined
*	It is possible to one or more relays with the Modbus command 0x0F		
!	An energized relay stays energized until the related coil is de-energized, an *Alarm Off after…* event (see Relay Settings) or a device reset occurs		

2.2.2 Valves A to D

Commands to energize/de-energize the valves of the CRP5 manually.

Coil	Name	Type	Description
9	Valve A (Zero+)	*	• Get state of valve A • Switch valve A ON/OFF
10	Valve B (Zero-)	*	• Get state of valve B • Switch valve B ON/OFF
11	Valve C (Front+)	*	• Get state of valve C • Switch valve C ON/OFF
12	Valve D (Front-)	*	• Get state of Valve D • Switch Valve D ON/OFF
13	Reserved		• Undefined
14	Reserved		• Undefined
15	Reserved		• Undefined
16	Reserved		• Undefined
*	It is possible to set one or more valves with the Modbus command 0x0F		
!	An energized valve stays energized until the related coil is de-energized or a device reset occurs		

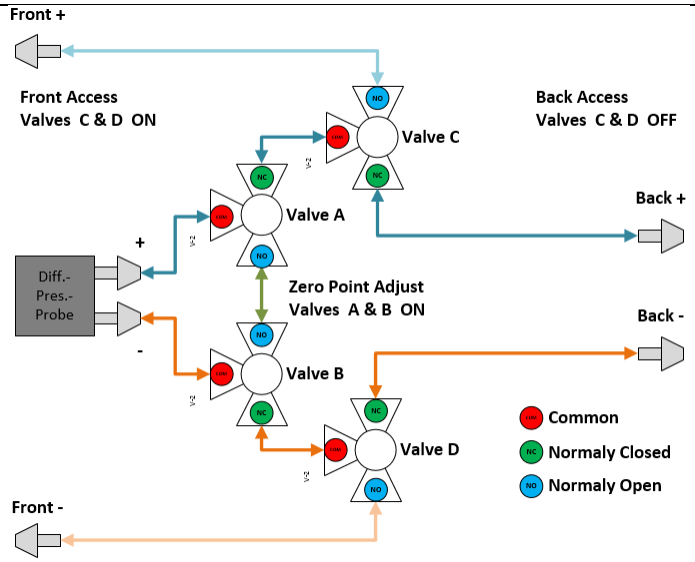
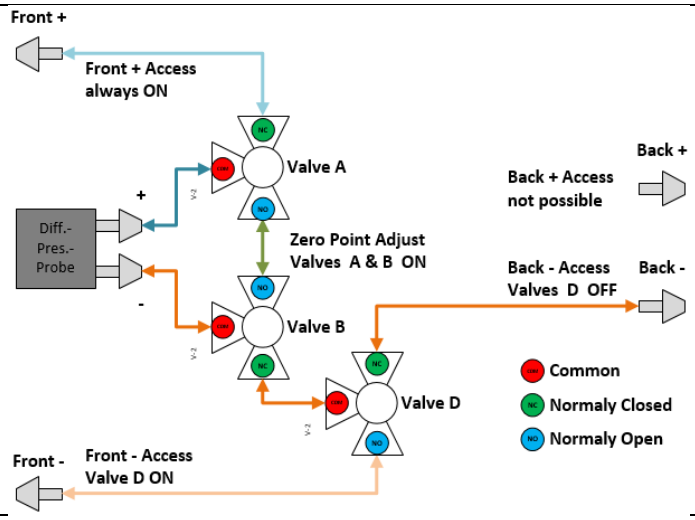
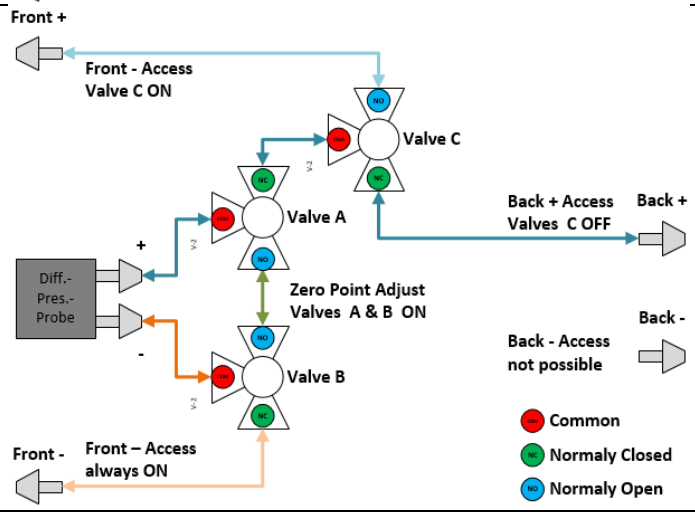
2.2.3 Maintenance/Calibration

The External Maintenance mode will have activated in case of maintenance services: clean room cleaning and during calibration process.
Modbus command *Write Multiple Coils* (0x0F) is **not** possible.

Coil	Name	Type	Description
17	External Maintenance		• Get state of external maintenance • Switch external maintenance ON/OFF
18	Calibration Back Access	!	• Get state of calibration back access • Switch calibration back access ON/OFF
19	Calibration Front Access	!	• Get state of calibration front access • Switch calibration front access ON/OFF
20	Reserved		• Undefined
21	Reserved		• Undefined
22	Reserved		• Undefined
23	Reserved		• Undefined
24	Reserved		• Undefined
!	Only one of these calibration accesses (back or front) can be active at the same time		

External Maintenance: By starting this action, maintenance services are possible, e.g. clean room cleaning or calibration processes.

Calibration Back/Front Access: Calibration can either occur on the front or back inputs of the differential pressure sensor – never set both calibration access points, front and back the same time.
There are 3 possibilities to access the differential pressure sensor of the CRP5 (see below).

Front or Back Access	
Fixed Front + Access	
Fixed Front - Access	

2.2.4 Sensor Actions

Direct sensor actions!

Attention!
Be careful to use these commands, due to any possible miss adjustments.

Modbus command *Write Multiple Coils* (0x0F) is **not** possible.

Coils	Name	Type	Description
25	Differential Pressure Zero Adjust	*	• Zero adjust of the differential pressure sensor • These action takes about 15 seconds to execute
26	Differential Pressure Gain Adjust	*!	• Setting the gain of the differential pressure sensor • These action takes about 2 seconds to execute
27	Differential Pressure Reset Adjustment	*	• Resets differential pressure gain and offset settings to 1.0 (gain) and 0.0 (offset)
28	Acquire Humidity Data	*!	• Acquires a reference value for the humidity • It's possible to acquire more than one different reference values
29	Delete Acquired Humidity Data	*	• Deletes all acquired humidity reference values
30	Adjust Acquired Humidity Data	*	• The acquired humidity data will be sent to the humidity sensor
	Attention! If no reference values has acquired, humidity adjust is not possible!		
31	Adjust Temperature Data	*!	• The reference temperature data will be sent to the temperature sensor
32	Reserved		• Undefined

*	During these action, communication with the device is not possible
!	Before activating these action, a reference value has to be set for the desired sensor (see Reference Value Settings)

Note!
For adjustment procedures, you need a stable environment no matter what sensor will have adjusted.

Differential Pressure Gain Adjust: By starting this action, the differential pressure sensor will be adjusted to a reference value that is applied to the chosen pressure inputs (front or back). This reference value must be entered in the appropriate reference register (see Reference Value Settings -> *Differential Pressure*) before the adjustment procedure is started. Beside the zero adjust point, only one further differential pressure value can be acquired as a reference value.

Differential Pressure Reset Adjustment: The adjustment parameters determined during the production of the CRP5 will be restored.

Acquire Humidity Data: By starting this action, the CRP5-probe will be adjusted to a reference humidity value. This reference humidity in the unit of the applied reference must be entered in the appropriate reference register (see Reference Value Settings -> *Humidity*) before the acquiring procedure is started. Up to 99 humidity values can be acquired as reference values.

Delete Acquired Humidity Data: By starting this action, all acquired data will get lost.

Adjust Acquired Humidity Data: By starting this action, the CRP5-probe will be adjusted to the acquired reference values. If no reference values has been acquired, a humidity adjustment is not possible.

Adjust Temperature Data: By starting this action, the CRP5-probe will be adjusted to a reference temperature value. This reference temperature in the unit of the applied reference must be entered in the appropriate reference register (see Reference Value SettingsReference Value Settings -> *Temperature*) before the adjust procedure is started. Only one temperature value can be acquired as a reference value.

2.2.5 Device Actions

Direct device actions!

Attention!
Be careful to use these commands, due to any possible wrong configurations.

Modbus command *Write Multiple Coils* (0x0F) is **not** possible.

Coils	Name	Type	Description
33	Reset Device	*	• Reset device
34	Store Device Settings	*	• Stores the actual settings of the device into FLASH
35	Restore All Device Settings	*	• Restores the device (factory) settings in FLASH to the device
36	Restore Device Settings without Ethernet Data	*	• Restores the device (factory) settings in FLASH to the device, without the Ethernet settings
37 … 64	Reserved		• Undefined
65 … 9'999	Reserved		• Undefined • Gives back Modbus Exception Code 02
*	During these action, communication with the device is not possible		

Reset Device: The device will be restarted.

Store Device Settings: All device-relevant data will be stored in the FLASH. **Be careful, executing this command, will overwrite older (factory) settings in the FLASH.**

Restore All Device Settings: All device-relevant data will be restored from the FLASH to the device. Be careful, all individual device settings by customer will be overwritten by the factory settings.

Restore All Device Settings without Ethernet Data: All device-relevant data, except Ethernet settings, will have restored from the FLASH to the device. Be careful, all device settings will have overwritten, except the Ethernet settings.

2.2.6 Example: Read Single Coil

2.2.6.1 Red Relay 1 to 6

Initial situation: The relays 1, 3 and 5 are set.
RTU Example:

Transmit	01 01 00 00 00 07 7d c8
Receive	01 01 01 15 90 47

TCP Example:

Transmit	MBAP 01 01 00 00 00 07
Receive	MBAP 01 01 01 15

Field	Bytes	Value	Description
MBAP	7	MBAP	MBAP header (see Modbus RTU / TCP)
Checksum	2	CRC	CRC Checksum (see Modbus RTU / TCP)
RTU number	1	0x01	Modbus RTU Address (RS485 Address + 1) (see Device Descriptions)
Function code	1	0x01	Read Single Coil
Starting address	2	0x0000	= 0, means address of the 1. coil (Attention! coil number – 1)
Quantity of coils	2	0x0007	= 7, 1 to 7 gives the same result 1 byte (8 coils) 8 to 15 will give back 2 bytes (16 coils) etc. (maximal value for CRP5 0x003f = 63 ≙ 8 bytes)
Byte count	1	0x01	= 1 ≙ **N**, means quantity of coils / 8, if the remainder is different of 0 => N = N+1
Coil status (see Relays)	n	0x15	n = N or N+1 = 8 bits

Bit	State	State of Relais 1 to 6
0	**ON**	Coil 1 = Relais 1 (ON = 1, OFF = 0)
1	OFF	Coil 2 = Relais 2 (ON = 1, OFF = 0)
2	**ON**	Coil 3 = Relais 3 (ON = 1, OFF = 0)
3	OFF	Coil 4 = Relais 4 (ON = 1, OFF = 0)
4	**ON**	Coil 5 = Relais 5 (ON = 1, OFF = 0)
5	OFF	Coil 6 = Relais 6 (ON = 1, OFF = 0)
6	OFF	Not used
7	OFF	Not use

For detailed information about Modbus protocol *Read Single Coil* see:
(http://modbus.org/docs/Modbus_Application_Protocol_V1_1b3.pdf).

2.2.7 Example: Write Single Coil

2.2.7.1 Set State of Relay 2

RTU Example:

Transmit	01 05 00 01 ff 00 dd fa
Receive	01 05 00 01 ff 00 dd fa

TCP Example:

Transmit	MBAP 01 05 00 01 ff 00
Receive	MBAP 01 05 00 01 ff 00

Field	Bytes	Value	Description
MBAP	7	MBAP	MBAP header (see Modbus RTU / TCP)
Checksum	2	CRC	CRC Checksum (see Modbus RTU / TCP)
RTU number	1	0x01	Modbus RTU Address (RS485 Address + 1) (see Device Descriptions)
Function code	1	0x05	Write Single Coil
Starting address	2	0x0001	= 1, means address of the 2. coil (Attention! coil number – 1)
Output value	2	0xff00	0xff00 for setting the selected coil 0x0000 for resetting the selected coil

Test the change with Modbus commands in example Read coil 1 to coil 8

For detailed information about Modbus protocol *Write Single Coil* see:
(http://modbus.org/docs/Modbus_Application_Protocol_V1_1b3.pdf).

2.2.8 Example: Write Multiple Coils

2.2.8.1 Set State of Relay 1 to 6

RTU Example:

Transmit	01 0f 00 00 00 07 01 2a 4f 49
Receive	01 0f 00 00 00 07 14 09

TCP Example:

Transmit	MBAP 01 0f 00 00 00 07 01 2a
Receive	MBAP 01 0f 00 00 00 07

Field	Bytes	Value	Description
MBAP	7	MBAP	MBAP header (see Modbus RTU / TCP)
Checksum	2	CRC	CRC Checksum (see Modbus RTU / TCP)
RTU number	1	0x01	Modbus RTU Address (RS485 Address + 1) (see Device Descriptions)
Function code	1	0x0f	Write Multiple Coils
Starting address	2	0x0000	= 0, means address of the 1. coil (Attention! coil number – 1)
Quantity of outputs	2	0x0007	= 7 for coils 0 to 7

Byte count	1	0x01	= 1 ≙ **N**, means quantity of coils / 8, if the remainder is different of 0 => N = N+1
Output values (see Relays)	N * 1	0x2a	

Bit	State	State of Relais 1 to 6
0	OFF	Coil 1 = Relais 1 (ON = 1, OFF = 0)
1	**ON**	Coil 2 = Relais 2 (ON = 1, OFF = 0)
2	OFF	Coil 3 = Relais 3 (ON = 1, OFF = 0)
3	**ON**	Coil 4 = Relais 4 (ON = 1, OFF = 0)
4	OFF	Coil 5 = Relais 5 (ON = 1, OFF = 0)
5	**ON**	Coil 6 = Relais 6 (ON = 1, OFF = 0)
6	OFF	Not used
7	OFF	Not use

Test the change with Modbus commands in example Read coil 1 to coil 8

For detailed information about Modbus protocol *Write Single Coil* see:
(http://modbus.org/docs/Modbus_Application_Protocol_V1_1b3.pdf).

2.2.9 Example: Reset Device

RTU Example:

Transmit	01 05 00 20 ff 00 0d f0
Receive	01 05 00 20 ff 00 0d f0

TCP Example:

Transmit	MBAP 01 05 00 20 ff 00
Receive	MBAP 01 05 00 20 ff 00

Field	Bytes	Value	Description
MBAP	7	MBAP	MBAP header (see Modbus RTU / TCP)
Checksum	2	CRC	CRC Checksum (see Modbus RTU / TCP)
RTU number	1	0x01	Modbus RTU Address (RS485 Address + 1) (see Device Descriptions)
Function code	1	0x05	Write Single Coil
Starting address	2	0x0020	= 32, means address of the 33. Coil (Reset Device) (Attention! coil number – 1)
Output value	2	0xff00	0xff00 for setting the selected action

For detailed information about Modbus protocol *Write Single Coil* see:
(http://modbus.org/docs/Modbus_Application_Protocol_V1_1b3.pdf).

2.3 *Device Specific Discrete Inputs (read only)*

With Modbus **Discrete Inputs** you can get the state of the digital inputs of the CRP5.

Assisted Modbus command is *Read Discrete Input* (0x02).

2.3.1 Digital Inputs 1 and 2

Current state of the digital inputs of the CRP5, updated every measurement cycle, which means every second.

Coil	Protocol	Name	Type	Description
10'001	10'000	Digital Input		Bit: State of Initialization bits 0: Digital Input 1 (ON = 1, OFF = 0) 1: Digital Input 2 (ON = 1, OFF = 0) 2…15: 0
10'002 … 10'063	10'001 … 10'062	Reserved		• Undefined
10'064 … 29'999	10'063 … 29'998	Reserved		• Gives back Modbus Exception Code 02

2.3.2 Example: Read Discrete Inputs

2.3.2.1 Read Modbus Coil 10'001

RTU Example:

Transmit	01 02 27 10 00 01 b2 bb
Receive	01 02 01 01 60 48

TCP Example:

Transmit	MBAP 01 02 27 10 00 01
Receive	MBAP 01 02 01 01

Field	Bytes	Value	Description
MBAP	7	MBAP	MBAP header (see Modbus RTU / TCP)
Checksum	2	CRC	CRC Checksum (see Modbus RTU / TCP)
RTU number	1	0x01	Modbus RTU Address (RS485 Address + 1) (see Device Descriptions)
Function code	1	0x02	Read Discret Inputs
Starting address	2	0x2710	= 10'000 (Attention! coil number – 1)
Quantity of inputs	2	0x0001	= 1, means read 1 byte (8 bits)
Byte count	1	0x01	= 1 ≙ **N**, means numbers of returned bytes
Input status (see Digital Inputs)	**N * 1**	0x01	Bit: State of Digital Inputs 0: Digital Input 1 (ON = 1, OFF = 0) 1: Digital Input 2 (ON = 1, OFF = 0) 2…7: not used

For detailed information about Modbus protocol *Read Discrete Inputs* see:
(http://modbus.org/docs/Modbus_Application_Protocol_V1_1b3.pdf).

2.4 *Device Specific Input Registers (read only)*

With Modbus **Input Registers** you can read some device specific data of the CRP5.

Assisted Modbus command is *Read Input Registers* (0x04).

2.4.1 Device Data

CRP5-specific data.

Register	Protocol	Name	Type	Description
30’001	30’000	Serial Number	&	• Serial number of the device (part 1)
30’002	30’001		&	• Serial number of the device (part 2)
30’003	30’002	Serial Number Probe	&	• Serial number of the CRP5-probe (part 1)
30’004	30’003		&	• Serial number of the CRP5-probe (part 2)
30’005	30’004	Device Name		• Device name (part 1 – character 1 & 2) *e.g. “CR”*
30’006	30’005			• Device name (part 2 – character 3 & 4) *e.g. “P-“*
30’007	30’006			• Device name (part 3 – character 5 & 6) *e.g. “1 “*
30’008	30’007			• Device name (part 4 – character 7 & 8) *e.g. “ab“*
30’009	30’008			• Device name (part 5 – character 9 & 10) *e.g. “cd“*
30’010	30’009			• Device name (part 6 – character 11 & 12)*e.g. “ef“*
30’011	30’010	Differential Pressure Sensor Type		No. / Differential pressure sensor type 0 / ± 10Pa 1 / ± 25Pa 2 / ± 50Pa 3 / ± 100Pa 4 / ± 250Pa 5 / ± 500Pa 6 / ± 50Pa (Second source supplier) 7 / ± 100Pa (Second source supplier) 8 / ± 250Pa (Second source supplier)
30’012	30’011	Hardware Version		• Hardware version
30’013	30’012	Production Date	&!	• Production date (part 1)
30’014	30’013		&!	• Production date (part 2)
30’015	30’014	Reserved		• Undefined
30’016	30’015	Reserved		• Undefined
30’017	30’016	State of Reset		• Internal use only
30’018	30’017	State of Initialization		• Internal use only
30’019	30’018	State of Alarms		Bit / State of Alarm bits 0 / Alarm Differential Pressure Hi 1 / Alarm Differential Pressure Low 2 / Alarm Humidity Hi 3 / Alarm Humidity Low 4 / Alarm Temperature Hi 5 / Alarm Temperature Low 6 / Alarm Calculation Hi 7 / Alarm Calculation Low 8 / Alarm Analog Input 1 Hi 9 / Alarm Analog Input 1 Low 10 / Alarm Analog Input 2 Hi

				11 Alarm Analog Input 2 Low 12 Alarm Digital Input 1 13 Alarm Digital Input 2 14…15 0 0 = alarm OFF; 1 = alarm ON
30'020	30'019	State of Other Alarms		Bit: State of Other Alarm bits 0 Internal use only 1 Internal use only 2…7 0 8 Missing Probe Maintenance 9 Internal Maintenance 10 External Maintenance 11 Calibration Back Access 12 Calibration Front Access 13…15 0 0 = alarm OFF; 1 = alarm ON
30'021	30'020	State of Relays and Valve		Bit: State of Relay/Valve bits 0 Relay 1 1 Relay 2 2 Relay 3 3 Relay 4 4 Relay 5 5 Relay 6 6…7 0 8 Valve A 9 Valve B 10 Valve C 11 Valve D 12…15 0 0 = deactivated; 1 = activated
30'022 … 30'500	30'021… 30'499	Reserved		• Undefined • Gives back Modbus Exception Code 02

&	These are 32-bit values, separated in two succeeding registers (16-bits). How to bring together part 1 and part 2 of the 32-bit value, depends on the *Swap Mode* of the Modbus communication (see Device Settings -> *Modbus Operation Mode* and Selectable Swap Modes for Rotronic Devices)
"	Character values separated in succeeding registers, *e.g. "CRP5-1 abcdef"*
!	Represents the Unix Time (UTC) since 1.1.1970 in seconds

State of Alarms: Shows all possible sensor alarms. You have to enable the appropriate alarm bit and alarm level (see "Holding Registers" -> "Alarm Settings" -> "Alarm Bits" resp. "*Sensors*") before an alarm can be activated.

State of Other Alarms: Shows all possible "other" alarms, like maintenance modes, calibration access and differential pressure offset limits.

State of Relays and Valves: Shows the current state of the relays and valves.

2.4.2 Current Values: Float Values

Current values in 32-bit IEEE754 float format of all CRP5 sensors, updated every measurement cycle (see "Holding Registers" -> "Device Settings" -> "Measurement Interval").

Note!
These values are changing every measurement cycle, so always read the two corresponding registers in one Modbus command.
The transmitted values are always in the basic unit of the measurement.

Register	Protocol	Name	Type	Description
31'001	31'000	Humidity [%rh]	&	• Current humidity value (part 1)
31'002	31'001		&	• Current humidity value (part 2)
31'003	31'002	Temperature [°C]	&	• Current temperature value (part 1)
31'004	31'003		&	• Current temperature value (part 2)
31'005	31'004	Differential Pressure [Pa]	&	• Current differential pressure value (part 1)
31'006	31'005		&	• Current differential pressure value (part 2)
31'007	31'006	Calculation [basic unit] (Unit depends on calculation)	&	• Current calculation value (part 1)
31'008	31'007		&	• Current calculation value (part 2)
31'009	31'008	Analog Input 1 [selected unit]	&	• Current analog input 1 value (part 1)
31'010	31'009		&	• Current analog input 1 value (part 2)
31'011	31'010	Analog Input 2 [selected unit]	&	• Current analog input 2 value (part 1)
31'012	31'011		&	• Current analog input 2 value (part 2)
31'013	31'012	Digital Input 1	&	• Current digital input 1 value (part 1)
31'014	31'013		&	• Current digital input 1 value (part 2)
31'015	31'014	Digital Input 2	&	• Current digital input 2 value (part 1)
31'016	31'015		&	• Current digital input 2 value (part 2)
31'017	31'016	Ambient Pressure [hPa]	&	• Current ambient pressure value (part 1)
31'018	31'017		&	• Current ambient pressure value (part 2)
31'019	31'018	Internal Temperature	&	• Current internal temperature value (part 1)
31'020	31'019		&	• Current internal temperature value (part 2)
31'021 … 31'999	31'020 … 31'998	Reserved		• Undefined • Gives back Modbus Exception Code 02

&	These are float-values (32-bit IEEE754), separated in two succeeding registers (16-bits). How to bring together part 1 and part 2 of the 32-bit float-value, depends on the *Swap Mode* of the Modbus communication (see Device SettingsDevice Settings -> *Modbus Operation Mode* and Selectable Swap Modes for Rotronic Devices)

2.4.3 Current Values: Integer Values

Current values in 16-bit integer format of all CRP5 sensors, updated every measurement cycle, which means all every second.
The current values are the result of the reduction to 16-bit values of the multiplication of the current 32-bit IEEE754 float values (see Current Values: Float Values) and the corresponding scaling values (see Integer Value Scaling).

Note!
The transmitted values are always in the basic unit of the measurement.

Register	Protocol	Name	Type	Description
32'001	32'000	Humidity [%rh]		• Current humidity value
32'002	32'001	Temperature [°C]		• Current temperature value
32'003	32'002	Differential Pressure [Pa]		• Current differential pressure value
32'004	32'003	Calculation [basic unit]		• Current calculation value

		(Unit depends on calculation)		
32’005	32’004	Analog Input 1 [selected unit]		• Current analog input 1 value
32’006	32’005	Analog Input 2 [selected unit]		• Current analog input 2 value
32’007	32’006	Digital Input 1		• Current digital input 1 value
32’008	32’007	Digital Input 2		• Current digital input 2 value
32’009	32’008	Ambient Pressure [hPa]		• Current ambient pressure value
32’010	32’009	Internal Temperature [°C]		• Current internal temperature value
32’011 … 32’999	32’010 … 32’998	Reserved		• Undefined • Gives back Modbus Exception Code 02

2.4.4 FDA Data

FDA Data fields contain information about firmware update, sensor adjustments and device properties.

Register	Protocol	Name	Type	Description
33’001	33’000	FDA Date FW Update	&!	• FDA date firmware update (part 1)
33’002	33’001		&!	• FDA date firmware update (part 2)
33’003	33’002	FDA ID FW Update	&	• FDA ID firmware update (part 1)
33’004	33’003		&	• FDA ID firmware update (part 2)
33’005	33’004	FDA Date DiffP. Adjust (RAG)	&!	• DA date differential pressure adjust RAG (part 1)
33’006	33’005		&!	• DA date differential pressure adjust RAG (part 2)
33’007	33’006	FDA ID DiffP. Adjust (RAG)	&	• FDA ID differential pressure adjust RAG (part 1)
33’008	33’007		&	• FDA ID differential pressure adjust RAG (part 2)
33’009	33’008	FDA Date DiffP. Adjust (User)	&!	• FDA date differential pressure adjust user (part 1)
33’010	33’009		&!	• FDA date differential pressure adjust user (part 2)
33’011	33’010	FDA ID DiffP. Adjust (User)	&	• FDA ID differential pressure adjust user (part 1)
33’012	33’011		&	• FDA ID differential pressure adjust user (part 2)
33’013	33’012	FDA Date Properties	&!	• FDA date device properties (part 1)
33’014	33’013		&!	• FDA date device properties (part 2)
33’015	33’014	FDA ID Properties	&	• FDA ID device properties (part 1)
33’016	33’015		&	• FDA ID device properties (part 2)
33’017 … 33’999	33’016 … 33’998	Reserved		• Undefined • Gives back Modbus Exception Code 02

&	These are 32-bit values, separated in two succeeding registers (16-bits). How to bring together part 1 and part 2 of the 32-bit value, depends on the *Swap Mode* of the Modbus communication (see Device SettingsDevice Settings -> *Modbus Operation Mode* and Selectable Swap Modes for Rotronic Devices)
!	Represents the Unix Time (UTC) since 1.1.1970 in seconds

FDA Date DiffP. Adjust (User):
FDA ID DiffP. Adjust (User):

FDA Date Properties:
FDA ID Properties:
If you change the device properties or set the offset/gain of the differential pressure over the menu of the CRP5 or Modbus, the date and ID of the FDA-fields *Diffp. Adjust (User)* and *Properties* would be changed.

	Date	ID
Change in the CRP5-menu	0, representing 1.1.1970	Serial Number of the CRP5
Change over Modbus	0, representing 1.1.1970	0xFFFFFFFF

2.4.5 Example: Read Input Register

2.4.5.1 Read Current Values: Float Value (Registers 31'001 to 31'006)

RTU Example:

Transmit	01 04 79 18 00 06 e9 53
Receive	01 04 0c 41 f3 70 a3 41 ba 00 00 3d 80 e9 a2 97 8a

TCP Example:

Transmit	MBAP 01 04 79 18 00 06
Receive	MBAP 01 04 0c 41 f3 70 a3 41 ba 00 00 3d 80 e9 a2

Field	Bytes	Value	Description
MBAP	7	MBAP	MBAP header (see Modbus RTU / TCP)
Checksum	2	CRC	CRC Checksum (see Modbus RTU / TCP)
RTU number	1	0x01	Modbus RTU Address (RS485 Address + 1) (see Device Descriptions)
Function code	1	0x04	Read Discret Inputs
Starting address	2	0x7918	= 31'000 (Attention! register number – 1)
Quantity of input registers	2	0x0006	= 6, means read 6 registers
Byte count	1	0x0c	= 12 ≙ **2 * N**, means numbers of returned bytes
Input registers (see Current Values: Float Values)	**2 * N**	0x41f370a3	= 30.43 %rh Humidity
		0x41ba0000	= 23.25 °C Temperature
		0x3d80e9a2	= 0.063 Pa Differential Pressure

For detailed information about Modbus protocol *Read Discrete Inputs* see:
(http://modbus.org/docs/Modbus_Application_Protocol_V1_1b3.pdf).

2.5 *Device Specific Holding Registers*

With Modbus **Holding Registers** you can read and write device specific data to the CRP5.

Assisted Modbus commands are *Read Holding Registers* (0x03), *Write Single Register* (0x06) and *Write Multiple Registers* (0x10).

Attention!
Changes to register content in the CRP5 can change the functionality of the CRP5. This may cause the CRP5 to become inoperable.
Changes of register contents should only be made with the necessary knowledge of the Modbus protocol.

2.5.1 Value Type

Selection of the possible calculation and analog input modes.

Register	Protocol	Name	Type	Description
40’001	40’000	Calculation Type	!	No. / Select Calculation 0 Dew Point 1 Frost Point 2 Wet Bulb Temperature 3 Enthalpy 4 Vapour Concentration 5 Specific Humidity 6 Mixing Ratio 7 Saturation Vapour Concentration 8 Vapour Partial Pressure 9 Vapour Saturation Pressure
40’002	40’001	Analog Input 1 Type	!	No. / Description of the Analog Input 1 type 0 Voltage Input 1 Current Input (120Ω)
40’003	40’002	Analog Input 2 Type	!	No. / Description of the Analog Input 2 type 0 Voltage Input 1 Current Input (120Ω)
40’004 … 40’099	40’003 … 40’098	Reserved		• Undefined • Gives back Modbus Exception Code 02
!	Change of these registers needs a restart of the device (see Device Actions)			

Calculation Type: Select the calculation showed on display (row 4), if selected (see Display Settings -> *Display Row 4*).

Analog Input x Type: Select the analog input type, voltage or current (120Ω internal resistance).

2.5.2 Value Unit

Select the unit shown on display for the different sensors and calculation values.

Register	Protocol	Name	Type	Description
41'001	41'000	Temperature *For Calculation:* Dew Point, Frost Point, Wet Bulb Temperature	!	No. / Temperature Units 0 / °C 1 / °F
41'002	41'001	Differential Pressure	!	No. / Differential Pressure Units 0 / Pa 1 / inH_2O 2 / mpsi 3 / mbar 4 / mmHg 5 / mmH_2O 6 / Torr 7 / g/cm^2
41'003	41'002	Ambient Pressure *For Calculation:* Vapour Partial Pressure Vapour Saturation Pressure	!	No. / Ambient Pressure Unit 0 / hPa 1 / inHg 2 / psi
41'004	41'003	*For Calculation:* Enthalpy	!	No. / Enthalpy Units 0 / kJ/kg 1 / BTI/lb
41'005	41'004	*For Calculation:* Vapour Concentration Saturation Vapour Concentration	!	No. / Concentration Units 0 / g/m^3 1 / g/ft^3
41'006	41'005	*For Calculation:* Specific Humidity Mixing Ratio	!	No. / Weight Units 0 / g/kg 1 / gr/lb
41'007	41'006	Reserved		• undefined
41'008	41'007	Reserved		• undefined
41'009	41'008	Humidity	!*	• For humidity the unit is always **%rh**
41'010	41'009	Analog Input 1 Unit	!*	• Characters 1 & 2 of the unit of the analog input 1
41'011	41'010		!*	• Characters 3 & 4 of the unit of the analog input 1
41'012	41'011	Analog Input 2 Unit	!*	• Characters 1 & 2 of the unit of the analog input 2
41'013	41'012		!*	• Characters 3 & 4 of the unit of the analog input 2
41'014 … 41'099	41'013 … 41'098	Reserved		• Undefined • Gives back Modbus Exception Code 02

!	Change of these registers needs a restart of the device (see Device Actions)
*	It is not possible to verify the value, written to this register!

Humidity: It is not possible to change the unit for humidity. It is always set to **%rh**.
Analog Input x Unit: Select the characters showed on display (row 4) for analog input 1/2, e.g. "ppm".

2.5.3 Integer Value Scaling

Selection of the scaling factor of the current values for data conversion float to integer. Scaling factor should be between 1 and 1000.

Register	Protocol	Name	Type	Description
42'001	42'000	Humidity	!	• Scaling factor for the humidity value
42'002	42'001	Temperature	!	• Scaling factor for the temperature value
42'003	42'002	Differential Pressure	!	• Scaling factor for the differential pressure value
42'004	42'003	Calculation	!	• Scaling factor for the calculation value
42'005	42'004	Analog Input 1	!	• Scaling factor for the analog input 1 value
42'006	42'005	Analog Input 2	!	• Scaling factor for the analog input 1 value
42'007	42'006	Digital Input 1	!	• Scaling factor for the digital input 1 value
42'008	42'007	Digital Input 2	!	• Scaling factor for the digital input 1 value
42'009	42'008	Ambient Pressure	!	• Scaling factor for the ambient pressure value
42'010	42'009	Internal Temperature	!	• Scaling factor for the internal temperature value
42'011 … 43'999	42'010 … 43'998	Reserved		• Undefined • Gives back Modbus Exception Code 02

!	Change of these registers needs a restart of the device (see Device Actions)

2.5.4 Reference Value Settings

Settings of reference values for adjustments of differential pressure, humidity and temperature (see Sensor Actions).
Values in these registers are only valuable until the next restart of the device!

Register	Protocol	Name	Type	Description
44'001	44'000	Humidity	?&*	• Reference value humidity (part 1)
44'002	44'001		?&*	• Reference value humidity (part 2)
44'003	44'002	Temperature	?&*	• Reference value temperature (part 1)
44'004	44'003		?&*	• Reference value temperature (part 2)
44'005	44'004	Differential Pressure	?&*	• Reference value differential pressure (part 1)
44'006	44'005		?&*	• Reference value differential pressure (part 2)
44'007 … 44'099	44'006 … 44'098	Reserved		• Undefined • Gives back Modbus Exception Code 02

?	After reset of the device, the *Reference Values* are always set to 0.0
&	These are float-values (32-bit IEEE754), separated in two succeeding registers (16-bits). How to bring together part 1 and part 2 of the 32-bit float-value, depends on the *Swap Mode* of the Modbus communication (see Device Settings -> *Modbus Operation Mode* and Selectable Swap Modes for Rotronic Devices)
*	It is not possible to verify the value, written to this register!

2.5.5 Device Settings

Device specific settings.

Register	Protocol	Name	Type	Description
44'101	44'100	Device Bits	!	Bit: Description of the Device bits 0: Trend Enable (OFF/ON) 1…15: Reserved
44'102	44'101	Measurement Interval		• Fixed to 1 second. Cannot be changed
44'103	44'102	Logging Interval		• Not yet implemented, undefined

44’104	44’103	Differential Pressure Filter	!	• Filter for the Differential Pressure • 0 <= filter <= 10
44’105	44’104	Device Protection	!	No. / Description of the Device Protection **171** / Device Write Protection ON x / Device Write Protection OFF
		Attention! After writing this command with parameter **171**, it’s not possible to overwrite the content of the FLASH until executing the same command without parameter **171**		
44’106	44’105	Calculation Select	!	No. / Select Calculation 0 Dew Point 1 Frost Point 2 Wet Bulb Temperature 3 Enthalpy 4 Vapour Concentration 5 Specific Humidity 6 Mixing Ratio 7 Saturation Vapour Concentration 8 Vapour Partial Pressure 9 Vapour Saturation Pressure
		The same selection as in “Holding Registers” -> “Value Type” -> “Calculation Type”		
44’107	44’106	RS485 Address	!	• RS485 address • 0 <= addr <= 63 • **Attention!** Modbus address = RS485 address + 1
44’108	44’107	Modbus Operation Mode	!	• Modbus Operation Mode for 32-bit float and integer values
44’109	44’108	Valve Bits		• Not yet implemented, undefined
44’110	44’109	Offset Adjust Repeat Time	!&*	• Repeat time for the automatic zero point adjustment of differential pressure, in minutes (part 1)
44’111	44’110		!&*	• Repeat time for the automatic zero point adjustment of differential pressure, in minutes (part 2)
44’112	44’111	Switch Bits		• Not yet implemented, undefined
44’113	44’112	Menu Protection	!	No. / Menu Protection 0 Menu protection OFF 1 Menu protection ON
44’114 … 44’199	44’113 … 44’198	Reserved		• Undefined • Gives back Modbus Exception Code 02

!	Change of these registers needs a restart of the device (see Device Actions)
&	These are 32-bit values, separated in two succeeding registers (16-bits). How to bring together part 1 and part 2 of the 32-bit value, depends on the *Swap Mode* of the Modbus communication (see Device Settings -> *Modbus Operation Mode* and Selectable Swap Modes for Rotronic Devices)
*	It is not possible to verify the value, written to this register!

Measurement Interval: It is not possible to change the measurement interval. It is fixed to 1 second.

Logging Interval: Currently the logging function is not used. The address is reserved for futures implementation of this function.

Differential Pressure Filter: Low pass filter of the differential pressure sensor data. Possible values are between 0 and 10. The filter number x represents the average calculation of the last actual x measurements.

0 no average, min. low pass filter function, pressure changes will be shown best.

10 max. average of the last 10 measurements of the last 10 seconds, max. low pass filter function, short time pressure changes will damped strongly.

Device Protection: If the device protection is set to 171, it is not possible anymore to write into the internal FLASH! You have to write a value unequal 171 to this register to suspend the blockade.
Be careful to use this command over Modbus! If writing Modbus commands to a device with *Device Protection ON*, you don't get an error back, because the Modbus writing process was successful - only writing to FLASH was not possible.

RS485 Address: The RS485 address is used in conjunction with a RS485 network. Each network address should be unique and within the values of 1 to 63.

Note!
The default factory RS-485 address of the CRP5 is 0. On the menu *Device Information* of the CRP5, you can see the RS485 address of the device.

Attention!
The Modbus address for Modbus RTU is always the RS485 address + 1.

Modbus Operation Mode: Defines the order of the bytes and registers of 32-bit and float-values (see Selectable Swap Modes for Rotronic DevicesSelectable Swap Modes for Rotronic Devices).

Offset Adjust Repeat Time: Repeat time for the automatic zero point adjustment of differential pressure in minutes.

Note!
Repeat time is minimal 1 minute, maximal 2^{32} minutes.

Menu Protection: If set, it is not possible to select the menus of the CRP5. Only the first menu *Device Informations* of the CRP5 is reachable.

2.5.6 Device Descriptions

Name for the different parts of the device, which is clearly related with its function. For *Digital Input 1/2 Low/High* a text which describes the meaning of the input states *Low* and *High*.

Register	Protocol	Name	Type	Description
44'201	44'200	Device	"!*	• Description device (part 1 – char. 1 & 2)
44'202	44'201		"!*	• Description device (part 2 – char. 3 & 4)
44'203	44'202		"!*	• Description device (part 3 – char. 5 & 6)
44'204	44'203		"!*	• Description device (part 4 – char. 7 & 8)
44'205	44'204		"!*	• Description device (part 5 – char. 9 & 10)
44'206	44'205		"!*	• Description device (part 6 – char. 11 & 12)
44'207	44'206	Differential Pressure	"!*	• Desc. diff. pressure sensor (part 1 – char. 1 & 2)
44'208	44'207		"!*	• Desc. diff. pressure sensor (part 2 – char. 3 & 4)
44'209	44'208		"!*	• Desc. diff. pressure sensor (part 3 – char. 5 & 6)
44'210	44'209		"!*	• Desc. diff. pressure sensor (part 4 – char. 7 & 8)
44'211	44'210		"!*	• Desc. diff. pressure sensor (part 5 – char. 9 & 10)
44'212	44'211		"!*	• Desc. diff. pressure sensor (part 6 – char. 11 & 12)
44'213	44'212	Relay 1	"!*	• Description relay 1 (part 1 – char. 1 & 2)
44'214	44'213		"!*	• Description relay 1 (part 2 – char. 3 & 4)
44'215	44'214		"!*	• Description relay 1 (part 3 – char. 5 & 6)
44'216	44'215		"!*	• Description relay 1 (part 4 – char. 7 & 8)
44'217	44'216		"!*	• Description relay 1 (part 5 – char. 9 & 10)

44’218	44’217		“!*	• Description relay 1 (part 6 – char. 11 & 12)
44’219	44’218	Relay 2	“!*	• Description relay 2 (part 1 – char. 1 & 2)
44’220	44’219		“!*	• Description relay 2 (part 2 – char. 3 & 4)
44’221	44’220		“!*	• Description relay 2 (part 3 – char. 5 & 6)
44’222	44’221		“!*	• Description relay 2 (part 4 – char. 7 & 8)
44’223	44’222		“!*	• Description relay 2 (part 5 – char. 9 & 10)
44’224	44’223		“!*	• Description relay 2 (part 6 – char. 11 & 12)
44’225	44’224	Relay 3	“!*	• Description relay 3 (part 1 – char. 1 & 2)
44’226	44’225		“!*	• Description relay 3 (part 2 – char. 3 & 4)
44’227	44’226		“!*	• Description relay 3 (part 3 – char. 5 & 6)
44’228	44’227		“!*	• Description relay 3 (part 4 – char. 7 & 8)
44’229	44’228		“!*	• Description relay 3 (part 5 – char. 9 & 10)
44’230	44’229		“!*	• Description relay 3 (part 6 – char. 11 & 12)
44’231	44’230	Relay 4	“!*	• Description relay 4 (part 1 – char. 1 & 2)
44’232	44’231		“!*	• Description relay 4 (part 2 – char. 3 & 4)
44’233	44’232		“!*	• Description relay 4 (part 3 – char. 5 & 6)
44’234	44’233		“!*	• Description relay 4 (part 4 – char. 7 & 8)
44’235	44’234		“!*	• Description relay 4 (part 5 – char. 9 & 10)
44’236	44’235		“!*	• Description relay 4 (part 6 – char. 11 & 12)
44’237	44’236	Relay 5	“!*	• Description relay 5 (part 1 – char. 1 & 2)
44’238	44’237		“!*	• Description relay 5 (part 2 – char. 3 & 4)
44’239	44’238		“!*	• Description relay 5 (part 3 – char. 5 & 6)
44’240	44’239		“!*	• Description relay 5 (part 4 – char. 7 & 8)
44’241	44’240		“!*	• Description relay 5 (part 5 – char. 9 & 10)
44’242	44’241		“!*	• Description relay 5 (part 6 – char. 11 & 12)
44’243	44’242	Relay 6	“!*	• Description relay 6 (part 1 – char. 1 & 2)
44’244	44’243		“!*	• Description relay 6 (part 2 – char. 3 & 4)
44’245	44’244		“!*	• Description relay 6 (part 3 – char. 5 & 6)
44’246	44’245		“!*	• Description relay 6 (part 4 – char. 7 & 8)
44’247	44’246		“!*	• Description relay 6 (part 5 – char. 9 & 10)
44’248	44’247		“!*	• Description relay 6 (part 6 – char. 11 & 12)
44’249	44’248	CRP5 Probe	“!*	• Description CRP5 probe (part 1 – char. 1 & 2)
44’250	44’249		“!*	• Description CRP5 probe (part 2 – char. 3 & 4)
44’251	44’250		“!*	• Description CRP5 probe (part 3 – char. 5 & 6)
44’252	44’251		“!*	• Description CRP5 probe (part 4 – char. 7 & 8)
44’253	44’252		“!*	• Description CRP5 probe (part 5 – char. 9 & 10)
44’254	44’253		“!*	• Description CRP5 probe (part 6 – char. 11 & 12)
44’255	44’254	Analog Input 1	“!*	• Description analog input 1 (part 1 – char. 1 & 2)
44’256	44’255		“!*	• Description analog input 1 (part 2 – char. 3 & 4)
44’257	44’256		“!*	• Description analog input 1 (part 3 – char. 5 & 6)
44’258	44’257		“!*	• Description analog input 1 (part 4 – char. 7 & 8)
44’259	44’258		“!*	• Description analog input 1 (part 5 – char. 9 & 10)
44’260	44’259		“!*	• Description analog input 1 (part 6 – char. 11 & 12)
44’261	44’260	Analog Input 2	“!*	• Description analog input 2 (part 1 – char. 1 & 2)
44’262	44’261		“!*	• Description analog input 2 (part 2 – char. 3 & 4)
44’263	44’262		“!*	• Description analog input 2 (part 3 – char. 5 & 6)
44’264	44’263		“!*	• Description analog input 2 (part 4 – char. 7 & 8)
44’265	44’264		“!*	• Description analog input 2 (part 5 – char. 9 & 10)
44’266	44’265		“!*	• Description analog input 2 (part 6 – char. 11 & 12)
44’267	44’266	Digital Input 1	“!*	• Description digital input 1 (part 1 – char. 1 & 2)

44’268	44’267		“!*	• Description digital input 1 (part 2 – char. 3 & 4)
44’269	44’268		“!*	• Description digital input 1 (part 3 – char. 5 & 6)
44’270	44’269		“!*	• Description digital input 1 (part 4 – char. 7 & 8)
44’271	44’270		“!*	• Description digital input 1 (part 5 – char. 9 & 10)
44’272	44’271		“!*	• Description digital input 1 (part 6 – char. 11 & 12)
44’273	44’272	Digital Input 2	“!*	• Description digital input 2 (part 1 – char. 1 & 2)
44’274	44’273		“!*	• Description digital input 2 (part 2 – char. 3 & 4)
44’275	44’274		“!*	• Description digital input 2 (part 3 – char. 5 & 6)
44’276	44’275		“!*	• Description digital input 2 (part 4 – char. 7 & 8)
44’277	44’276		“!*	• Description digital input 2 (part 5 – char. 9 & 10)
44’278	44’277		“!*	• Description digital input 2 (part 6 – char. 11 & 12)
44’279	44’278	Ambient Pressure	“!*	• Description ambient pressure (part 1 – char. 1 & 2)
44’280	44’279		“!*	• Description ambient pressure (part 2 – char. 3 & 4)
44’281	44’280		“!*	• Description ambient pressure (part 3 – char. 5 & 6)
44’282	44’281		“!*	• Description ambient pressure (part 4 – char. 7 & 8)
44’283	44’282		“!*	• Description ambient pressure (part 5 – char. 9 & 10)
44’284	44’283		“!*	• Description ambient pressure (part 6 – char. 11 & 12)
44’285	44’284	Digital Input 1 Text Low	”!*	• Description dig. input 1 text low (part 1 – char. 1 & 2)
44’286	44’285		“!*	• Description dig. input 1 text low (part 2 – char. 3 & 4)
44’287	44’286		“!*	• Description dig. input 1 text low (part 3 – char. 5 & 6)
44’288	44’287		“!*	• Description dig. input 1 text low (part 4 – char. 7 & 8)
44’289	44’288		“!*	• Description dig. input 1 text low (part 5 – char. 9 & 10)
44’290	44’289		“!*	• Descript. dig. input 1 text low (part 6 – char. 11 & 12)
44’291	44’290	Digital Input 1 Text High	“!*	• Description dig. input 1 text high (part 1 – char. 1 & 2)
44’292	44’291		“!*	• Description dig. input 1 text high (part 2 – char. 3 & 4)
44’293	44’292		“!*	• Description dig. input 1 text high (part 3 – char. 5 & 6)
44’294	44’293		“!*	• Description dig. input 1 text high (part 4 – char. 7 & 8)
44’295	44’294		“!*	• Descript. dig. input 1 text high (part 5 – char. 9 & 10)
44’296	44’295		“!*	• Descript. dig. input 1 text high (part 6 – char. 11 & 12)
44’297	44’296	Digital Input 2 Text Low	“!*	• Description dig. input 2 text low (part 1 – char. 1 & 2
44’298	44’297		“!*	• Description dig. input 2 text low (part 2 – char. 3 & 4)
44’299	44’298		“!*	• Description dig. input 2 text low (part 3 – char. 5 & 6)
44’300	44’299		“!*	• Description dig. input 2 text low (part 4 – char. 7 & 8)
44’301	44’300		“!*	• Description dig. input 2 text low (part 5 – char. 9 & 10)
44’302	44’301		“!*	• Descript. dig. input 2 text low (part 6 – char. 11 & 12)
44’304	44’303	Digital Input 1 Text High	“!*	• Description dig. input 2 text high (part 1 – char. 1 & 2)
44’305	44’304		“!*	• Description dig. input 2 text high (part 2 – char. 3 & 4)
44’306	44’305		“!*	• Description dig. input 2 text high (part 3 – char. 5 & 6)
44’307	44’306		“!*	• Description dig. input 2 text high (part 4 – char. 7 & 8)
44’308	44’307		“!*	• Descript. dig. input 2 text high (part 5 – char. 9 & 10)
44’309	44’308		“!*	• Descript. dig. input 2 text high (part 6 – char. 11 & 12)
44’310 … 44’399	44’309 … 44’398	Reserved		• Undefined • Gives back Modbus Exception Code 02

“	Character values separated in succeeding registers
!	Change of these registers needs a restart of the device (see Device Actions)
*	It is not possible to verify the value, written to this register!

2.5.7 Fix Value Settings

Fixed values are used to simulate an output value for testing purposes. To activate the *Fix Values*, you have to set the corresponding *Fix Value Bit* to *ON*. The fixed values must be within the following limits:

- Differential Pressure: ±120% of the measuring range (for instance 300 Pa for a 250 Pa sensor)
- Humidity: 0 … 100%
- Temperature: -100 … 200
- Calculation: -9999 … 9999
- Analog Input: -9999 … 9999

Register	Protocol	Name	Flags	Description
44’401	44’400	Fix Value Bits	!	Bit / Description of the Fix **Value** bits 0 Differential Pressure 1 Humidity 2 Temperature 3 Analog Input 1 4 Analog Input 2 5 Digital Input 1 6 Digital Input 2 7 Calculation 8…15 Reserved 0 = fix value is OFF, 1 = fix value is ON
44’402	44’401	Differential Pressure	!&*	• Fix value differential pressure (part 1)
44’403	44’402		!&*	• Fix value differential pressure (part 2)
44’404	44’403	Humidity	!&*	• Fix value humidity (part 1)
44’405	44’404		!&*	• Fix value humidity (part 2)
44’406	44’405	Temperature	!&*	• Fix value temperature (part 1)
44’407	44’406		!&*	• Fix value temperature (part 2)
44’408	44’407	Analog Input 1	!&*	• Fix value analog Input 1 (part 1)
44’409	44’408		!&*	• Fix value analog Input 1 (part 2)
44’410	44’409	Analog Input 2	!&*	• Fix value analog Input 2 (part 1)
44’411	44’410		!&*	• Fix value analog Input 2 (part 2)
44’412	44’411	Digital Input 1	!	• Fix value digital Input 1
44’413	44’412	Digital Input 2	!	• Fix value digital Input 2
44’414	44’413	Calculation	!&*	• Fix value calculation (part 1)
44’415	44’414		!&*	• Fix value calculation (part 2)
44’416 … 44’499	44’415 … 44’498	Reserved		• Undefined • Gives back Modbus Exception Code 02

!	Change of these registers needs a restart of the device (see Device Actions)
&	These are float-values (32-bit IEEE754), separated in two succeeding registers (16-bits). How to bring together part 1 and part 2 of the 32-bit float-value, depends on the *Swap Mode* of the Modbus communication (see Device Settings -> *Modbus Operation Mode* and Selectable Swap Modes for Rotronic Devices)
*	It is not possible to verify the value, written to this register!

2.5.8 Analog Output Settings

The CRP5 can provide up to four analog output signals. The analog signal type can be set individually to every analog output.

Register	Protocol	Name	Flags	Description
44’501	44’500	Source for Analog Output 1	!	No. / Select Source 0 Unused 1 Differential Pressure 2 Humidity 3 Temperature 4 Analog Input 1 5 Analog Input 2 6 Digital Input 1 7 Digital Input 2
44’502	44’501	Output Range Analog Output 1	!	No. / Select Output Range 0 Output Range 0…1V 1 Output Range 0…5V 2 Output Range 0…10V 3 Output Range 0…20mA 4 Output Range 4…20mA
44’503	44’502	Scale Low Analog Output 1	!*	• Output value scale low
44’504	44’503	Scale High Analog Output 1	!*	• Output value scale high
44’505	44’504	Source for Analog Output 2	!	No. / Select Source - Same as for Analog Output 1
44’506	44’505	Output Range Analog Output 2	!	No. / Select Output Range - Same as for Analog Output 1
44’507	44’506	Scale Low Analog Output 2	!*	• Output value scale low
44’508	44’507	Scale High Analog Output 2	!*	• Output value scale high
44’509	44’508	Source for Analog Output 3	!	No. / Select Source - Same as for Analog Output 1
44’510	44’509	Output Range Analog Output 3	!	No. / Select Output Range - Same as for Analog Output 1
44’511	44’510	Scale Low Analog Output 3	!*	• Output value scale low
44’512	44’511	Scale High Analog Output 3	!*	• Output value scale high
44’513	44’512	Source for Analog Output 4	!	No. / Select Source - Same as for Analog Output 1
44’514	44’513	Output Range Analog Output 4	!	No. / Select Output Range - Same as for Analog Output 1
44’515	44’514	Scale Low Analog Output 4	!*	• Output value scale low
44’516	44’515	Scale High Analog Output 4	!*	• Output value scale high
44’517	44’516	Load Value Analog Output 1	!	• Load value used at the analog output 1, used only by selected output range 3 and 4 (0/4 to 20 [mA]) • 0 [Ω] <= Load <= 500 [Ω]
44’518	44’517	Load Value Analog Output 2	!	• Load value used at the analog output 2, used only by selected output range 3 and 4 (0/4 to 20 [mA]) • 0 [Ω] <= Load <= 500 [Ω]
44’519	44’518	Load Value Analog Output 3	!	• Load value used at the analog output 3, used only by selected output range 3 and 4 (0/4 to 20 [mA])

				• 0 [Ω] <= Load <= 500 [Ω]
44’520	44’519	Load Value Analog Output 4	!	• Load value used at the analog output 4, used only by selected output range 3 and 4 (0/4 to 20 [mA]) • 0 [Ω] <= Load <= 500 [Ω]
44’521 … 44’599	44’520 … 44’598	Reserved		• Undefined • Gives back Modbus Exception Code 02

!	Change of these registers needs a restart of the device (see Device Actions)
*	It is not possible to verify the value, written to this register!

Output Range Analog Output x: Select a possible analog output range (Voltage or Current).

Scale Low/High: Enter the numerical values corresponding to the analog signal minimum and maximum output values (Output Range Analog Output x). **The Scale Low/High Values must be between -32'768 to 32'767 in steps of 1**.

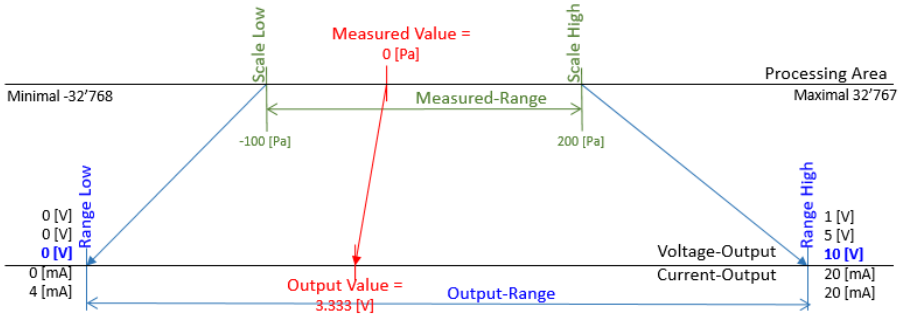
Example with fixed Output Range of 0…10 [V]:
With a changed input scale, the input and the fixed output ranges can be adapted to the customer's needs.

	Input Scale		Fixed Output Range	
Analog Output	Scale Low	-32'768 to +32767	Range Low	0 [V]
	Scale High	-32'768 to +32767	Range High	10 [V]

The input value in the range of **-100** to **+200 [Pa]** will be scaled to the output value in the range of **0** to **10 [V]**. This means that a measured value of **0 [Pa]** is shown on the analog output as a value of **3.333 [V]**.

Calculation:

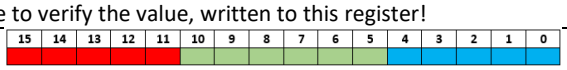
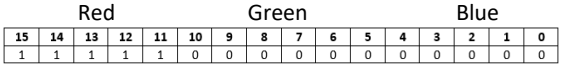
$$\text{Displayed Value} = \frac{(\text{ADC Value} - \text{Range Low}) * (\text{Scale High} - \text{Scale Low})}{\text{Range High} - \text{Range Low}} + \text{Scale Low}$$



2.5.9 Display Settings

Adjustments to the CRP5 display concerning appearance and content can be configured.

Register	Protocol	Name	Flags	Description
44'601	44'600	Display Bits	!	• Not yet used, undefined
44'602	44'601	Display Row 1	!	No. – Select Display Row 1 0 – Differential Pressure 1 – Humidity 2 – Temperature
44'603	44'602	Display Row 2	!	No. – Select Display Row 2 - – Same as for Display Row 1
44'604	44'603	Display Row 3	!	No. – Select Display Row 3 - – Same as for Display Row 1
44'605	44'604	Display Row 4	!	No. – Select Display Row 4 0 – None 1 – Calculation 2 – Analog Input 1 2 – Analog Input 2
44'606	44'605	Display Row 5	!	No. – Select Display Row 5 0 – None 1 – Digital Input 1 2 – Digital Input 2 2 – Ambient Pressure
44'607	44'606	Display Row 6	!	No. – Select Display Row 6 - – Same as for Display Row 5
44'608	44'607	Reserved		• Undefined
44'609	44'608	Reserved		• Undefined
44'610	44'609	Pixel Color	!*	• Pixel Color (see Example Colors)
44'611	44'610	Pixel Color Alarm	!*	• Pixel Color Alarm (see Example Colors)
44'612	44'611	Reserved		• Undefined
44'613	44'612	Reserved		• Undefined
44'614	44'613	Background Color	!*	• Background Color (see Example Colors)
44'615	44'614	Brightness	!	No. – Select Brightness Value 0 – Display Brightness 100% 1 – Display Brightness 90% 2 – Display Brightness 80% 3 – Display Brightness 70% 4 – Display Brightness 60% 5 – Display Brightness 50% 6 – Display Brightness 40% 7 – Display Brightness 30% 8 – Display Brightness 20%
44'616 … 44'699	44'615 … 44'698	Reserved		• Undefined • Gives back Modbus Exception Code 02

!	Change of these registers needs a restart of the device (see Device Actions)
*	It is not possible to verify the value, written to this register!
Example Colors	Color Bits:  Red Green Blue e.g. Red 

2.5.10 Alarm Settings

For most sensors, it is possible to set alarm values to *Low*, *High* and *Hysteresis*. Values of the selected sensor that are below the *Low Alarm* value or above the *High Alarm* value will trigger an alarm. The value specified for the alarm function *Hysteresis* is used for both the *Low* and the *High Alarm*.
To activate the alarm, you have to set the corresponding Alarm Bit to *ON*.
Be sure to select alarm values inside the operating range of the sensors.

Register	Protocol	Name	Flags	Description
44’701	44’700	Alarm Bits	!	Bit / Description of the Alarm bits 0 Differential Pressure 1 Humidity 2 Temperature 3 Calculation 4 Analog Input 1 5 Analog Input 2 6 Digital Input 1 7 Digital Input 2 8…15 Reserved 0 = Alarm Value is OFF, 1 = Alarm Value is ON
44’702	44’701	Differential Pressure Low	!&*	• Alarm value differential pressure low (part 1)
44’703	44’702		!&*	• Alarm value differential pressure low (part 2)
44’704	44’703	Differential Pressure High	!&*	• Alarm value differential pressure high (part 1)
44’705	44’704		!&*	• Alarm value differential pressure high (part 2)
44’706	44’705	Differential Pressure Hysteresis	!&*	• Alarm value differential pressure hysteresis (part 1)
44’707	44’706		!&*	• Alarm value differential pressure hysteresis (part 2)
44’708	44’707	Humidity Low	!&*	• Alarm value humidity low (part 1)
44’709	44’708		!&*	• Alarm value humidity low (part 2)
44’710	44’709	Humidity High	!&*	• Alarm value humidity high (part 1)
44’711	44’710		!&*	• Alarm value humidity high (part 2)
44’712	44’711	Humidity Hysteresis	!&*	• Alarm value humidity hysteresis (part 1)
44’713	44’712		!&*	• Alarm value humidity hysteresis (part 2)
44’714	44’713	Temperature Low	!&*	• Alarm value temperature low (part 1)
44’715	44’714		!&*	• Alarm value temperature low (part 2)
44’716	44’715	Temperature High	!&*	• Alarm value temperature high (part 1)
44’717	44’716		!&*	• Alarm value temperature high (part 2)
44’718	44’717	Temperature Hysteresis	!&*	• Alarm value temperature hysteresis (part 1)
44’719	44’718		!&*	• Alarm value temperature hysteresis (part 2)
44’720	44’719	Calculation Low	!&*	• Alarm value calculation low (part 1)
44’721	44’720		!&*	• Alarm value calculation low (part 2)
44’722	44’721	Calculation High	!&*	• Alarm value calculation high (part 1)
44’723	44’722		!&*	• Alarm value calculation high (part 2)

44'724	44'723	Calculation Hysteresis	!&*	• Alarm value calculation hysteresis (part 1)
44'725	44'724		!&*	• Alarm value calculation hysteresis (part 2)
44'726	44'725	Analog Input 1 Low	!&*	• Alarm value analog input 1 low (part 1)
44'727	44'726		!&*	• Alarm value analog input 1 low (part 2)
44'728	44'727	Analog Input 1 High	!&*	• Alarm value analog input 1 high (part 1)
44'729	44'728		!&*	• Alarm value analog input 1 high (part 2)
44'730	44'729	Analog Input 1 Hysteresis	!&*	• Alarm value analog input 1 hysteresis (part 1)
44'731	44'730		!&*	• Alarm value analog input 1 hysteresis (part 2)
44'732	44'731	Analog Input 2 Low	!&*	• Alarm value analog input 2 low (part 1)
44'733	44'732		!&*	• Alarm value analog input 2 low (part 2)
44'734	44'733	Analog Input 2 High	!&*	• Alarm value analog input 2 high (part 1)
44'735	44'734		!&*	• Alarm value analog input 2 high (part 2)
44'736	44'735	Analog Input 2 Hysteresis	!&*	• Alarm value analog input 2 hysteresis (part 1)
44'737	44'736		!&*	• Alarm value analog input 2 hysteresis (part 2)
44'738	44'737	Digital Input 1	!	• Alarm Value Digital Input 1
44'739	44'738	Digital Input 2	!	• Alarm Value Digital Input 2
44'740 … 44'799	44'739 … 44'798	Reserved		• Undefined • Gives back Modbus Exception Code 02

!	Change of these registers needs a restart of the device (see Device Actions)
&	These are float-values (32-bit IEEE754), separated in two succeeding registers (16-bits). How to bring together part 1 and part 2 of the 32-bit float-value, depends on the *Swap Mode* of the Modbus communication (see Device Settings -> *Modbus Operation Mode* and Selectable Swap Modes for Rotronic Devices)
*	It is not possible to verify the value, written to this register!

2.5.11 Relay Settings

Settings of Relays for all Sensors.
IMPORTANT: In order to make use of the CRP5 relay outputs, you must first enable the alarm function for each of the parameters that you want to monitor and also define out-of-limit values.

Register	Protocol	Name	Flags	Description
44'801	44'800	Relay 1: Alarm Source	!	

No.	Select Alarm Source
0	Alarm: Off
1	Alarm: Differential Pressure Low
2	Alarm: Differential Pressure High
3	Alarm: Humidity Low
4	Alarm: Humidity High
5	Alarm: Temperature Low
6	Alarm: Temperature High
7	Alarm: Calculation Low
8	Alarm: Calculation High
9	Alarm: Analog Input 1 Low
10	Alarm: Analog Input 1 High
11	Alarm: Analog Input 2 Low

				12 Alarm: Analog Input 2 High 13 Alarm: Digital Input 1 Low 14 Alarm: Digital Input 1 High 15 Alarm: Digital Input 2 Low 16 Alarm: Digital Input 2 High
44'802	44'801	Relay 1: Alarm Off after…	!	Bit – Select Alarm Off 0 Relay 1 Off when Alarm ends 1 Relay 1 Off after Timeout 2..15 Reserved **Attention!** If no bit is set, the relay stays energized until you de-energize it manually!
44'803	44'802	Relay 1: On Delay for Relay 1	!*	• Switch on delay for relay 1 in seconds
44'804	44'803	Relay 1: Off Timeout	!*	• Maximal alarm time for relay 1 in seconds
44'805	44'804	Relay 2: Alarm Source	!	No. – Select Alarm Source - Same as for Relay 1
44'806	44'805	Relay 2: Alarm Off after…	!	Bit – Select Alarm Off - Same as for Relay 1
44'807	44'806	Relay 2: On Delay	!*	• Switch on delay for relay 2 in seconds
44'808	44'807	Relay 2: Off Timeout	!*	• Maximal alarm time for relay 2 in seconds
44'809	44'808	Relay 3: Alarm Source	!	No. – Select Alarm Source - Same as for Relay 1
44'810	44'809	Relay 3: Alarm Off after…	!	Bit – Select Alarm Off - Same as for Relay 1
44'811	44'810	Relay 3: On Delay	!*	• Switch on delay for relay 3 in seconds
44'812	44'811	Relay 3: Off Timeout	!*	• Maximal alarm time for relay 3 in seconds
44'813	44'812	Relay 4: Alarm Source	!	No. – Select Alarm Source - Same as for Relay 1
44'814	44'813	Relay 4: Alarm Off after…	!	Bit – Select Alarm Off - Same as for Relay 1
44'815	44'814	Relay 4: On Delay	!*	• Switch on delay for relay 4 in seconds
44'816	44'815	Relay 4: Off Timeout	!*	• Maximal alarm time for relay 4 in seconds
44'8017	44'816	Relay 5: Alarm Source	!	No. – Select Alarm Source - Same as for Relay 1
44'818	44'817	Relay 5: Alarm Off after…	!	Bit – Select Alarm Off - Same as for Relay 1
44'819	44'818	Relay 5: On Delay	!*	• Switch on delay for relay 5 in seconds
44'820	44'819	Relay 5: Off Timeout	!*	• Maximal alarm time for relay 5 in seconds
44'821	44'820	Relay 6: Alarm Source	!	No. – Select Alarm Source - Same as for Relay 1
44'822	44'821	Relay 6: Alarm Off after…	!	Bit – Select Alarm Off - Same as for Relay 1
44'823	44'822	Relay 6: On Delay	!*	• Switch on delay for relay 6 in seconds
44'824	44'823	Relay 6: Off Timeout	!*	• Maximal alarm time for relay 6 in seconds
44'825 … 44'899	44'824 … 44'898	Reserved		• Undefined • Gives back Modbus Exception Code 02

!	Change of these registers needs a restart of the device (see Device Actions)
*	It is not possible to verify the value, written to this register!

On Delay: If the time delay in seconds is not set to zero, the relay will be energized after the specified time provided that the alarm condition persists. Use this control if you want to prevent the relay from being immediately energized when an alarm occurs, e. g. to avoid short time alarms or alarm on-off toggling.
Range: 1 to 2^{16} seconds.

Off Timeout: Time in seconds between the occurrence of the trigger criterion and the de-energizing of the relay. This timeout will be active when *Off after Timeout* is chosen.
Range: 1 to 2^{16} seconds.

Off when Alarm ends: The relay will be de-energized as soon as the alarm condition ends.

Off after Timeout: When set, the relay will remain energized for the specified duration even if the alarm condition has ended.

Note!
When both options are enabled – *Off when Alarm ends* and *Off after Timeout* – the relay will be de-energized as soon as one of the conditions has ended, either the end of the alarm or the end of timeout.

Attention!
When both options are disabled – *Off when Alarm ends* and *Off after Timeout* – the relay will never be de-energized. The relay can only be de-energized manually (see Relays 1 to 6).

2.5.12 Analog Input Settings

Voltage or current type *Analog Input 1/2*.
The maximum detectable voltage range is 0…3300 mV, the maximum detectable current range 0…27 mA.

Register	Protocol	Name	Flags	Description
44’901	44’900	Analog Input Bits	!	Bit: 0 = Auto Unit: Analog Input 1; 1 = Auto Unit: Analog Input 2; 2…15 = Reserved
44’902	44’901	Analog Input 1 Select	!	No. 0 = Voltage Input; 1 = Current Input (120Ω)
		The same value as in Value Type -> *Analog Input 1 Select*		
44’903	44’902	Analog Input 2 Select	!	No. 0 = Voltage Input; 1 = Current Input (120Ω)
		The same value as in Value Type -> *Analog Input 2 Select*		
44’904	44’903	Analog Input 1 Range Low	!*	• Analog input 1 input range low
44’905	44’904	Analog Input 1 Range High	!*	• Analog input 1 input range high
44’906	44’905	Analog Input 1 Scale Low	!*	• Analog input 1 scale low
44’907	44’906	Analog Input 1 Scale High	!*	• Analog input 1 scale high
44’908	44’907	Analog Input 2 Range Low	!*	• Analog input 2 input range low
44’909	44’908	Analog Input 2 Range High	!*	• Analog input 2 input range high
44’910	44’909	Analog Input 2 Scale Low	!*	• Analog input 2 scale low
44’911	44’910	Analog Input 2 Scale High	!*	• Analog input 2 scale high
44’912 … 44’999	44’911 … 44’998	Reserved		• Undefined • Gives back Modbus Exception Code 02

!	Change of these registers needs a restart of the device (see Device Actions)
*	It is not possible to verify the value, written to this register!

Auto Unit: Analog Input x: If the field *Analog Input Unit x* in the section *Value Unit* (see Value Unit

Value Unit) is empty the following automatic unit will be used:

Analog Input x Select	*Voltage*	*Current*
Auto Unit	mV	mA

If the field *Analog Input Unit x* in the section *Value Unit* (see Value Unit) is not empty, e.g. set to [*ppm*], the unit in the field *Analog Input Unit x* will be used, in this case [*ppm*].

Analog Input x Range Low/High: Minimum and maximum of the output range of the connected external device. The values must be within the maximum detectable voltage/current ranges selected *Analog Input 1/2 Select* (see examples), **in steps of 1 [mV] resp. 1 [mA]**.

Analog Input x Scale Low/High: Minimum and maximum of the measure range to scale the input (see examples). **The Scale Low/High Values must be between -9'999 to 32767 in steps of 1**.

Example voltage measurement:

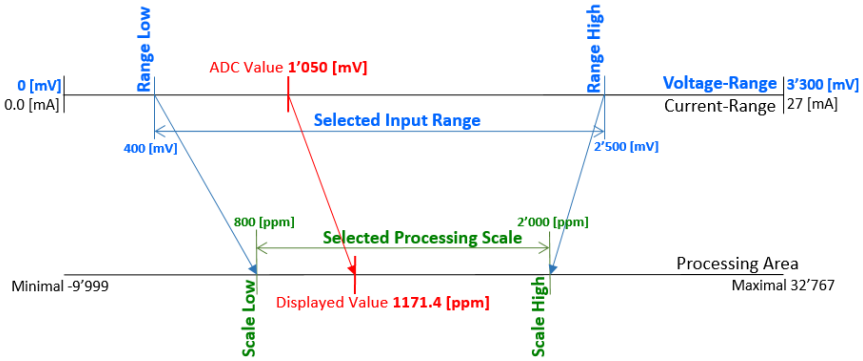
With a changed input range and a scaled output range, the input and the output ranges can be adapted to the customer's needs. The unit used can be adapted to the output signal.

	Input Range		Output Range	
Voltage measurement	Range Low	>= 0 [mV]	Scale Low	-9'999 to +32767
	Range High	<= 3'300 [mV]	Scale High	-9'999 to +32767

The input value in the range of **400** to **2'500 [mV]** will be scaled to the output value in the range of **800** to **2'000 [ppm]**. This means that an input value of **1'050 [mV]** is shown on the display as a value of **1171.4 [ppm]**.

Calculation:

$$\text{Displayed Value} = \frac{(\text{ADC Value} - \text{Range Low}) * (\text{Scale High} - \text{Scale Low})}{\text{Range High} - \text{Range Low}} + \text{Scale Low}$$



The unit [ppm] must be set (see Value Unit -> Analog Input 1/2 Unit to [ppm]).

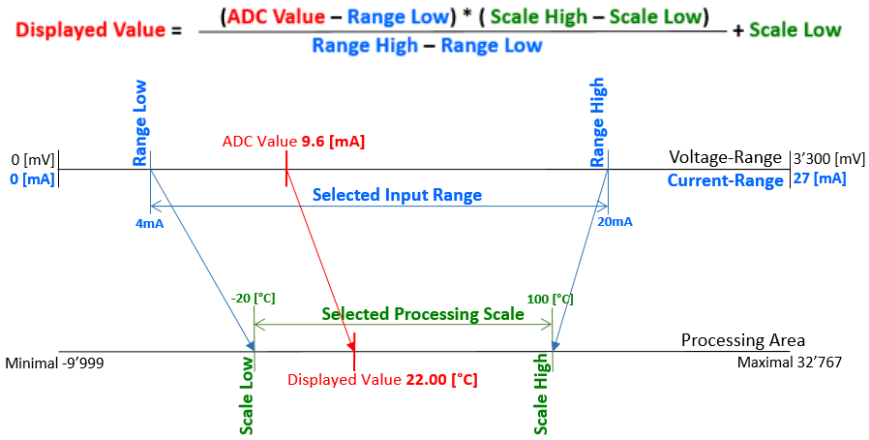
Example current measurement:

With a changed input range and a scaled output range, the input and the output ranges can be adapted to the customer's needs. The unit used can be adapted to the output signal.

	Input Range		Output Range	
Current measurement	Range Low	>= 0 [mA]	Scale Low	-9'999 to +32767
	Range High	<= 27 [mA]	Scale High	-9'999 to +32767

The input value in the range of **4** to **20 [mA]** will be scaled to the output value in the range of **-20** to **+100 [°C]**. This means that an input value of **9.6 [mA]** is shown on the display as a value of **22.0 [°C]**.

Calculation:



The unit [°C] must be set (see Value Unit -> Analog Input 1/2 Unit to [°C]).

2.5.13 Ethernet Settings

It is possible to enter the IP address of the CRP5, the Subnet mask and the Gateway IP-address to make the CRP5 accessible from inside and outside of the existing LAN.

In case of the factory Ethernet setting of the CRP5 does not fit the existing LAN infrastructure, the easiest method to configure these settings by communication via Rotronic Service interface. Please use the AC3006 cable for that. Also the use of RS485 is possible. Both ways supports the Modbus RTU protocol.

Register	Protocol	Name	Flags	Description
45'001	45'000	Ethernet Bits		• Not yet used, undefined
45'002	45'001	Ethernet IP Address	!*	• Ethernet IP address (part 1) *e.g. 0xC0A8*
45'003	45'002		!*	• Ethernet IP address (part 2) *e.g. 0x6465*
45'004	45'003	Ethernet Subnet Mask	!*	• Ethernet subnet mask (part 1) *e.g. 0xFFFF*
45'005	45'004		!*	• Ethernet subnet mask (part 2) *e.g. 0xFF00*
45'006	45'005	Ethernet Gateway Address	!*	• Ethernet gateway address (part 1) *e.g. 0xC0A8*
45'007	45'006		!*	• Ethernet gateway address (part 2) *e.g. 0x6401*
45'008 … 45'099	45'007 … 45'098	Reserved		• Undefined • Gives back Modbus Exception Code 02

!	Change of these registers needs a restart of the device (see Device Actions)
*	It is not possible to verify the value, written to this register!

Ethernet IP Address: Ethernet Address, e.g. 192.168.100.101 (*0xC0.0xA8.0x64.0x65*)

Note!
On the menu *Device Information*, you can see the IP address of the device.

Ethernet Subnet Mask: Subnet Mask, e.g. 255.255.255.0 (*0xFF.0xFF.0xFF.0x00*)

Ethernet Gateway Address: Gateway Address, e.g. 192.168.100.1 (*0xC0.0xA8.0x64.0x01*)

2.5.14 Example: Read Holding Register

2.5.14.1 Read Display Settings (Registers 44'602 to 44'607)

RTU Example:

Transmit	01 03 ae 39 00 06 35 2d
Receive	01 03 0c 00 01 00 00 00 02 00 01 00 01 00 02 59 8d

TCP Example:

Transmit	MBAP 01 03 ae 39 00 06
Receive	MBAP 01 03 0c 00 01 00 00 00 02 00 01 00 01 00 02

Field	Bytes	Value	Description
MBAP	7	MBAP	MBAP header (see Modbus RTU / TCP)
Checksum	2	CRC	CRC Checksum (see Modbus RTU / TCP)
RTU number	1	0x01	Modbus RTU Address (RS485 Address + 1) (see Device Descriptions)
Function code	1	0x03	Read Holding Register
Starting address	2	0xae39	= 44'601 (Attention! register number – 1)
Quantity of registers	2	0x0006	= 6, means read 6 registers
Byte count	1	0x0c	= 12 ≙ **2 * N**, means numbers of returned bytes
Register value (see Display Settings)	**2 * N**	0x0001	Display Row 1: Humidity
		0x0000	Display Row 2: Differential Pressure
		0x0002	Display Row 3: Temperature
		0x0001	Display Row 4: Calculation
		0x0001	Display Row 5: Digital Input 1
		0x0002	Display Row 6: Digital Input 2

For detailed information about Modbus protocol *Read Holding Register*, see:
(http://modbus.org/docs/Modbus_Application_Protocol_V1_1b3.pdf).

2.5.15 Example: Write Holding Register

2.5.15.1 Write Display Settings (Registers 44'602 to 44'607)

RTU Example:

Transmit	01 10 ae 39 00 06 0c 00 00 00 01 00 02 00 02 00 02 00 01 f3 44
Receive	01 10 ae 39 00 06 b0 ee

TCP Example:

Transmit	MBAP 01 10 ae 39 00 06 0c 00 00 00 01 00 02 00 02 00 02 00 01
Receive	MBAP 01 10 ae 39 00 06

Field	Bytes	Value	Description
MBAP	7	MBAP	MBAP header (see Modbus RTU / TCP)
Checksum	2	CRC	CRC Checksum (see Modbus RTU / TCP)
RTU number	1	0x01	Modbus RTU Address (RS485 Address + 1) (see Device Descriptions)
Function code	1	0x10	Write Multiple Register
Starting address	2	0xae39	= 44'601 (Attention! register number – 1)
Quantity of registers	2	0x0006	= 6, means read 6 registers
Byte count	1	0x0c	= 12 ≙ **2 * N**, means numbers of returned bytes
Register value (see Display Settings)	**2 * N**	0x0000	Display Row 1: Differential Pressure
		0x0001	Display Row 2: Humidity
		0x0002	Display Row 3: Temperature
		0x0002	Display Row 4: Analog Input 1
		0x0002	Display Row 5: Digital Input 2
		0x0001	Display Row 6: Digital Input 1

Note!

After writing a *Write Multiple Register* command, it needs a restart of the device (see Device Actions or Reset Device) to activate the selected changes.

For detailed information about Modbus protocol *Write Multiple Register*, see:
(http://modbus.org/docs/Modbus_Application_Protocol_V1_1b3.pdf).

3 Document Releases

Release	Software Ver.	Date	Notes
_01	1.0	30.07.2015	Original release
_02	1.2	03.01.2018	Updated
_03	1.2	31.01.2018	Examples and more information included
_04	1.2	08.04.2021	Protocol Address for RS-485