



HOME OF SENSOR TECHNOLOGY

**Description of the  
RS485 MODBUS interface**

WRF06 RC (x) RS485 Modbus\*  
WRF07 RC (x) RS485 Modbus

\*WRF06 RC without LCD

## Revision

| Revision | Date       | Description                                                                                                                                                                                                                                                                                                 | Author |
|----------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| A        | 13.07.2010 | First Release                                                                                                                                                                                                                                                                                               |        |
| B        | 28.03.2011 | <ul style="list-style-type: none"> <li>Changes in manual output mode:<br/>valid since firmware version 1.01, configuration software since version 1.1</li> <li>Type DI4 added</li> </ul>                                                                                                                    |        |
| C        | 25.04.2012 | <ul style="list-style-type: none"> <li>Corrections</li> </ul>                                                                                                                                                                                                                                               |        |
| D        | 23.09.2015 | <ul style="list-style-type: none"> <li>Description for Belimo® 6-way valve added<br/>(from firmware 1.02 and configuration software 1.5 or higher)</li> </ul>                                                                                                                                               |        |
| E        | 06.09.2016 | <ul style="list-style-type: none"> <li>Supplement the protocol description (WRF06 RS485 Modbus without display)</li> <li>new Thermokon Logo</li> <li>Corrections</li> </ul>                                                                                                                                 |        |
| F        | 13.12.2016 | <ul style="list-style-type: none"> <li>Defined output states in case of communication failure.</li> <li>Added register 45 and 46. (from firmware 1.05)</li> </ul>                                                                                                                                           |        |
| G        | 10.02.2017 | <ul style="list-style-type: none"> <li>SAUTER 6-way valve DN15/DN20 and Belimo 6-way valve inverted description (from firmware 1.06 and configuration software 1.6)</li> <li>Direct control of manual value of outputs (no configuration bit needed anymore)</li> <li>Optional address extension</li> </ul> |        |
| H        | 21.09.2017 | <ul style="list-style-type: none"> <li>Description auto / manual mode of the analogue outputs</li> </ul>                                                                                                                                                                                                    |        |
| I        | 01.11.2018 | <ul style="list-style-type: none"> <li>Update for firmware 2.00<br/>For older firmware version, please use register description Rev. A-H.</li> </ul>                                                                                                                                                        |        |
| J        | 10.12.2018 | <ul style="list-style-type: none"> <li>Update for firmware 2.01<br/>Description for absolute Humidity, Dewpoint and Enthalpy added.</li> </ul>                                                                                                                                                              |        |
| K        | 03.02.2020 | <ul style="list-style-type: none"> <li>Description for coil 5 added (firmware 2.05 or higher).</li> </ul>                                                                                                                                                                                                   |        |
| L        | 07.05.2021 | <ul style="list-style-type: none"> <li>various corrections</li> </ul>                                                                                                                                                                                                                                       |        |
| M        | 30.03.2022 | <ul style="list-style-type: none"> <li>various corrections</li> </ul>                                                                                                                                                                                                                                       | JD     |
| N        | 18.04.2023 | <ul style="list-style-type: none"> <li>Register 16 "0 = no potentiometer</li> </ul>                                                                                                                                                                                                                         | JD     |
| O        | 12.06.2024 | <ul style="list-style-type: none"> <li>Controller renaming to "...RC...", Adding WRF06 RC (x) to the document</li> </ul>                                                                                                                                                                                    | JD     |
| P        | 20.09.2024 | <ul style="list-style-type: none"> <li>Korrekturen</li> </ul>                                                                                                                                                                                                                                               | JD     |

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### 1 General

The present document describes the Modbus registers of the room operating panel

WRF06 RC (x) RS485 Modbus\*

WRF07 RC (x) RS485 MODBUS

\*without display

#### 1.1 Hardware Installation

The room operating panel can be connected by means of a twisted-pair cable (line resistance 120 Ohm). For detailed information on installation and mounting, please see the product datasheet and the data sheet wiring\_rs485\_network.pdf.

#### 1.2 RS485 Transceiver

The maximum number of bus participants without use of a repeater is defined by the RS485-transceiver. The transceiver used enables 32 devices per bus segment at maximum.

#### 1.3 Protocol

The room operating panel WRF06- & WRF07-RS485-Modbus is a slave-bus participant only allowed to send to the bus on demand of the master. The protocol corresponds to the defaults of:

- MODBUS Application Protocol Specification V1.1
- MODBUS via Serial Line Specification & Implementation guide V1.0

#### 1.4 Configuration Options

##### Device addressing

In addition to address setting via dip switch an option for address extension (1-247) is implemented. To use extended addressing write a valid address (1-247) to register 16385 and set dip switch to address 0. As long as a dip switch address > 0 is set, the device uses the dip switch address as network address.

To modify register 16385 following sequence must be strictly adhered:

Set valid dip switch address. Use Modbus command 'Write multiple registers' (FC16) and write value 0x4793 to register 16384 and the selected address to register 16385 in one sequence. Subsequently set dip switch address to 0. Device uses the extended address setting as network address.

**As long as the dip switch address is set to 0 it's not possible to modify the extended address!**

## Register Description

### 1.5 Dip Switches and LEDs

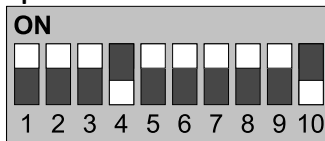
#### LEDs

Via the integrated LEDs the current operating status of the Modbus interface is indicated.

| LED | Description                                                          |
|-----|----------------------------------------------------------------------|
| STA | Lights up permanently during normal operation                        |
| RXD | Blinks when RS485 Modbus telegrams are received                      |
| TXD | Blinks when RS485 Modbus telegrams are sent                          |
| ERR | Lights up in case of a corrupt bus configuration and internal errors |

Note: During startup, all 4 LEDs blink for a few seconds.

#### Dip Switch



Example: Address 55, 57600 Baud, Parity EVEN

#### Address

| Dip Switch | 1         | 2         | 3         | 4         | 5          | 6          |
|------------|-----------|-----------|-----------|-----------|------------|------------|
| Priority   | $2^0$ (1) | $2^1$ (2) | $2^2$ (4) | $2^3$ (8) | $2^4$ (16) | $2^5$ (32) |

#### Baudrate

| 7   | 8   | Baudrate |
|-----|-----|----------|
| off | off | 9600     |
| on  | off | 19200    |
| off | on  | 38400    |
| on  | on  | 57600    |

#### Parity / Stopbits

| 9   | 10  | Parity            |
|-----|-----|-------------------|
| off | off | None - 2-Stopbits |
| on  | off | Even - 1 Stopbit  |
| off | on  | Odd - 1 Stopbit   |
| on  | on  | None - 1-Stopbit  |

### 1.6 Controller

#### 1.6.1 Device Types

The controller is integrated in the following devices: AO2V, OVR, OVT, DO2R, DO2T, 6WV.

#### 1.6.2 Function Mode of PI-Controller

The integrated PI-controller controls the temperature (register 258) of set point 1 (register 260). The control variable resulting is directly output to the outputs. The PI-controller can be set by properties. The control variable of the controller is re-calculated approx. every second. Thus, changes, such as e.g. adjustment of set point or triggering of window contact are only considered after expiration of the control time.

#### 1.6.3 Change-Over Operation

The device can be used for a 2-pipe and a 4-pipe wire system. The corresponding selection is made via the configuration coil "Change-Over Operation".

If the change-over operation is activated, the corresponding mode (heating or cooling of controller) must be defined (e.g. by digital input or register 515, Controller mode).

**The Change-Over Operation runs via output 1.**

#### 1.6.4 Energy Stop / Dew Point Detector

If a window contact or a dew point detector are connected to the digital inputs and the digital inputs are parameterized the same, both are directly affecting the control.

#### 1.6.5 Override of Outputs

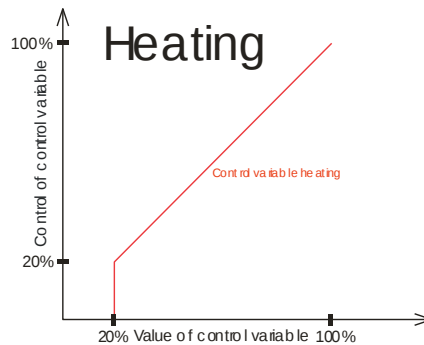
During operation an overriding of the outputs is possible via the input registers 516 and 517. The automatic mode of an output is activated if the corresponding register is -1 (= 0xFFFF). In automatic mode, the output is directly linked to the manipulated variable of the controller. Values between 0 and 1000 represent the manual value.

### 1.6.6 Minimal Control Variable

By means of the property "Use minimal control variable with control variable = 0" (Coil-Bit 8 = 0) the minimal control variable is only used, if the control variable is > 0. If Coil-Bit 8 is =1, the minimal control variable is also used if the control variable is = 0.

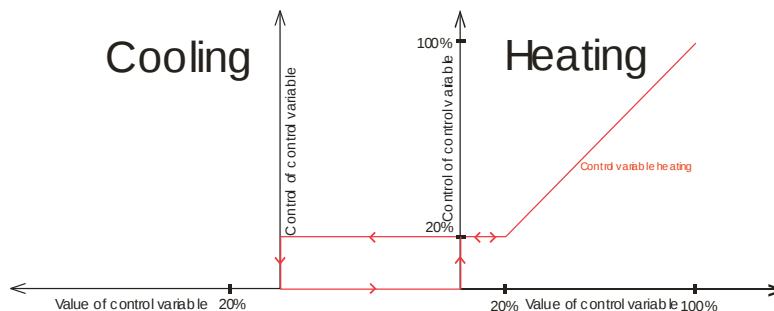
#### Mode Selection Control Variable (Coil Register 0x0000)

- (1) Mode selection Control Variable = 1  
Ymin = 20%



The control variable is only sent to the output if the calculated value of the control variable is bigger than the minimal control variable.

- (2) Mode selection Control Variable = 0  
Ymin = 20%



The minimal control variable at the output remains unchanged until the controller changes the operating mode

### 1.6.7 Calculating Set Points:

#### (1) OCCUPIED

- *Heating set point* = basic set point + offset (register 512) + poti offset\*
- *Cooling set point* = basic set point + dead zone (register 20) + offset (register 512) + Poti-Offset\*

#### (2) UNOCCUPIED

- *Heating set point* = basic set point + offset (register 512) + poti offset\* -night lowering
- *Cooling set point* = basic set point + dead zone (register 20) + offset (register 512) + poti offset\* + night lowering (register 19)

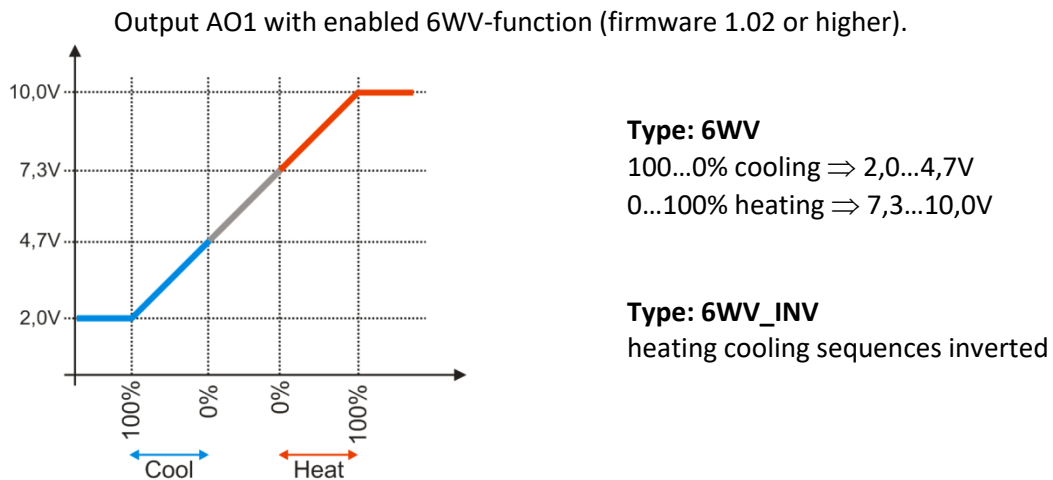
\*if used

### 1.6.8 Function 6WV for BELIMO® 6-way valves

If device type "6WV" (for BELIMO® 6-way valves) is enabled, output AO1 is used as control variable output for 6-way valve. Control variable is calculated by integrated PI controller and the output voltage is adapted according to characteristic curve of used device type. Choosing type \_INV inverts sequences for heating and cooling.

100...0% cooling  $\Rightarrow$  2,0...4,7V

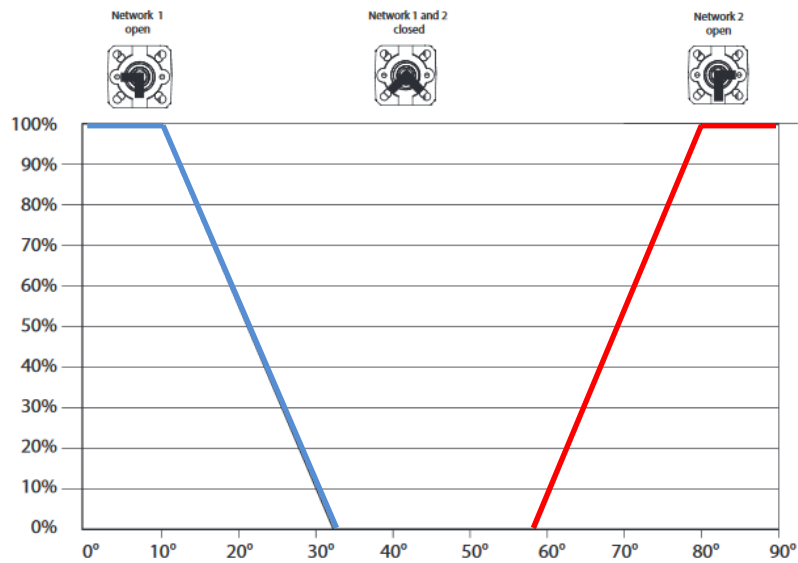
0...100% heating  $\Rightarrow$  7,3...10,0V



### 1.6.9 Function 6WV for SAUTER 6-way valves DN15 und DN20

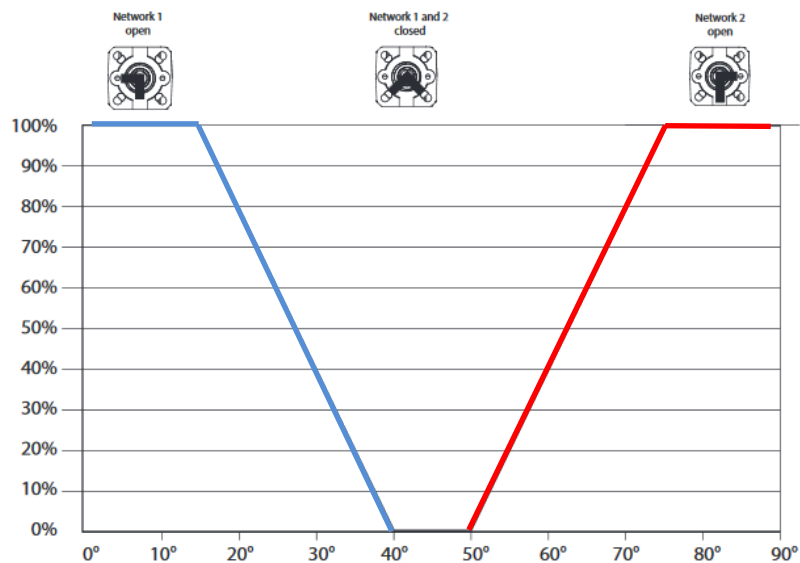
If device type „6WV\_DN15“, or „6WV\_DN20“ (for SAUTER 6-way valves) is enabled, output AO1 is used as control variable output for 6-way valve. Control variable is calculated by integrated PI controller and the output voltage is adapted according to characteristic curve of used device type. Please see SAUTER datasheet 58.001, B2KL: 6-way-ball valve with male thread, PN16).

Circuit B2KL015F400



Picture 1 Charactersitic curve of DN15 valve (extract from SAUTER datasheet 58.001e)

Circuit B2KL020F400



Picture 2 Charactersitic curve of DN20 valve (extract from SAUTER datasheet 58.001e)

### 1.7 Communication failure monitoring

The device monitors Modbus communication. In case of a 90s communication failure the outputs are set to default values, which can be configured in registers 45 and 46.

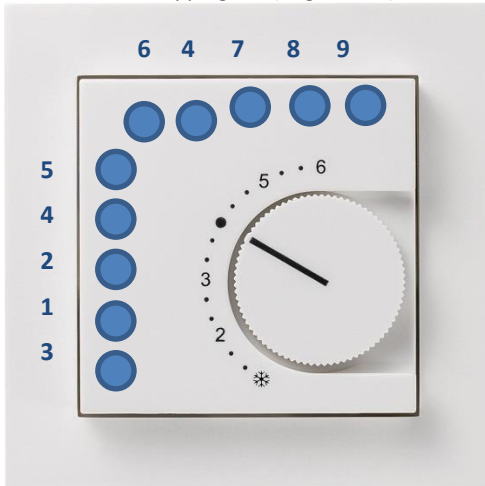
Setting -1 (=0xFFFF) as default value, the outputs keep their last values (manual mode) respectively the controller triggers them (automatic mode).

## Register Description

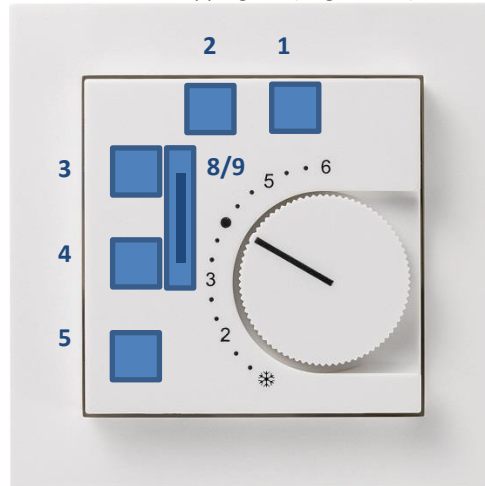
### 1.8 LED- and Button-Mapping

| Mapping | Description                                                                         |
|---------|-------------------------------------------------------------------------------------|
| 0       | Recommended for new projects.                                                       |
| 1       | Recommended for existing projects, compatible with older devices.                   |
| 2       | Recommended for existing projects, compatible with older devices in BJ-enclousures. |

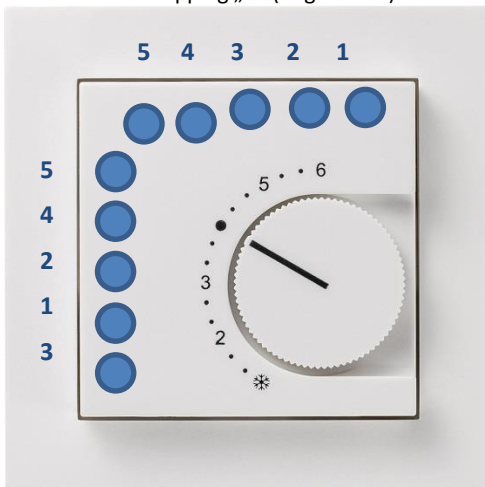
LED-Mapping „0“ (Register 52)



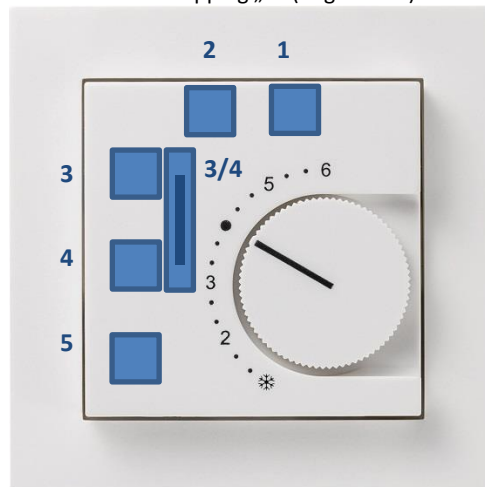
Button-Mapping „0“ (Register 47)



LED-Mapping „1“ (Register 52)



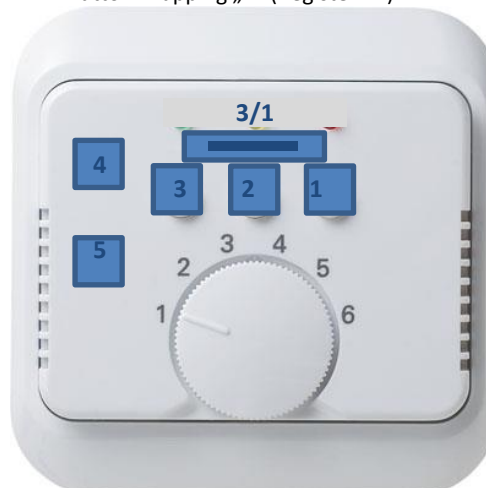
Button-Mapping „1“ (Register 47)



LED-Mapping „2“ (Register 52)



Button-Mapping „2“ (Register 47)



## 2 WRF06- & WRF07-RS485-Modbus Protocol

### 2.1 Control Commands Supported

The following MODBUS – control commands are supported:

| Description               | Function code |          |
|---------------------------|---------------|----------|
| Read bits                 | 01 (hex)      | 1 (dez)  |
|                           | 02 (hex)      | 2 (dez)  |
| Read register             | 03 (hex)      | 3 (dez)  |
|                           | 04 (hex)      | 4 (dez)  |
| Write individual bit      | 05 (hex)      | 5 (dez)  |
| Write individual register | 06 (hex)      | 6 (dez)  |
| Write several bits        | 0F (hex)      | 15 (dez) |
| Write several registers   | 10 (hex)      | 16 (dez) |

## 2.2 Register Definition

### 2.2.1 Registers for the Device Configuration

| Register Address | Description                 |                                                                                                                                                                                                                                                                                                                                                              | Default values |
|------------------|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| 0 R              | Device Coding, read only    |                                                                                                                                                                                                                                                                                                                                                              | 0x0003         |
| 1 R              | Firmware Version, read only |                                                                                                                                                                                                                                                                                                                                                              | -              |
| 2 R/W            | Device Type                 | 0x0000, Type AO2V<br>(AO1: Heating, AO2: Cooling)                                                                                                                                                                                                                                                                                                            | 0              |
|                  |                             | 0x0001, Type DO2R<br>(DO1: Heating, DO2: Cooling)                                                                                                                                                                                                                                                                                                            |                |
|                  |                             | 0x0002, Type DO2T<br>(DO1: Heating, DO2: Cooling)                                                                                                                                                                                                                                                                                                            |                |
|                  |                             | 0x0003, Type OVR<br>(DO1: Heating, AO2: Cooling)                                                                                                                                                                                                                                                                                                             |                |
|                  |                             | 0x0004, Type OVT<br>(DO1: Heating, AO2: Cooling)                                                                                                                                                                                                                                                                                                             |                |
|                  |                             | 0x0005, Type 4DI<br>(4 digital inputs)                                                                                                                                                                                                                                                                                                                       |                |
|                  |                             | 0x0006, Type 6WV<br>For BELIMO® 6-way valves, (AO1: 2...4,7V cooling, 7,3...10V heating)                                                                                                                                                                                                                                                                     |                |
|                  |                             | 0x0007, Type 6WV_INV<br>For BELIMO® 6-way valves, (AO1: 2...4,7V heating, 7,3...10V cooling)                                                                                                                                                                                                                                                                 |                |
|                  |                             | 0x0008, Type 6WV_DN15,<br>For SAUTER 6-way valve DN15                                                                                                                                                                                                                                                                                                        |                |
|                  |                             | 0x0009, Type 6WV_DN20,<br>For SAUTER 6-way valve DN20                                                                                                                                                                                                                                                                                                        |                |
| 3 R/W            | Device location             |                                                                                                                                                                                                                                                                                                                                                              | 0              |
| 4 R/W            | Not used                    |                                                                                                                                                                                                                                                                                                                                                              |                |
| 5 R/W            | Function button 1           | 0x00 = without special function<br>0x20 = Room unoccupied<br>0x21 = Room occupied<br>0x22 = Room occupancy toggle<br>0x23 = Room occupancy<br>0x24 = Occupancy bypass mode (Party time)<br>0x25 = Fan stage „up“<br>0x26 = Fan stage „down“<br>0x27 = Fan stage „Loop“ (0, 1, 2, 3, Auto, 0, 1, ...)                                                         | 0              |
| 6 R/W            | Function button 2           |                                                                                                                                                                                                                                                                                                                                                              |                |
| 7 R/W            | Function button 3           |                                                                                                                                                                                                                                                                                                                                                              |                |
| 8 R/W            | Function button 4           |                                                                                                                                                                                                                                                                                                                                                              |                |
| 9 R/W            | Function button 5           |                                                                                                                                                                                                                                                                                                                                                              |                |
| 10 R/W           | Function LED 1              | 0x00 = external trigger<br>0x01 = room occupied (ON) / unoccupied(OFF)<br>0x02 = controller active(ON)/ inactive(OFF)<br>0x03 = controller cooling active(ON)/inactive(OFF)<br>0x04 = controller heating active(ON)/inactive(OFF)<br>0x05 = Fan stage „0“<br>0x06 = Fan stage „1“<br>0x07 = Fan stage „2“<br>0x08 = Fan stage „3“<br>0x09 = Fan stage „Auto“ | 1              |
| 11 R/W           | Function LED 2              |                                                                                                                                                                                                                                                                                                                                                              |                |
| 12 R/W           | Function LED 3              |                                                                                                                                                                                                                                                                                                                                                              |                |
| 13 R/W           | Function LED 4              |                                                                                                                                                                                                                                                                                                                                                              |                |
| 14 R/W           | Function LED 5              |                                                                                                                                                                                                                                                                                                                                                              |                |

## Register Description

| Register Address | Description                                                                                                                                                      |                                                                                                                 | Default values |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|----------------|
| 15 R/W           | Temperature-Offset for calibration of temperature sensor<br>signed int, e.g. $10_{\text{dec}} = +1.0 \text{ K}$ , $-5_{\text{dez}} = -0.5 \text{ K}$             |                                                                                                                 | 0              |
| 16 R/W           | Adjustable range set point $\pm 3\text{K}$<br>signed int, e.g. $30_{\text{dec}} = + 3.0 \text{ K}$                                                               | No potentiometer = 0                                                                                            | 30             |
| 17 R/W           | Set temperature – Basic set point after reset<br>signed int, e.g. $220_{\text{dez}} = 22.0 \text{ }^{\circ}\text{C}$                                             |                                                                                                                 | 220            |
| 18 R/W           | Set temperature display                                                                                                                                          | 0 = Basic set point<br>1 = Change over display of heating/cooling set point<br>depending on activated operating | 0              |
| 19 R/W           | Night setback (unoccupied)<br>Heating = set point – night lowering<br>Cooling = set point + night lowering<br>signed int, e.g. $40_{\text{dec}} = 4.0 \text{ K}$ |                                                                                                                 | 50             |
| 20 R/W           | Dead band between heating and cooling<br>Signed int, e.g. $20_{\text{dec}} = 2.0\text{K}$                                                                        |                                                                                                                 | 20             |
| 21 R/W           | Proportional range Xp (K) Heating<br>signed int, e.g. $40_{\text{dec}} = 4.0 \text{ K}$<br>Xp = 0 deactivates controller                                         |                                                                                                                 | 20             |
| 22 R/W           | Reset time Tn (min) Heating<br>signed int, e.g. $100_{\text{dec}} = 100 \text{ min}$                                                                             |                                                                                                                 | 100            |
| 23 R/W           | Maximal control variable limit Heating<br>signed int, e.g. $100_{\text{dec}} = 100 \text{ \%}$                                                                   |                                                                                                                 | 100            |
| 24 R/W           | Minimal control variable limit Heating<br>signed int, e.g. $10_{\text{dec}} = 10 \text{ \%}$                                                                     |                                                                                                                 | 0              |
| 25 R/W           | PWM-Cycle time Heating<br>signed int, e.g. $15_{\text{dec}} = 15 \text{ min}$                                                                                    |                                                                                                                 | 15             |
| 26 R/W           | Proportional range Xp (K) Cooling<br>signed int, e.g. $40_{\text{dec}} = 4.0 \text{ K}$<br>Xp = 0 deactivates controller                                         |                                                                                                                 | 20             |
| 27 R/W           | Reset Time Tn (min) Cooling<br>signed int, e.g. $100_{\text{dec}} = 100 \text{ min}$                                                                             |                                                                                                                 | 100            |
| 28 R/W           | Maximal control variable limit Cooling<br>signed int, e.g. $100_{\text{dec}} = 100 \text{ \%}$                                                                   |                                                                                                                 | 100            |
| 29 R/W           | Minimal control variable limit Cooling<br>signed int, e.g. $10_{\text{dec}} = 10\%$                                                                              |                                                                                                                 | 0              |
| 30 R/W           | PWM-Cycle time Cooling<br>signed int, e.g. $15_{\text{dec}} = 15 \text{ min}$                                                                                    |                                                                                                                 | 15             |
| 31 R/W           | Frost protection<br>0x00 deactivates antifreeze<br>signed int, e.g. $50_{\text{dez}} = 5.0 \text{ K}$                                                            |                                                                                                                 | 50             |
| 32 R/W           | Controller mode after reset and Off                                                                                                                              | 0 = Controller off<br>1 = Controller heating<br>2 = Controller cooling<br>3 = Controller automatic              | 3              |
| 33 R             | Not used                                                                                                                                                         |                                                                                                                 |                |
| 34 R             | Not used                                                                                                                                                         |                                                                                                                 |                |

## Register Description

| Register Address | Description                                                                                                | Default values |
|------------------|------------------------------------------------------------------------------------------------------------|----------------|
| 35 R/W           | Function of Digital Input 1                                                                                | 0x10           |
| 36 R/W           | Function of Digital Input 2                                                                                |                |
| 37 R/W           | Counter mode digit.input1                                                                                  | 0              |
| 38 R/W           | Counter mode digit.input 2                                                                                 |                |
| 39 R/W           | Bypass time occupancy (min)<br>signed int, e.g. 0x0078 = 120 <sub>dec</sub> = 120 min                      | 120            |
| 40 R/W           | Function of Digital Input 3<br>(Device variant 4DI only)                                                   | 0x10           |
| 41 R/W           | Function of Digital Input 4<br>(Device variant 4DI only)                                                   |                |
| 42 R/W           | Counter Mode of Digital Input 3<br>(Device variant 4DI only)                                               | 0x00           |
| 43 R/W           | Counter Mode of Digital Input 4<br>(Device variant 4DI only)                                               |                |
| 44 R/W           | Type:<br>AO2V, OVR, OVT, 6WV<br>Analogue value 0-10V after communication failure<br><b>Output1 Heating</b> | -1             |
|                  | Type:<br>DO2R, DO2T<br>Digital value after communication failure<br><b>Output1 Heating</b>                 | -1             |
| 45 R/W           | Type:<br>AO2V, OVR, OVT, 6WV<br>Analogue value 0-10V after communication failure<br><b>Output2 Cooling</b> | -1             |
|                  | Type:<br>DO2R, DO2T<br>Digital value after communication failure<br><b>Output2 Cooling</b>                 | -1             |
| 46 R             | Not used                                                                                                   |                |
| 47 R/W           | <u>Button Mapping</u><br>0: Button 1-9<br>1: Button 1-5 (Std.)<br>2: Button 1-5 (BJ)                       | 1              |

## Register Description

| Register Address | Description                                                                                | Default values |
|------------------|--------------------------------------------------------------------------------------------|----------------|
| 48 R/W           | Function Button 6                                                                          | 0              |
| 49 R/W           | Function Button 7                                                                          |                |
| 50 R/W           | Function Button 8                                                                          |                |
| 51 R/W           | Function Button 9                                                                          |                |
| 52 R/W           | <u>LED Mapping</u><br>0: LED 1-9<br>1: LED 1-5 (Std.)<br>2: LED 1-5 (BJ)                   | 1              |
| 53 R/W           | Function LED 6                                                                             | 1              |
| 54 R/W           | Function LED 7                                                                             |                |
| 55 R/W           | Function LED 8                                                                             |                |
| 56 R/W           | Function LED 9                                                                             |                |
| 57 R/W           | Offset relative Humidity<br>(only available on devices with an integrated humidity sensor) | 0              |
| 58 R/W           | Number of Fan Stages                                                                       | 7              |
| 59 R/W           | Fan Stage after Reset                                                                      | 4              |
| 60 R/W           | Lowest Fan Stage                                                                           | 0              |
| 61 R/W           | Threshold Fan Stage 1 Y-Heat                                                               | 1              |
| 62 R/W           | Threshold Fan Stage 2 Y-Heat                                                               | 33             |
| 63 R/W           | Threshold Fan Stage 3 Y-Heat                                                               | 66             |
| 64 R/W           | Threshold Fan Stage 1 Y-Cool                                                               | 1              |
| 65 R/W           | Threshold Fan Stage 2 Y-Cool                                                               | 33             |

## Register Description

| Register Address | Description                     | Default values |
|------------------|---------------------------------|----------------|
| 66 R/W           | Threshold Fan Stage 3<br>Y-Cool | 66             |
| 67 R/W           | Output Voltage<br>Fan Stage 1   | 300            |
| 68 R/W           | Output Voltage<br>Fan Stage 2   | 600            |
| 69 R/W           | Output Voltage<br>Fan Stage 3   | 1000           |

0...1000 = 0...10,00V

The contents of the configuration registers are retained even after a device restart.  
These registers must not be described cyclically.

### 2.2.2 Registers to read out the operation states

| Register Address | Description                                                                                                                                                                                                                                                                                                                                                                                            |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 256 R            | Bit 0    Button 1        1=pressed,        0=not pressed<br>Bit 1    Button 2        1=pressed,        0=not pressed<br>...<br>Bit 7    Button 8        1=pressed,        0=not pressed<br>Bit 8    Button 9        1=pressed,        0=not pressed                                                                                                                                                    |
| 257 R            | It is buffered if a button was actuated since the last read out of the register.<br>After the read out, all bits are reset to the actual value.<br>Bit 0    Button 1        1=pressed,        0=not pressed<br>Bit 1    Button 2        1=pressed,        0=not pressed<br>...<br>Bit 7    Button 8        1=pressed,        0=not pressed<br>Bit 8    Button 9        1=pressed,        0=not pressed |
| 258 R            | Temperature<br>signed int, e.g. 184 <sub>dec</sub> = 18.4 °C                                                                                                                                                                                                                                                                                                                                           |
| 259 R            | Set temperature offset<br>signed int,<br>Temperature: e.g. -25 <sub>dez</sub> = -2.5K                                                                                                                                                                                                                                                                                                                  |
| 260 R            | Set temperature effective<br>signed int, e.g. 220 <sub>dec</sub> = 22.0 °C                                                                                                                                                                                                                                                                                                                             |
| 261 R            | Occupancy mode<br>0 = unoccupied<br>1 = occupied                                                                                                                                                                                                                                                                                                                                                       |
| 262 R            | Regulating variable heating<br>signed int, e.g. 1023 <sub>dec</sub> =100.0%<br>range 0-1023 corresponds to. 0-100%                                                                                                                                                                                                                                                                                     |
| 263 R            | Regulating variable cooling<br>signed int, e.g. 1023 <sub>dec</sub> =100.0%<br>range 0-1023 corresponds to 0-100%                                                                                                                                                                                                                                                                                      |
| 264 R            | Controller mode<br>0 = stop of controller<br>1 = heating<br>2 = cooling<br>3 = automatic heating control<br>4 = automatic cooling control                                                                                                                                                                                                                                                              |

## Register Description

| Register Address | Description                                                                                   |                                                                                                                                                                                                                                                                                  |
|------------------|-----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 265 R            | Type: AO2V<br>Analogue output value 0-10V<br><b>Output1 Heating</b>                           | Unsigned int, e.g. 500 <sub>dec</sub> = 5V                                                                                                                                                                                                                                       |
|                  | Type: DO2R, DO2T, OVR, OVT<br>Digital output state<br><b>Output1 Heating</b>                  | 0 = open<br>1 = closed                                                                                                                                                                                                                                                           |
| 266 R            | Type: AO2V, OVR, OVT<br>Analogue output value 0-10V<br><b>Output2 cooling</b>                 | signed int, e.g. 500 <sub>dez</sub> = 5V                                                                                                                                                                                                                                         |
|                  | Type: DO2R, DO2T<br>Digital output state<br><b>Output2 cooling</b>                            | 0 = open<br>1 = closed                                                                                                                                                                                                                                                           |
| 267 R            | Digital input1                                                                                | 0 = open<br>1 = closed                                                                                                                                                                                                                                                           |
| 268 R            | Digital input2                                                                                | 0 = open<br>1 = closed                                                                                                                                                                                                                                                           |
| 269 R            | Counter value<br>digital Input 1<br>(only available on device type 4DI)                       | 0...65535<br>(after reading the register value is set to 0 automatically)                                                                                                                                                                                                        |
| 270 R            | Counter value<br>digital Input 2<br>(only available on device type 4DI)                       | 0...65535<br>(after reading the register value is set to 0 automatically)                                                                                                                                                                                                        |
| 271 R            | Digital Input 3<br>(only available on device type 4DI)                                        | 0 = open<br>1 = closed                                                                                                                                                                                                                                                           |
| 272 R            | Digital Input 4<br>(only available on device type 4DI)                                        | 0 = open<br>1 = closed                                                                                                                                                                                                                                                           |
| 273 R            | Counter value<br>digital Input 3<br>(only available on device type 4DI)                       | 0...65535<br>(after reading the register value is set to 0 automatically)                                                                                                                                                                                                        |
| 274 R            | Counter value<br>digital Input 4<br>(only available on device type 4DI)                       | 0...65535<br>(after reading the register value is set to 0 automatically)                                                                                                                                                                                                        |
| 275 R            | Sensor value relative humidity<br>(only available on devices with a built in humidity sensor) | 0...1000 = 0...100,0%rH                                                                                                                                                                                                                                                          |
| 276 R            | Current Fan Stage                                                                             | The current fan stage can be read out via this register.<br><br>0x00 = Fan Stage „0“<br>0x01 = Fan Stage „1“<br>0x02 = Fan Stage „2“<br>0x03 = Fan Stage „3“<br>0x04 = Fan Stage „Auto 0“<br>0x05 = Fan Stage „Auto 1“<br>0x06 = Fan Stage „Auto 2“<br>0x07 = Fan Stage „Auto 3“ |
| 277 R            | Sensor value absolute Humidity<br>(only available on devices with a built in humidity sensor) | Example:<br>64 = 6,4g/m <sup>3</sup> (SI Unit System)<br>28 = 2,8grain/ft <sup>3</sup> (Imperial Unit System)                                                                                                                                                                    |
| 278 R            | Sensor value Dewpoint<br>(only available on devices with a built in humidity sensor)          | Example:<br>49 = 4,9°C (SI Unit System)<br>408 = 40,8°F (Imperial Unit System)                                                                                                                                                                                                   |
| 279 R            | Sensor value Enthalpy<br>(only available on devices with a built in humidity sensor)          | Example:<br>349 = 34,9kJ/kg (SI Unit System)<br>150 = 15,0 BTU/lb <sup>3</sup> (Imperial Unit System)                                                                                                                                                                            |

## Register Description

### 2.2.3 Registers to set the operation states

| Register Address | Description                                                                                   |                                                                                                                                                                                              |
|------------------|-----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 512 R/W          | Set point offset                                                                              | signed int, e.g. $-25_{dez} = -2.5K$                                                                                                                                                         |
| 513 R/W          | Base set point                                                                                | signed int, e.g. $220_{dez} = 22\text{ °C}$                                                                                                                                                  |
| 514 R/W          | Occupancy mode                                                                                | 0 = unoccupied<br>1 = occupied<br>2 = bypass mode                                                                                                                                            |
| 515 R/W          | Controller mode                                                                               | 0 = controller off<br>1 = heating (cooling deactivated)<br>2 = cooling (heating deactivated)<br>3 = automatic                                                                                |
| 516 R/W          | Type: AO2V<br>Manual value<br>Analogue output value 0-10V<br><b>Output1 Heating</b>           | Unsigned int, e.g. $1000_{dec} = 100\%$<br>0-1000 = manual mode<br>0xFFFF = -1 = automatic mode                                                                                              |
|                  | Type: DO2R, DO2T, OVR, OVT<br>Manual value<br>Digital output state<br><b>Output1 Heating</b>  | 0 = open<br>≥1 = closed                                                                                                                                                                      |
| 517 R/W          | Type: AO2V, OVR, OVT<br>Manual value<br>Analogue output value 0-10V<br><b>Output2 cooling</b> | signed int, e.g. $1000_{dez} = 100\%$<br>0-1000 = manual mode<br>0xFFFF = -1 = automatic mode                                                                                                |
|                  | Type: DO2R, DO2T<br>Manual value<br>Digital output state<br><b>Output2 cooling</b>            | 0 = open<br>≥1 = closed                                                                                                                                                                      |
| 518 R/W          | Current Fan Stage                                                                             | This register can be used to overwrite the current fan stage.<br><br>0x00 = Fan Stage „0“<br>0x01 = Fan Stage „1“<br>0x02 = Fan Stage „2“<br>0x03 = Fan Stage „3“<br>0x04 = Fan Stage „Auto“ |

### 2.2.4 Extended address range

| Register Address | Description       |
|------------------|-------------------|
| 16384 R/W        | Access protection |
| 16385 R/W        | Extended address  |

To modify extended address strictly adhere to sequence as described in chapter 2.12.1.

## Register Description

### 2.3 Coils

#### 2.3.1 Coils for Device Configuration

| Coil Address | Description                                                                                                                          | Default values                                         |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|
| 0 R/W        | Use Minimal Control Variable with control variable > 0: = 1<br>Use Minimal Control Variable with control variable = 0: = 0 (default) | 0                                                      |
| 1 R/W        | Change over mode                                                                                                                     | 0 = 4-wire-system<br>1 = 2-wire-system                 |
| 2 R/W        | Unit System                                                                                                                          | 1 = SI (Temp. °C)<br>0 = Imperial (Temp. °F)           |
| 3 R/W        | Room occupancy after reset                                                                                                           | 1 = occupied<br>0 = unoccupied                         |
| 4 R          | Humidity sensor available yes/no                                                                                                     | 0 = sensor not available<br>1 = sensor available       |
| 5 R/W        | Disable State LEDs (STA, RXD, TXD, ERR)                                                                                              | 0 = State LEDs not disabled<br>1 = State LEDs disabled |

The contents of the configuration coils are retained even after a device restart.  
These coils must not be described cyclically.

#### 2.3.2 Coils to set the operation states

| Coil Address | Description                                   |                                                                                                   |
|--------------|-----------------------------------------------|---------------------------------------------------------------------------------------------------|
| 256 R/W      | Status signal dew point                       | 0 = Dew point inactive<br>1 = Dew point active                                                    |
| 257 R/W      | Status signal energy hold off                 | 0 = Energy hold off inactive<br>1 = Energy hold off active                                        |
| 258 R/W      | Release of local presence button <sup>1</sup> | 0 = Locked<br>1 = Released                                                                        |
| 259 R/W      | Release of controller                         | 0 = Locked<br>1 = Released                                                                        |
| 260 R/W      | Trigger LED1                                  | 0 = OFF<br>1 = ON<br><br>LED 6...9 only available if LED mapping 0 is set previously (address 52) |
| 261 R/W      | Trigger LED2                                  |                                                                                                   |
| 262 R/W      | Trigger LED3                                  |                                                                                                   |
| 263 R/W      | Trigger LED4                                  |                                                                                                   |
| 264 R/W      | Trigger LED5                                  |                                                                                                   |
| 265 R/W      | Trigger LED6                                  |                                                                                                   |
| 266 R/W      | Trigger LED7                                  |                                                                                                   |
| 267 R/W      | Trigger LED8                                  |                                                                                                   |
| 268 R/W      | Trigger LED9                                  |                                                                                                   |