# Operating instructions

# RYMASKON® **1000 Controller**

Room controller (controller) for controlling temperature, fan, lighting, and sun protection (2 zones)

Room control unit with color TFT display and capacitive keys (touch keys), with Modbus connection or W-Modbus (wireless)


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**CONTROLS**

## ABBREVIATIONS

**AO** .....Analog output (0-10 V)

**DI**.....Digital input

**DO** .....Digital output 24 V

**dt** .....Time span between the individual iterations of the control

**$dT_2$**.....Control difference Secondary control loop

**$dT_{L1/L2/L3}$**.....Fan switch thresholds (temperature)
When connected to the main control circuit as a 2-point controller
(only for type RYMASKON 144xC with 3 relays for multi-stage fans)

**$dT_{Reg}$**.....Control difference main control circuit

**$dRCV_{L1/L2/L3}$**.....Fan switching thresholds (RH/CO2/VOC content)
When connected to RCV control circuit as 2-point controller
(only for type RYMASKON 144xC with 3 relays for multi-stage fans)

**FSK**.....Color scale (sensors)

**GLT** ..... building management

system **GUI**.....Graphical user interface

**HMI** .....Human Machine Interface

**I**.....Integral component PI controller

**PWM** .....Pulse width modulation

**RCV**.....RH/CO2/VOC control

**RO** .....Digital output 230 V

**$T_{2,actual}$**.....Actual temperature secondary control loop

**$T_{2,setpoint}$**.....Setpoint temperature secondary control loop

**$T_{Actual}$**.....Actual temperature Main control loop

**$T_N$**..... PI controller

**$T_{setpointReg}$**.....Controller setpoint Temperature Main control loop

**$X_P$**.....Proportional band PI controller

**$Y_2$**.....Control variable heating/cooling secondary control loop

**$Y_{calculated}$**.....Calculated control variable

**$Y_H$ / $Y_K$**.....Control variable heating/cooling Main control loop

**$Y_L$**.....Control variable fan coupled to main control loop (fan coil)

**$Y_{RCV}$**.....Control variable fan for RH/CO2/VOC control (RCV)

## INSTALLATION AND COMMISSIONING

Commissioning must be carried out by qualified personnel only! Read these instructions before installation and commissioning, and observe the information contained therein!

Installation must be carried out in accordance with the relevant regulations and standards applicable to the measuring location (such as welding regulations, etc.). In particular, the following must be observed:

- V D E / VDI Technical Temperature Measurements, Guideline, Measurement Arrangements for Temperature Measurements
- EMC guidelines must be observed
- Parallel installation with live cables must be avoided at all costs
- It is recommended to use shielded cables, with the shield connected to one side of the DDC/PLC.

Installation must be carried out in accordance with the technical parameters of the measuring device and the actual operating conditions, in particular:

- Measuring range
- Permissible maximum temperature and humidity
- Protection type and protection class
- Avoid vibrations, shocks, and impacts (< 0.5 g)

## IMPORTANT NOTES

**Our General Terms and Conditions and the valid "General Terms and Conditions of Delivery for Products and services of the electrical industry (ZVEI conditions) plus the supplementary clause "Extended retention of title."**

In addition, the following points must be observed:

- These instructions must be read before installation and commissioning, and all instructions contained therein must be observed!
- This device is only to be used for the specified purpose, in compliance with the relevant safety regulations of the VDE, the federal states, their supervisory bodies, the TÜV, and the local energy supply company. The buyer must ensure compliance with the construction and safety regulations and avoid hazards of any kind.
- No warranty or liability is assumed for defects and damage resulting from improper use of this device.
- Consequential damage caused by faults in this device is excluded from the warranty and liability.
- The devices may only be installed and commissioned by qualified personnel.
- Only the technical data and connection conditions specified in the installation and operating instructions supplied with the device apply. Deviations from the catalog description are not listed separately and are possible in the interest of technical progress and the continuous improvement of our products.
- Any modifications to the device by the user will void all warranty claims.
- This device must not be used near heat sources (e.g., radiators) or their heat flow; direct sunlight or heat radiation from similar sources (strong lights, halogen spotlights) must be avoided at all costs.
- Operation in the vicinity of devices that do not comply with EMC guidelines may affect the functionality of the device.
- This device must not be used for monitoring purposes that serve to protect persons from danger or injury, nor as an emergency stop switch on systems and machines or for comparable safety-related tasks.
- The dimensions of the housing and housing accessories may vary slightly from the specifications in this manual.
- Modifications to this documentation are not permitted.
- Complaints will only be accepted if the product is returned in its original packaging.
- A safety device for the device must be provided nearby and easily accessible to users. The safety device must be marked as a disconnecting device for the device.

### Safety instructions for devices with a supply voltage of 24 V AC/DC

- The devices must only be connected to safety extra-low voltage and when de-energized. To prevent damage and faults to the device (e.g., due to voltage induction), use shielded cables, avoid parallel installation with live cables, and observe the EMC guidelines.
- When using power supplies with an output power greater than 15 W, additional safety measures (circuit breakers) must be provided to limit the energy output in the event of a fault.
- Commissioning must be carried out by qualified personnel and may only be performed by qualified personnel!
- The device must be operated with a power supply from an approved SELV (Safety Extra Low Voltage) or PELV (Protective Extra Low Voltage) power supply unit with limited power up to max. 25 W or with its own 1 A backup fuse.

### Safety instructions for devices with a supply voltage of 230 V AC (100 - 240 V AC)

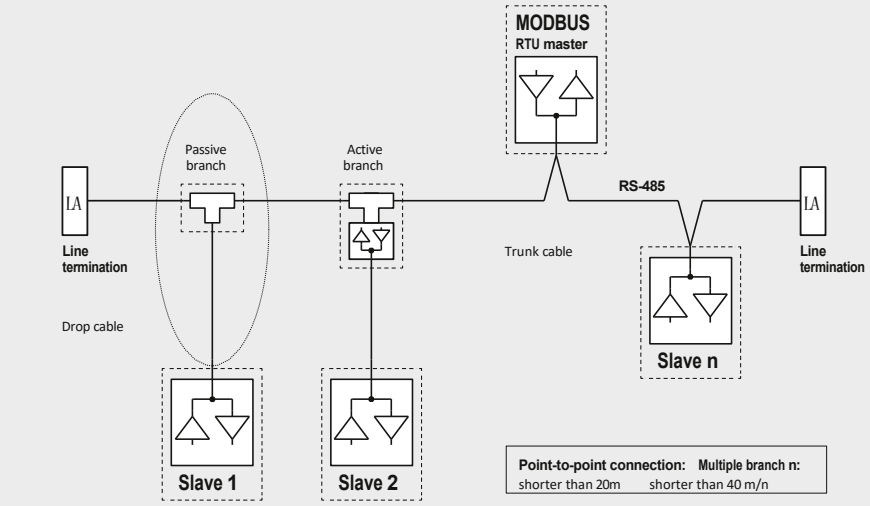
- The devices must only be connected when they are disconnected from the power supply. To prevent damage and faults to the device (e.g. due to voltage induction), use shielded cables, avoid laying cables parallel to live cables, and observe the EMC guidelines.
- Commissioning must be carried out by qualified personnel and is mandatory!
- Minimum cross-section 1 $mm^2$ / AWG 18, temperature range – 40 °C to + 60 °C, fuse 3 A Cable type according to UL 719 / VDE 0250-204

### CAUTION!

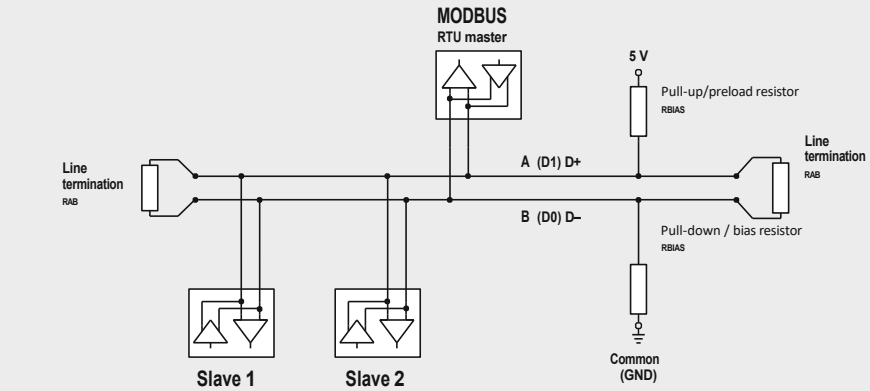
**Risk of electric shock! Live parts may be present inside the housing. Particularly in devices operating on mains voltage (normally between 90 V and 265 V), contact with live parts may result in personal injury.**

## INSTALLATION

**General structure Bus structure**




**Bus topology with terminating and bias resistors**




**Terminating resistors** may only be connected to the ends of the bus line.
If necessary, the **LA-Modbus** (separate accessory) serves as a terminating resistor for the RYMASKON. In networks without repeaters, no more than 2 line terminations are permitted.

The **bias resistors** for defining the bus level in idle mode are usually activated on the Modbus master/repeater.

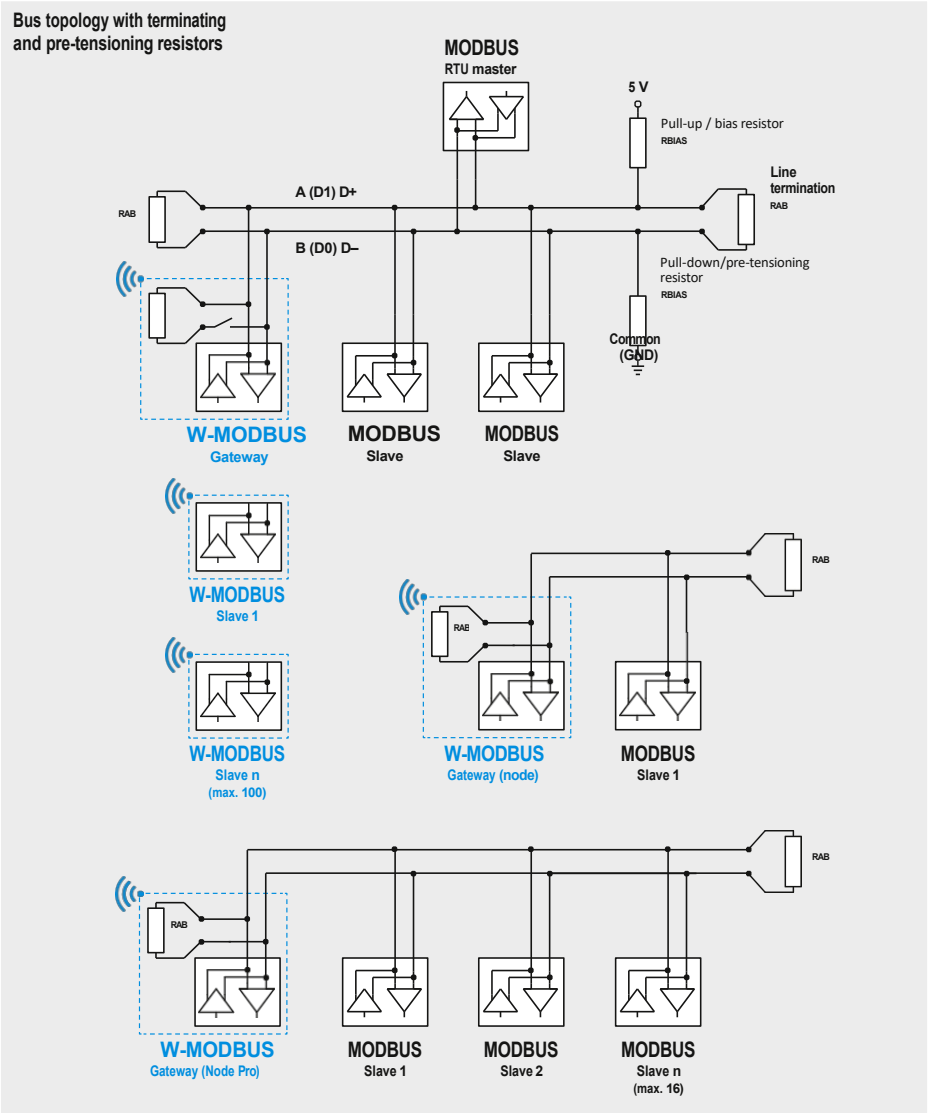
The maximum **number of participants** per Modbus segment is 32 devices.
If there are a large number of participants, the bus must be divided into several segments separated by repeaters.
The participant address can be set from 1 to 247.

A cable with twisted pair data line/power supply and copper shielding must be used for the **bus line**. The capacitance of the line should be less than 100 pF/m (e.g., Profibus cable).

## INSTALLATION

**W-Modbus**

**Bus topology with terminating and pre-tensioning resistors**




The **W-Modbus protocol** is based on the 2.4 GHz ISM radio band and uses a patented frequency hopping to enable maximum reliability and resistance to interference. This means that reliable radio transmission can also be relied upon in industrial environments.

In **the W-Modbus network**, up to 100 participants can communicate with each other over a long distance (up to 500 m in open field) via a gateway. A standardized W-Modbus module ensures compatibility with all W-Modbus devices.

The **W-Modbus sensors** only need to be supplied with power. Only the slave address is configured manually; the transmission parameters (baud rate and parity) are set automatically.
A terminating resistor is not necessary. The sensor is then connected to a gateway.

The **W-Modbus gateway** serves as a transition between wired Modbus and wireless W-Modbus. Mixed forms of wired and wireless Modbus devices can also be easily integrated into existing network topologies via the W-Modbus gateway.

S+S Regeltechnik GmbH hereby declares that the radio equipment type
RYMASKON® **1000 Controller W-Modbus** (WMOD) complies with Directive 2014/53/EU.

The full text of the EU declaration of conformity is available at the following Internet address:
www.spluss.de/RYM13111W220000/

## KEY FEATURES

Basic models
(see type table)



- Power supply 24 V AC/DC or 230 V AC
- **Modbus** connection or wireless **W-Modbus**
- 2.0" **TFT display** (320 x 240 x 3 RGB pixels),
  with LED backlighting, high contrast, 85° viewing angle
- capacitive keys (**touch keys**)
  (optional extension, see number key Pos. 14-15)
- Iduna 3 **housing** (112 x 89.5 x 24 mm), colors white and black, for wall mounting on flush-mounted box,
  quick and easy installation via push-in terminals
- Integrated temperature and humidity sensor (standard equipment)
  (additional sensors optional: CO2, VOC)
- **Control** of heating, cooling, 6-way valve, fan
- **Control** of temperature, fan
  (sun protection and light with dimming function optional)
- Energy-saving and environmentally friendly thanks to **features**
  such as brightness adjustment, standby, wake-up, etc.
- **CuRA** (Customized Register Assignment)
  Assignment of individual register addresses for each data point

## DESCRIPTION

Introduction

The RYMASKON series room control units® **1000** / **2000** / **3000** are designed for controlling up to five climate zones in residential, hotel, and office spaces and individually regulate the heating, cooling, and fan settings in the interior. The controller variants can be operated as stand-alone devices thanks to the integrated PI, PWM or 2/3-point control functions. The product family is characterized by its elegant design,
intuitive operation and the wide range of possible combinations of individual components.

The RYMASKON® **1000 C** (controller) room control units are used to control and regulate heating convectors and fan coil units. Depending on the model, the devices are available with analog outputs ( 0–10 V) and with digital/relay outputs for controlling heating valves,
cooling valves, 6-way valves, multi-stage fans, or EC fans. Control is via PI, PWM, or 2-/3-point control. The changeover function allows 2- and 4-pipe systems to be operated.
The Modbus or W-Modbus communication interface allows the climate parameters on the controller to be changed and monitored at any time via the GLT. In addition, the sun protection (external blinds, venetian blinds) or lighting (with dimming function) functions can be controlled via the bus. The visual display is via
2" **TFT display**, and operation via capacitive buttons (**touch keys**).

In addition to the integrated temperature and humidity sensor, **sensors** for CO2 and VOC are available as options. Furthermore, an input for a passive temperature sensor (NTC10K) and an input for a potential-free contact are available. This allows, for example, a window contact or a condensation monitor to be connected. This provides all the options required for flexible and individual climate control in rooms.

All device types are available in **the** timeless Iduna 3 **housing** (112 x 89.5 x 24 mm) in white or black. Wall mounting is carried out on standard flush-mounted boxes.

## DESCRIPTION

Technical data
(Rev. Data-V33)

| TECHNICAL | |
|---|---|
| Device type | Room controller for heating convectors or fan coil units (fan coil) Functions: |
| | Temperature, fan, sun protection, and light (see type table) |
| Unit system: | SI (default) or Imperial (can be changed in the Modbus register) |
| Data points: | Temperature [°C] [°F], relative humidity [% RH],<br>Air quality (VOC) [%] [pbb], Carbon dioxide (CO2) [ppm],<br>Setpoint (temperature, fan, presence) |
| Power consumption: | typical < 3 W at 24 V DC; < 4.5 VA at 24 V AC; < 6.5 VA at 230 V AC |
| Supply voltage: | 24 V AC/DC (± 10 %) or 230 V AC (100-240 V AC) |
| Communication: | **Modbus** (RTU cable),<br>Slave, address range 1...247, max. 32 devices, RS<br>485 interface, **galvanically isolated**,<br>9600 / 19200 / 38400 / 57500 baud, 8N1, even / odd parity,<br>1 / 2 stop bits or<br>**W-Modbus** (wireless Modbus, AES-128 encrypted), frequency **2.4**<br>**GHz** ISM, transmission power **100 mW**,<br>range **max. 500 m** (open field) / approx. 50 - 70 m (buildings),<br>Slave, address range 1...247, max. 100 devices on one gateway, GLT<br>connection is radio-based via W-Modbus gateway |
| Display | **TFT display**, 2" (41 x 30 mm), 320 x 240 x 3 pixels (RGB), LED<br>backlighting, viewing angle ± 85° |
| Control elements: | **Capacitive buttons** (up to 10 buttons, depending on type)<br>For setting the target temperature, fan speeds, presence detection, sensor values,<br>and for operating sun protection and lighting |
| Inputs: | 1 input **NTC10K**<br>(configurable as digital input **DI 1**, potential-free)<br>1 digital input **DI 2** for potential-free switches (24 V devices) or for potential-carrying switches (230 V devices) |
| Outputs: | **Analog outputs AO**<br>(0 -10 V DC, max. 5 mA) as **PI controller**<br>**Relay outputs RO**<br>(230 V AC, max. 500 mA, cos ϕ= 1.0 / ohmic load) **or**<br>(230 V AC, max. 3 A, cos ϕ= 1.0 / ohmic load) as **2-/3-point controller**<br>**Digital outputs DO**<br>($I_n$ 400 mA, short circuit max. 1.2 A) as **2-/3-point controller**, **PWM**<br>for heating/cooling, 6-way valves, fan,<br>Number depends on controller type (see connection diagrams) |
| Electrical connection: | 0.2 - 1.5 mm², via push-in terminals |
| Housing: | Plastic, **flame-retardant** (UL 94 V-0), material PC/ABS, color **white** (similar<br>to RAL 9016) or **black** (similar to RAL 9004) |
| Housing dimensions: | 112 x 89.5 x 24 mm (W x H x D) (Iduna 3), flush mounting:+ 23 mm (D), sensor protection:+ |
| 22 mm (H) Mounting | Wall mounting on flush-mounted box, Ø 55 mm |
| Ambient temperature: | 0...+50 °C (operation); -30...+70 °C (storage) |
| Permissible humidity: | 0...90 % RH (non-condensing air) Protection |
| class: | IP 30 (according to EN 60 529) Overvoltage |
| category: | OVC1 (at 24 V); OVC2 (at 230 V) |
| Degree of contamination: | PD2 |
| Standards: | CE conformity according to Low Voltage Directive 2014/35/EU, EMC<br>Directive 2014/30/EU (Modbus) or<br>Radio Directive 2014/53/EU (W-Modbus) |
| **TEMPERATURE** | (basic equipment) |
| Sensor: | Digital temperature sensor, low hysteresis, high long-term stability |
| Measuring range | 0...+50 °C / +32...+122 °F |
| Accuracy | Typical± 0.5 K /± 0.9 °F at +25 °C / +77 °F |
| **HUMIDITY** | (basic equipment) |
| Sensor | digital humidity sensor, low hysteresis, high long-term stability |
| Measuring range | 0...100 % RH |
| Accuracy: | ±typically 2.0% (20...80% RH) at +25 °C / +77 °F, otherwise 3.0% (± ) |
| **CARBON DIOXIDE (CO2)** | (optional) |
| Sensor: | Digital photoacoustic NDIR CO2 sensor (non-dispersive infrared technology), with automatic<br>calibration and high long-term stability |
| Measuring range | 0...2000 ppm |
| Accuracy | Typical± 50 ppm,± 3% of the measured value at +25 °C / +77 °F |
| **AIR QUALITY (VOC)** | (optional) |
| Sensor: | Digital metal oxide (MOX) based VOC sensor |
| Measuring range | 0...100 % (corresponds to IAQ Index 1...500 or<br>0...2383 ppb ethanol equivalent – non-linear) |
| Accuracy: | <± 15 |
| Service life | > 10 years (when used as intended, depending on the<br>type and duration of VOC exposure) |

## BASIC MODELS

Room control units for temperature adjustment


Type 1311 / 1321 / 1361


Type 1312 / 1322 / 1362

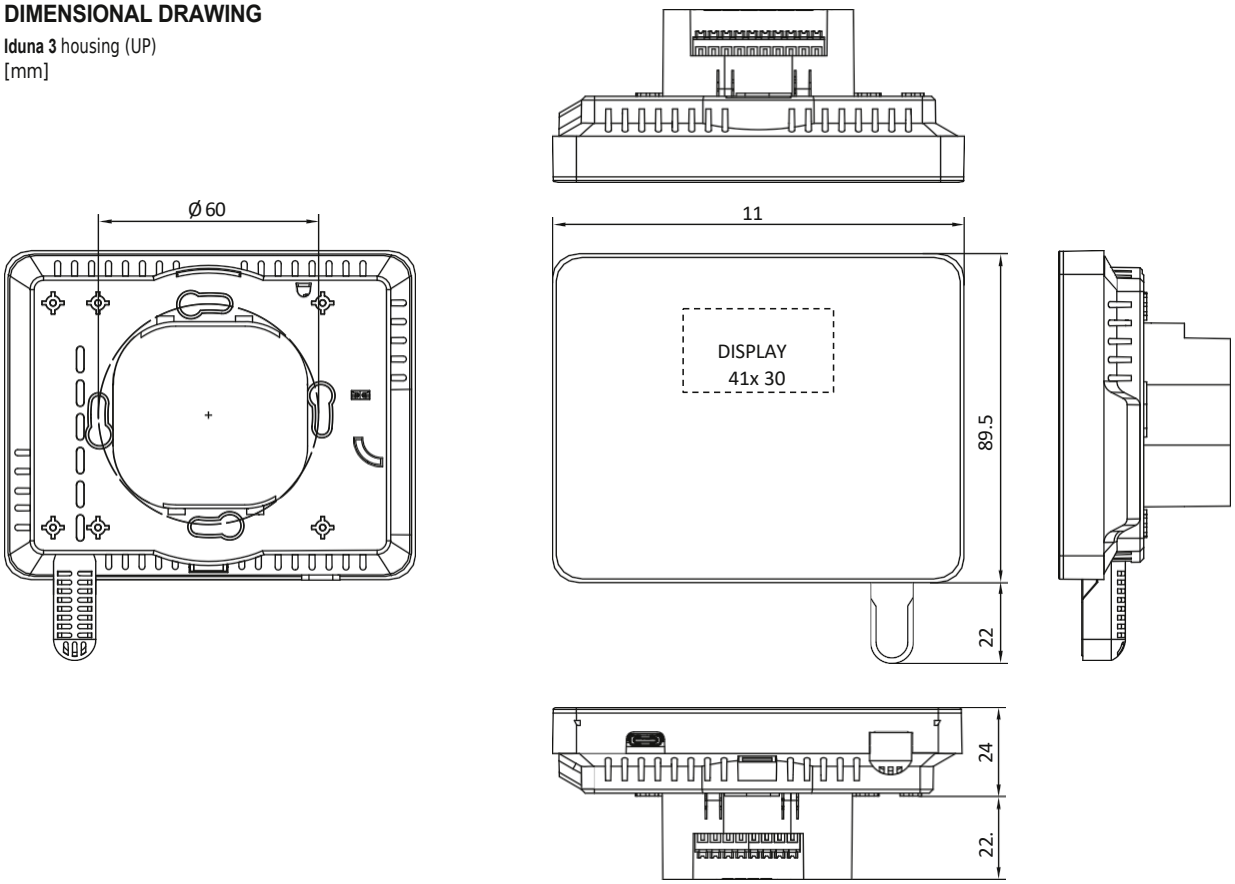
Room control units for temperature and fan adjustment


Type 1431 / 1441 / 1451 / 1461


Type 1432 / 1442 / 1452 / 1462

## DIMENSIONAL DRAWING

**Iduna 3** housing (UP)
[mm]



**Type 132x C - MOD**
**24 V**

3 AO (h, c, 6W)

| | |
|---|---|
| 1 | free |
| 2 | free |
| 3 | free |
| 4 | free |
| 5 | **AO3** 0-10V (6-way valve) |
| 6 | **AO2** 0-10V (cooling) |
| 7 | **AO1** 0-10V (heating) |
| 8 | GND (AO) |
| 9 | GND (DI2) |
| 10 | **DI 2** (potential-free) |
| 11 | **UB+** 24V AC/DC |
| 12 | **UB–** GND AC/DC |
| 13 | **NTC10K** (**DI1**, potential-free) |
| 14 | GND (NTC10K/DI1) |
| 15 | Modbus A |
| 16 | Modbus B |
| 17 | Modbus A |
| 18 | Modbus B |

**Type 143x C - MOD**
**24**

2 AO (h, c, 6W)+ 1 AO (f)

| | |
|---|---|
| 1 | free |
| 2 | free |
| 3 | free |
| 4 | free |
| 5 | **AO3** 0-10V (fan) |
| 6 | **AO2** 0-10V (cooling, 6-way valve) |
| 7 | **AO1** 0-10V (heating, 6-way valve) |
| 8 | GND (AO) |
| 9 | GND (DI2) |
| 10 | **DI 2** (potential-free) |
| 11 | **UB+** 24V AC/DC |
| 12 | **UB–** GND AC/DC |
| 13 | **NTC10K** (**DI1**, potential-free) |
| 14 | GND (NTC10K/DI1) |
| 15 | Modbus A |
| 16 | Modbus B |
| 17 | Modbus A |
| 18 | Modbus B |

**Type 136x C - MOD**
**Type 146x C - MOD**
**24**

2 AO (h, c) / (f)+ 2 DO (h, c)

| | |
|---|---|
| 1 | **DO2** (normally open, 400mA, cooling) |
| 2 | **DO1** (normally open, 400mA, heating) |
| 3 | Root/COM (24V, max. 1A ohm load) |
| 4 | free |
| 5 | free |
| 6 | **AO2** 0-10V (cooling) / (fan) |
| 7 | **AO1** 0-10V (heating) / (fan) |
| 8 | GND (AO) |
| 9 | GND (DI2) |
| 10 | **DI 2** (potential-free) |
| 11 | **UB+** 24V AC/DC |
| 12 | **UB–** GND AC/DC |
| 13 | **NTC10K** (**DI1**, potential-free) |
| 14 | GND (NTC10K/DI1) |
| 15 | Modbus A |
| 16 | Modbus B |
| 17 | Modbus A |
| 18 | Modbus B |

**Type 132x C - WMOD**
**24**

3 AO (h, c, 6W)

| | |
|---|---|
| 1 | free |
| 2 | free |
| 3 | free |
| 4 | free |
| 5 | **AO3** 0-10V (6-way valve) |
| 6 | **AO2** 0-10V (cooling) |
| 7 | **AO1** 0-10V (heating) |
| 8 | GND (AO) |
| 9 | GND (DI2) |
| 10 | **DI 2** (potential-free) |
| 11 | **UB+** 24V AC/DC |
| 12 | **UB–** GND AC/DC |
| 13 | **NTC10K** (**DI1**, potential-free) |
| 14 | GND (NTC10K/DI1) |
| 15 | free |
| 16 | free |
| 17 | free |
| 18 | free |

**Type 143x C - WMOD**
**24**

2 AO (h, c, 6W)+ 1 AO (f)

| | |
|---|---|
| 1 | free |
| 2 | free |
| 3 | free |
| 4 | free |
| 5 | **AO3** 0-10V (fan) |
| 6 | **AO2** 0-10V (cooling, 6-way valve) |
| 7 | **AO1** 0-10V (heating, 6-way valve) |
| 8 | GND (AO) |
| 9 | GND (DI2) |
| 10 | **DI 2** (potential-free) |
| 11 | **UB+** 24V AC/DC |
| 12 | **UB–** GND AC/DC |
| 13 | **NTC10K** (**DI1**, potential-free) |
| 14 | GND (NTC10K/DI1) |
| 15 | free |
| 16 | free |
| 17 | free |
| 18 | free |

**Type 136x C - WMOD**
**Type 146x C - WMOD**
**24**

2 AO (h, c) / (f)+ 2 DO (h, c)

| | |
|---|---|
| 01 | **DO2** (normally open, 400mA, cooling) |
| 02 | **DO1** (normally open, 400mA, heating) |
| 03 | Root/COM (24V, max. 1A ohmic load) |
| 04 | free |
| 05 | free |
| 06 | **AO2** 0-10V (cooling) / (fan) **07** |
| | **AO1** 0-10V (heating) / (fan) **08** |
| | GND (AO) |
| 09 | GND (DI2) |
| 10 | **DI 2** (potential-free) |
| 11 | **UB+** 24V AC/DC |
| 12 | **UB–** GND AC/DC |
| 13 | **NTC10K** (**DI1**, potential-free) |
| 14 | GND (NTC10K/DI1) |
| 15 | free |
| 16 | free |
| 17 | free |
| 18 | free |

**Type 131x C - WMOD**
**230 V**

2 RO (h, c)+ 1 AO (6W)

| | |
|---|---|
| 1 | free |
| 2 | free |
| 3 | free |
| 4 | **RO1** relay heating (solid state, 0.5A) |
| 5 | **RO2** relay cooling (solid state, 0.5A) |
| 6 | **DI2** (230V AC) - reference N |
| 7 | **N** (230V AC) |
| 8 | **L** (230V AC) |
| 11 | Output 0-10V (6-way valve) |
| 12 | GND (output 0-10V) |
| 13 | **NTC10K** (**DI1**, potential-free) |
| 14 | GND (NTC10K/DI1) |

**Type 145x C - WMOD**
**230 V**

2 RO (h, c)+ 1 AO (f)

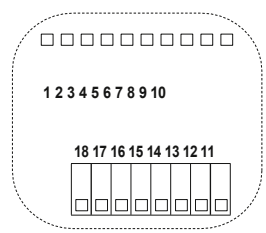
| | |
|---|---|
| 1 | free |
| 2 | free |
| 3 | free |
| 4 | **RO1** relay heating (solid state, 0.5A) |
| 5 | **RO2** relay cooling (solid state, 0.5A) |
| 6 | **DI2** (230V AC) - reference N |
| 7 | **N** (230V AC) |
| 8 | **L** (230V AC) |
| 11 | Output 0-10V (fan) |
| 12 | GND (output 0-10V) |
| 13 | **NTC10K** (**DI1**, potential-free) |
| 14 | GND (NTC10K/DI1) |

**Type 144x C - WMOD**
**230 V**

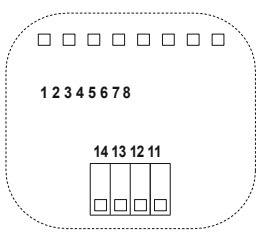
2 RO (h, c)+ 3 RO (f)

| | |
|---|---|
| 1 | **RO3** Relay **fan stage 1** (mechanical, 3A) |
| 2 | **RO4** Relay **fan stage 2** (mechanical, 3A) |
| 3 | **RO5** Relay **fan stage 3** (mechanical, 3A) |
| 4 | **RO1** relay heating (solid state, 0.5A) |
| 5 | **RO2** cooling relay (solid state, 0.5A) |
| 6 | **DI2** (230V AC) - reference N |
| 7 | **N** (230V AC) |
| 8 | **L** (230V AC) |
| 11 | free |
| 12 | free |
| 13 | **NTC10K** (**DI1**, potential-free) |
| 14 | GND (NTC10K/DI1) |

Connection diagram **24**




Connection diagram **230 V**




**WARNING: Switch off the power supply before starting wiring!**

## RYMASKON® **1000 C** Controller (series)
## Number key for type variants

RY M 1 -x x x 1 -x x x 0 -0 x x

**Pos. 1-4** **Type designation**
RYMASKON 1000 C — RYM1

**Pos. 5 - 6** **Controller type**
Setpoint a d j u s t m e n t | Output

Temperature

| | | | |
|---|---|---|---|
| [1] | 2 **RO** (h, c) + 1 **AO** (6W) | *1 | |
| [2] | 3 **AO** (h, c, 6W) | | 32 |
| [3] | 2 **AO** (h, c) + 2 **DO** (h, c) | | 36 |
| | Temperature-+ Fan | | |
| [4] | 2 **AO** (h, c, 6W) + 1 **AO** (f) | | 43 |
| [5] | 2 **RO** (h, c) + 3 **RO** (f) | * | 44 |
| [6] | 2 **RO** (h, c) + 1 **AO** (f) | * | 45 |
| [7] | 2 **AO** (h, c, f) + 2 **DO** (h, c) | | 46 |

**Pos. 7** **Housing color**

| | |
|---|---|
| white | 1 |
| black | 2 |

**Item 8** **Optical display**

| | |
|---|---|
| TFT display (2.0") | 1 |

**Item** **Communication**

| | | |
|---|---|---|
| Modbus | *2 | M |
| W-Modbus (wireless) | | W |

**Pos. 10** **Sensors**

| | |
|---|---|
| **T** [°C/°F], **RH** [%] | 2 |
| **T** [°C/°F], **RH** [%], **CO2** [ppm] | 6 |
| **T** [°C/°F], **RH** [%], **VOC** [%] | 7 |
| **T** [°C/°F], **RH** [%], **CO2** [ppm], **VOC** [%] | 8 |

**Pos. 11** **Power supply**

| | |
|---|---|
| 24 V AC/DC | 1 |
| 230 V AC | 2 |

**Item 12** **Mount**

| | |
|---|---|
| On flush-mounted box, Ø 55 mm | 0 |

**Items 14 - 15** **Touch button extension** *3

| | |
|---|---|
| Basic model (see **item 5**) including room assignment | 0 |
| + **B** (1 sun protection) | 0 |
| + **BB** ( 2 sunshades) | 02 |
| + **L** (1 light) | 03 |
| + (2 lights) | 04 |
| + **LB** ( 1 light, 1 sunshade) | 05 |

*1 230 V devices

*2 Not for 230 V devices

*3 Adjustment of sun protection (**B**) and light (**L**) only via the bus

**Output**

| | |
|---|---|
| **AO** | Analog (0 -10 V DC) |
| **RO** | Relay (230 V AC) |
| **DO** | Digital (24 V DC) |
| (h,c) | Heating, cooling |
| (f) | Fan |

(6W) 6-way valve

**Sensors**

| | |
|---|---|
| **T** | Temperature [°C /°F] |
| **RH** | Relative humidity [%] |
| **CO2** | Carbon dioxide [ppm] |
| **VOC** | Air quality [%] |

| RYMASKON® **13x x C** | **Controller** (basic models) for heating convectors (**HC**) for temperature adjustment | | | | | |
|---|---|---|---|---|---|---|
| **Type/ WG02 Control outputs** | **Communication** | **Measuring element** | **Control** | **Color / Housing** | **Display** | **Item no.** |
| **[1] 2 RO (heating, cooling, 230 V AC, max. 500 mA)+ 1 AO (6-way valve, 0 -10 V)** | | | | | | |
| RYMASKON® **131x C** | | | | **Iduna 3** | | |
| RYM 1311C-RH-WMOD | W-Modbus | **T\| RH** | **T \| –\| R** | white | ■ | RYM1-3111- W220-000 |
| RYM 1312C-RH-WMOD | W-Modbus | **T\| RH** | **T\| –\| R** | black | ■ | RYM1-3121- W220-000 |
| **[2] 3 AO (heating, cooling, 6-way valve, 0 -10 V)** | | | | | | |
| RYMASKON® **132x C** | | | | **Iduna 3** | | |
| RYM 1321C-RH-MOD | **Modbus** | **T\| RH** | **T \| –\| R** | White | ■ | RYM1-3211-M210-000 |
| RYM 1322C-RH-MOD | **Modbus** | **T\| RH** | **T \| –\| R** | black | ■ | RYM1-3221-M210-000 |
| RYM 1321C-RH-WMOD | **W-Modbus** | **T\| RH** | **T \| –\| R** | white | ■ | RYM1-3211- W210-000 |
| RYM 1322C-RH-WMOD | **W-Modbus** | **T\| RH** | **T\| –\| R** | black | ■ | RYM1-3221- W210-000 |
| **[3 2 AO (heating, cooling, 0 -10 V)+ 2 DO (heating, cooling, 24 V, max. 1 A ohmic load)** | | | | | | |
| RYMASKON® **136x C** | | | | **Iduna 3** | | |
| RYM 1361C-RH-MOD | **Modbus** | **T\| RH** | **T \| –\| R** | White | ■ | RYM1-3611-M210-000 |
| RYM 1362C-RH-MOD | **Modbus** | **T\| RH** | **T \| –\| R** | black | ■ | RYM1-3621-M210-000 |
| RYM 1361C-RH-WMOD | **W-Modbus** | **T\| RH** | **T \| –\| R** | white | ■ | RYM1-3611- W210-000 |
| RYM 1362C-RH-WMOD | **W-Modbus** | **T\| RH** | **T\| –\| R** | black | ■ | RYM1-3621- W210-000 |

| RYMASKON® **14x x C** | **Controller** (basic models) for fan coil units (**FANCOIL**) for temperature and fan control | | | | | |
|---|---|---|---|---|---|---|
| **Type/ WG02 Control outputs** | **Communication** | **Measurement element** | **Control** | **Color / Housing** | **Display** | **Item no.** |
| **[4 3 AO (heating, cooling, 6-way valve, EC fan, 0 -10 V)** | | | | | | |
| RYMASKON® **143x C** | | | | **Iduna 3** | | |
| RYM 1431C-RH-MOD | Modbus | **T\| RH** | **T\| F\| R** | White | ■ | RYM1-4311-M210-000 |
| RYM 1432C-RH-MOD | **Modbus** | **T\| RH** | **T\| F\| R** | black | ■ | RYM1-4321-M210-000 |
| RYM 1431C-RH-WMOD | W-Modbus | **T\| RH** | **T\| F\| R** | white | ■ | RYM1-4311- W210-000 |
| RYM 1432C-RH-WMOD | W-Modbus | **T\| RH** | **T\| F\| R** | black | ■ | RYM1-4321- W210-000 |
| **[5 5 RO (heating, cooling, 230 V AC, max. 500 mA\| 3-stage fan, 230 V AC, max. 3 A)** | | | | | | |
| RYMASKON® **144x C** | | | | **Iduna 3** | | |
| RYM 1441C-RH-WMOD | W-Modbus | **T\| RH** | **T-\| F-\| -R** | White | ■ | RYM1-4411- W220-000 |
| RYM 1442C-RH-WMOD | W-Modbus | **T\| RH** | **T\| F\| R** | black | ■ | RYM1-4421- W220-000 |
| **[6 2 RO (heating, cooling, 230 V AC, max. 500 mA)+ 1 AO (EC fan, 0 -10 V)** | | | | | | |
| RYMASKON® **145x C** | | | | **Iduna 3** | | |
| RYM 1451C-RH-WMOD | W-Modbus | **T\| RH** | **T-\| F-\| -R** | White | ■ | RYM1-4511- W220-000 |
| RYM 1452C-RH-WMOD | W-Modbus | **T\| RH** | **T\| F\| R** | black | ■ | RYM1-4521- W220-000 |
| **[7] 2 AO (EC fan, 0 -10 V)+ 2 DO (heating, cooling, 24 V, max. 1 A ohmic load)** | | | | | | |
| RYMASKON® **146x C** | | | | **Iduna 3** | | |
| RYM 1461C-RH-MOD | Modbus | **T\| RH** | **T\| F\| R** | White | ■ | RYM1-4611-M210-000 |
| RYM 1462C-RH-MOD | **Modbus** | **T\| RH** | **T\| F\| R** | black | ■ | RYM1-4621-M210-000 |
| RYM 1461C-RH-WMOD | W-Modbus | **T\| RH** | **T\| F\| R** | white | ■ | RYM1-4611- W210-000 |
| RYM 1462C-RH-WMOD | W-Modbus | **T\| RH** | **T\| F\| R** | black | ■ | RYM1-4621- W210-000 |
| Measuring element / control: | **T** = Temperature sensor<br>R H = Humidity sensor | | **T**= Temperature<br>F= Fan<br>R = Room occupancy | | | |

| **OPTIONS** | | | |
|---|---|---|---|
| Measuring elements: | **CO2** = CO2 sensor | | Surcharge |
| | **VOC** = VOC sensor | | Additional charge |
| Control: | **B / L** Buttons for sun protection and/or light | (see **items 14-15**) | On request |
| Communication: | Without Modbus | | on request |
| Optional | **Further type variants on request!**<br>configuration options, see Number key | | |

**CONFIG**
General information and configuration menu

## 1.0 General configuration

The device can be configured in three ways:

- **Display** (**device**)
  Manual entry using **the configuration menu** directly on the device display.
  (Configuration of the RS485 interface)
- **Configuration tool** (**PC**)
  Input/transfer using **configuration software** via PC to the device (USB-C interface). (Configuration of the RS485 interface and configuration of all other device parameters)
- **GLT** (**Modbus**)
  Input in **the** Modbus **register table** via the bus (RS485 interface).
  (No configuration of the RS485 interface, otherwise configuration of all other device parameters)

  The configuration parameters are permanently stored in the device's non-volatile memory.
  To do this, all changes must be saved to the non-volatile memory (EEPROM) with the parameter Save after configuration is complete.
  must be saved to the non-volatile memory (EEPROM) using the **Save** parameter. Configurable Modbus parameters

Configuration register

Save to non-volatile memory (**EEPROM**)
SaveToEEPROM_2013

(type-dependent)

| Modbus | Value range |
|---|---|
| Bus address | **1** (default) ... 247 |
| Baud | 9600 / **19200** (default) / 38400 / 57600 / 115200 baud |
| Parity / Stop bits | NONE (none, 1 stop bit)<br>**EVEN** (even, 1 stop bit) (default)<br>ODD (odd )<br>NONE (none, 2 stop bits) |

Menu tree Configuration menu

Configuration (**Main**)

1 **Device info**
- Serial number
- Device type
- Device ID
- Manufacturer
- Operating hours
- Software version Manual *(QR code)*

2 **Modbus** *(type-dependent)*
- Bus address Baud rate
- Parity / stop bits

2 **W-Modbus** *(depending on type)*
- Bus address
- NW status
- NW quality
- GW pairing (gateway)
- Bluetooth (AppMode)

3 **Date / time**
- Date format Date specification Time format Time specification Daylight saving time

4 **Factory reset**
- Confirm

5 **Exit with save**
- Confirm

6 **Cancel without saving**
- Confirm

## 1.1 Configuration menu (display)

The menu is used to configure the RS485 interface via the device display.
The **PRÄSENZ** (**PRESENCE**), **SENSOR**, and
as well as the arrow keys for temperature adjustment **UP** ( ) and **DOWN** ( ) with additional functions (see table).

**Key assignment in the configuration menu**

| | | |
|---|---|---|
| | **BACK** | **Go back** one level in the menu tree |
| | **CANCEL** | **Cancel** active editing |
| | **SELECT** | **Scroll** through the list (up/down) |
| | **VALUE** | **Change** the value of the entry (increase/decrease) |
| | **OK** | **Confirm** value of entry |
| | **NEXT** | **Next** menu level or next edit field for the value |

**Call up the configuration menu**

To access the configuration menu, press and hold the **SENSOR** button, immediately followed by the **PRESENCE** button. **Press** both buttons together **for 3 seconds** (Fig. 001).

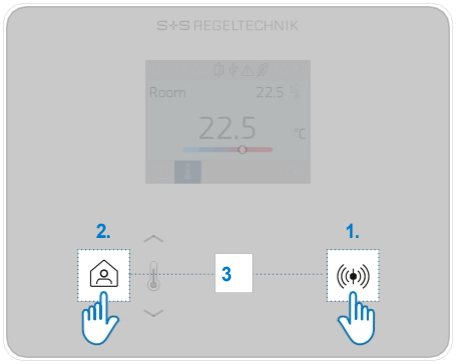



**Fig. 001** Calling up the configuration menu

Configuration register **PIN**

**Config menu**
PIN_2008
(default: 1111)

**Enter the PIN number**

After opening the configuration menu, you must first enter a 4-digit PIN number (Fig. 002). The Modbus register can be used to change the PIN number sequence or permanently disable the PIN prompt (default: 1111 / without PIN: 0000).

The top menu level Device Info (**Main**) then opens with the first entry (Fig. 003).


**Fig. 002** PIN entry

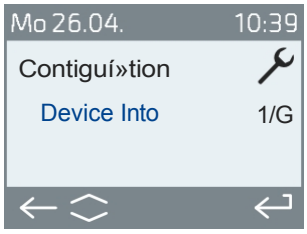



**Fig. 003** First entry (Main)

**Confirming a value**

The value of the entry is initially inactive (Fig. 004). It is activated using the **SENSOR** button.
The **activated value** is then displayed in a **focus color** (Fig. 005).

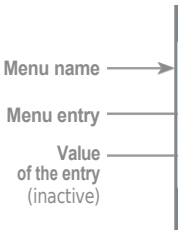



**Fig. 004** Editing inactive

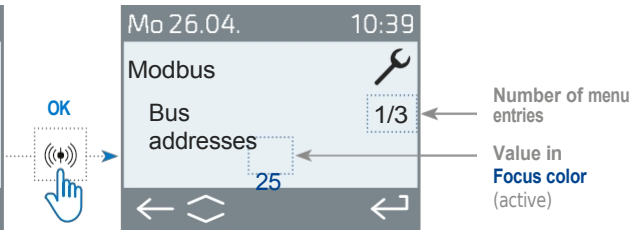



**Fig. 005** Active value in focus color

**Factory reset**

All parameters are reset in the **Factory Reset** level (Fig. 006).
After confirming with 'Yes', the device restores the factory settings (bus parameters are retained) and restarts (Fig. 007).


**Fig. 006** Calling factory reset

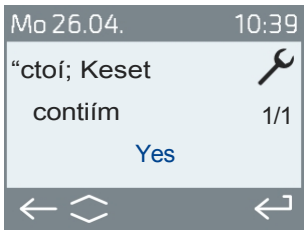



**Fig.** 007 Confirm factory reset

**Exit configuration**

**Saving** and exiting are performed in the **Safe** / **Exit** level (Fig. 008). All entered values are permanently saved.

Exiting **without saving** is done in the **Discard** / **Exit** level (Fig. 009). When the configuration is **canceled** in this way, all entries are discarded.

After confirming with 'Yes', the configuration menu is closed and the **home screen** (setpoint temperature adjustment) appears on the display.

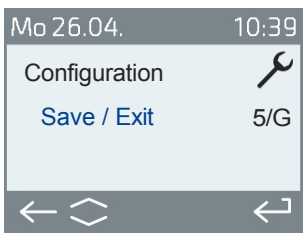



**Fig.** 008 Save and exit

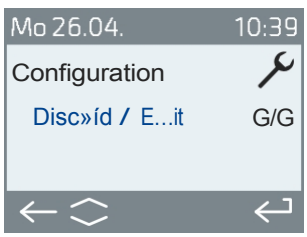



**Fig. 009** Exit without saving

## 1.2 Configuration software (PC)

The PC software **SplusS-ConfigurationTool** is used to configure the RS485 interface and all other device parameters. Furthermore, an existing **device configuration** can be saved within the software and **transferred** to other devices. Thanks to the innovative CuRA function (Customized Register Assignment), each data point can be assigned an individual register address (see chapter 1.5).

The software accesses the Modbus structure of the device and can read (r) or read/change (r/w) all values. The configuration options range from the adjustment range of the setpoints and the brightness setting of the display to the bus parameters.
Inputs via the **RS485 interface** are still possible.

**System requirements (PC)**

Windows operating system.....Win7 / Win8.x / Win10 / Win11
System type: ..... 32-bit or 64-bit
CPU .....2 GHz
Free HD storage space .....100 MB
: ..... min. 1 GB (2 GB for Win11)
Screen resolution: ..... min. 1400 x 1050 pixels USB connection required!

**Download (exe)**

The SplusS Configuration Tool is available online in the download area for the device at
https://www.spluss.de/collections/raumregler-rymaskon-controller

When the program is started for the first time, a security warning from **Microsoft Defender** appears, which must be confirmed with "**Run anyway**."

**Device connection**

The connection is made via the USB-C interface on the underside of the device (Fig. 010). A standard cable can be used for this (not included in the scope of delivery).
No additional power supply is required for the device.

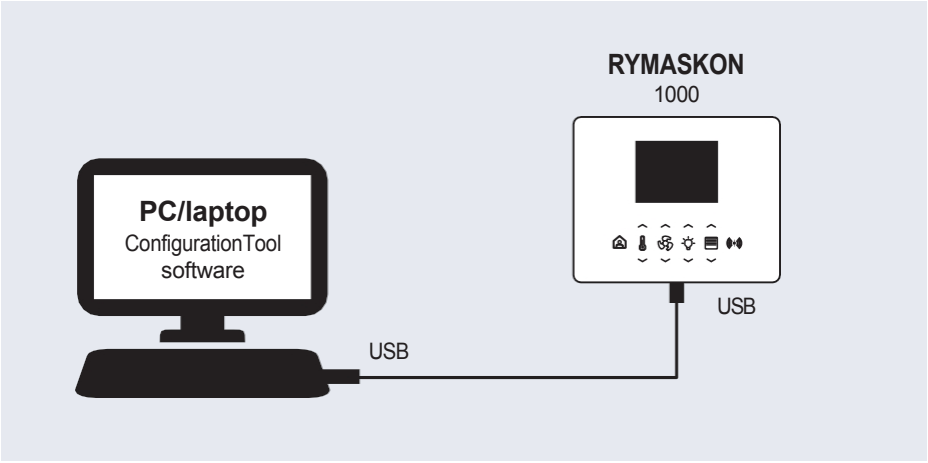



Fig. 010 Connection via USB-C interface

Configuration register

*The comments on the side refer to the relevant configuration register.*

*Note: The register address information refers to the original number (not the favorites list).*

## 1.3 Configuration register (higher-level system)

In addition to the data points that can be used to operate the device (data registers), the device can also be configured via the Modbus register.
Input is made via the GLT (RS485 interface) or using configuration software (PC).

For more information, refer to the document 'Modbus register tables' in the download area for the device at
https://www.spluss.de/collections/raumregler-rymaskon-controller

W-Modbus

## 1.4 W-Modbus

The RYMASKON® **1000** is integrated into a W-Modbus network via **the configuration menu** (see section 1.1) directly on the device (display).

**Network connection**

The connection to the W-Modbus gateway is established in the **pairing** level.
It is automatically deactivated when the learning mode is ended on the master gateway. **The network status** and **network quality** can also be checked via the menu.

**W-Modbus app**

The Lumenradio W-Modbus app can access W-Modbus devices. To do this, first activate **Bluetooth** in the configuration menu.
The device will then be visible for approx. 60 seconds and can be connected to the app.
The connection remains active until you press "Disconnect" in the app or activate pairing on the device.

The following data is available in app mode:

- Firmware updates for the wireless module
- Error detection (duplicate bus addresses, communication errors, etc.)
- Individual device names
- Network setup check
- Documentation of the network structure (PDF)

Further information can be found via the help function in the app. The app is available for Android and Apple mobile devices in the App Store.

**Link to** the **Apple** Lumenradio W-Modbus app:
https://apps.apple.com/de/app/w-modbus/id6472275984

**Link to** the **Android** Lumenradio W-Modbus app:
https://play.google.com/store/apps/details?id=com.lumenradio.wmodbus

## 1.5 CuRA (Customized Register Assignment)

The **SplusS Configuration Tool** software can be used to assign an **individual register address** to each data point. The individual addresses can be saved within the software and transferred to other devices.

This facilitates the integration of the device into an existing building automation system and can be done without reprogramming the GLT.

In addition, the **CuRA function** can also be used to create register blocks, thereby significantly increasing the query speed.

Configuration registers

**Time and date**

Time_SetSummerWinter_2017

Data registers

**Time and date**
Date_Time_2018-2023

## 1.6 Time setting (time/date)

The device has a real-time clock that automatically calculates **the time** and **date**.
When starting up, the time and date must be updated **manually** in the configuration menu (display), via the GLT (Modbus register) or using the configuration software (PC).

The time setting refers to standard time (winter time).
If required, **automatic time changeover** to daylight saving time can be activated. The configured time is retained in the event of a temporary power failure.

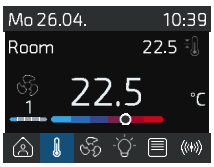
## SYMBOLS

Screen areas and symbol explanation

### DISPLAY / MENU

DISPLAY
(configurable)

Display mode (light/dark), brightness, language, units, and individual labels can be selected.




Display dark mode

HOME SCREEN
The default view is the target temperature setting with fan speeds, if applicable.

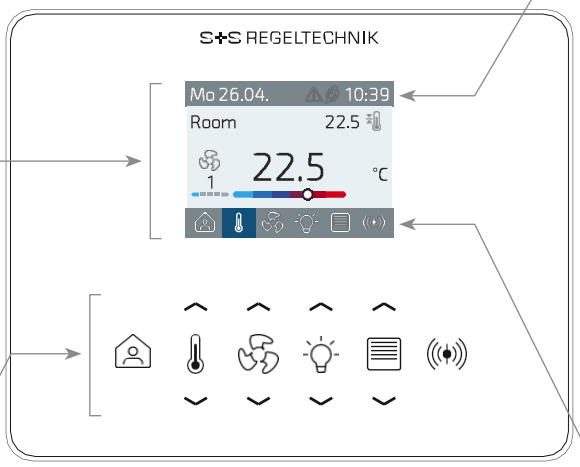



Fig. 011 Symbols using type 1401-LB as an example

### HEADER

Mo 26.04. 10:39

STANDARD DISPLAY
Weekday, date, time, summer/winter time (adjustable via Modbus).

Mo 26.04. 10:39

STATUS DISPLAY ROOM CLIMATE

- WINDOW CONTACT DEW POINT
- FROST PROTECTION
- ECO MODE

Mo 26.04. 10:39

NOTIFICATIONS

- USB
- MALFUNCTION / ALARM

### FOOT

MENU STATUS
(Options depending on type)

- Menu selection active
- Current menu Not called

**Note**:
Only functions integrated in the device type are also displayed as symbols in the footer.

### KEY (TOUCH KEYS)

SETTING THE DESIRED VALUE AND CALLING UP THE MENU USING ARROW KEYS

- UP
- DOWN

Note
Some keys are assigned additional functions in the configuration menu.

BASIC FUNCTIONS
MENU CALL PRESENCE AND SENSORS

- PRESENCE
- TEMPERATURE FAN
- SENSORS

ADDITIONAL FUNCTIONS KEY EXTENSION FOR 1 OR 2 ZONES

- LIGHT
- SUN PROTECTION

Options:
1x light / 1x sun protection, 1x or 2x light,
1x or 2x sun protection

### SYMBOLS AT A GLANCE

| | | |
|---|---|---|
| PRESENCE PRESENT | TEMPERATURE | WINDOW CONTACT |
| PRESENCE ABSENT | HEATING / HEAT | DEW POINT |
| SENSORS | COOL | FROST PROTECTION |
| FAN | OFF | ECO MODE |
| SUN PROTECTION / BLIND | AUTOMATIC | USB |
| LIGHT | KEY LOCK / LOCKED | FAULT / ALARM |

## USER INTERFACE

Structure and
operating modes

## 2.0 General user interface

In addition to the bright display view (Fig. 012), **dark mode** can also be activated. The **brightness** can be adjusted individually.

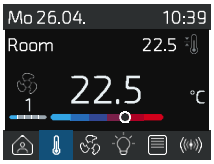
Six **languages** are available:
German, English (default), Spanish, French, Italian, Russian

**Default names** are already stored in each language (see top left of the menu content, e.g. Room) for specific environments. Regardless of this, each designation can be changed individually. A maximum of 12 characters are available for this purpose.

**Configuration register Dark mode**
Display_Dark mode_2024

**Display brightness**
Display_Brightness_2011

**Language**
Language_2009




Display dark mode

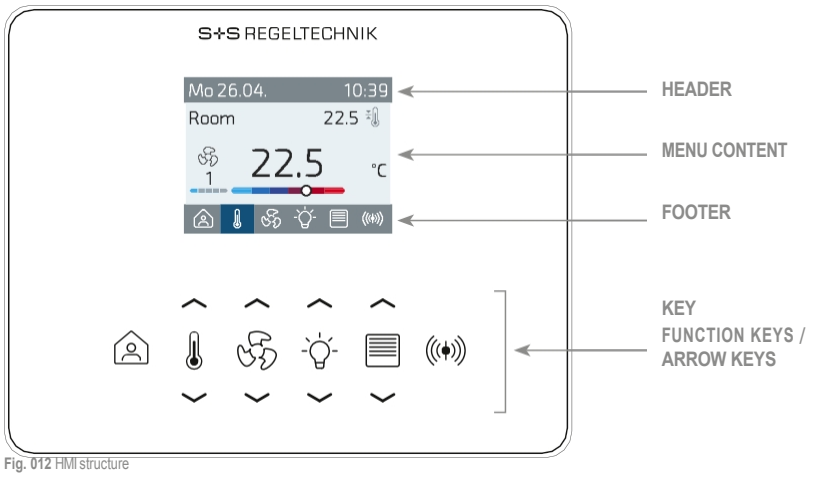



**Fig. 012** HMI structure

## 2.1 HMI (Human Machine Interface) structure

**Keypad (touch keys)**

Operation is carried out directly via the keypad.
The menus are accessed using the labeled function keys themselves or using the corresponding **arrow keys UP** (^) and **DOWN** (v).
The values in the menu can also be adjusted using the arrow keys.

The **GLT** can temporarily **lock** individual keys or pairs of keys for the user on site.

**Note:** The user interface corresponds to the respective **device type**, i.e. only integrated functions or sensors are available for selection.

**Data register**
Lock for individual keys or key pairs:

**Temperature, fan, presence**
RCBBMS_409_bitField

**Sun protection**
SP_AutoMode_700_bitField

**Light**
L_AutoMode_1100_bitField

**Header in the display (header)**

**The date** and **time** are permanently displayed in the header.
In addition to the time and date format, you can also configure automatic switching between summer and winter time.
For more information, see chapter 1.6 'Time setting (time/date)'.

**Configuration register Time and date**

Time_SetSummerWinter_2017

The **Modbus header icons** parameter can be used to display various icons via the GLT (Fig. 013). If the icons are switched via a configured DI input, refer to Chapter 7 'Inputs'.
The room climate icons trigger specific controller functions (see Chapter 9 'Controllers').

**Data register**

**Time and date**
Date_Time_2018-2023

**Header icons Modbus**
HeaderIconModbus_411_bitField

In normal operation, the following room climate icons can be displayed simultaneously:
Window contact – Dew point – Frost protection – ECO Mode

In the event of a malfunction or active access via the USB-C interface, the following status message icons are **automatically** displayed (Fig. 014):

USB-C interface connected – Malfunction / alarm
When a status message ends, the display automatically returns to the configured room climate icons. The appearance and position of the header icons are permanently programmed in the device and cannot be changed.


**Fig. 013** Header – Room climate


**Fig. 014** Header – Status messages

**USER INTERFACE**

Structure and
operating modes

## 21 HMI structure (continued)

**Footer**

All available functions are displayed in the footer (depending on the device type). The icon for the currently selected menu is highlighted in color in the footer.

The appearance and position of the footer icons are permanently programmed in the device and cannot be changed.

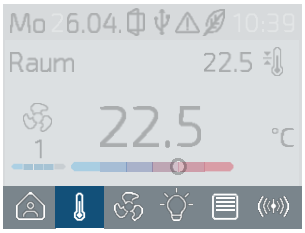



**Fig. 015** Footer – Temperature active

## 22 Screen saver

The screen saver helps to reduce energy consumption. In the delivery state, the graphical

user interface is automatically deactivated.
if the device is not operated for 20 seconds. The screen saver appears. The display switches to black and only the actual temperature display moves within the screen area.

Touching **any key** (touch key) reactivates the graphical user interface and the **home screen** (setpoint temperature adjustment) appears on the display.

Configuration register

**Screen saver**
ScreenSaver_Timeout_2012

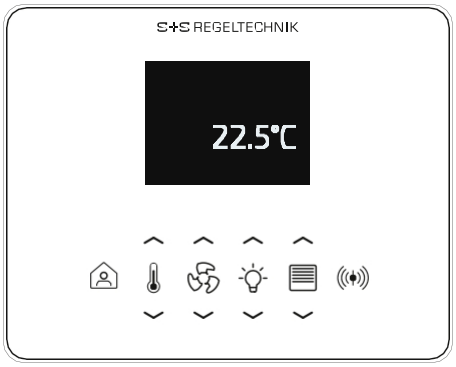



**Fig. 016** Screen saver

## 23 cleaning mode (key lock for 20 s)

To activate cleaning mode, press and hold the **SENSOR** button ( ) immediately followed by the **DOWN** arrow button ( ) for temperature adjustment. **Press** both buttons together for **3 seconds** (Fig. 017).

Immediately afterwards, all buttons are temporarily **locked** for **20 seconds.**
During this time, the **cleaning countdown** will be displayed (Fig. 018).

Once the countdown has elapsed, cleaning mode is **automatically ended**
and the **home screen** (set temperature adjustment) appears on the display.

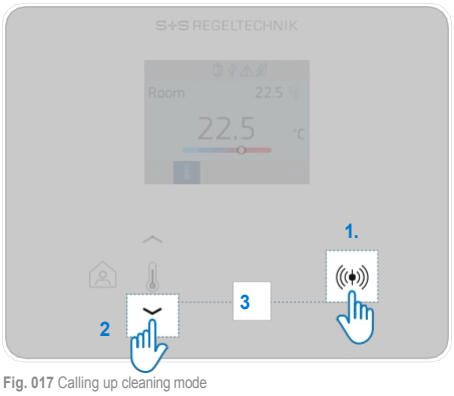



**Fig. 017** Calling up cleaning mode

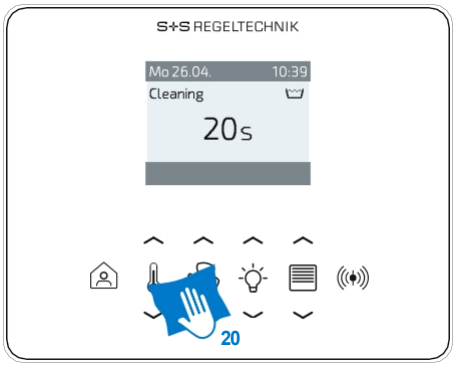



**Fig. 018** Cleaning mode – key lock with countdown

Do not allow liquids to enter the device! Use only a slightly damp cloth for cleaning. The device remains connected to the mains during cleaning – take special care.
No liability is accepted for damage caused by improper cleaning.

## 24 Key lock (child safety lock)

To activate or deactivate the key lock, press and hold the **SENSOR** button , immediately followed by the **UP** arrow button on the temperature control. **Press** both buttons together for **3 seconds** (Fig. 019).

The active key lock is indicated in the header with the **LOCKED** icon (Fig. 020). After deactivation, the home screen (setpoint temperature adjustment) appears on the display.

**Note:** The **BMS** can lock individual buttons or pairs of buttons for the user on site. This is not shown on the display. Deactivation is only possible via the BMS.

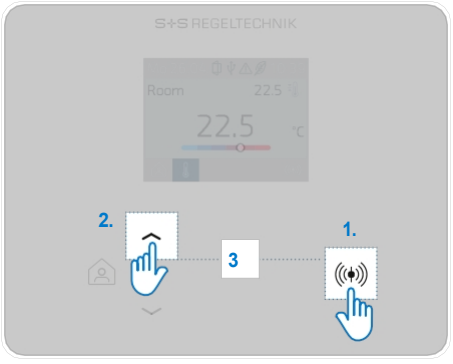



**Fig. 019** Activating/deactivating the key lock

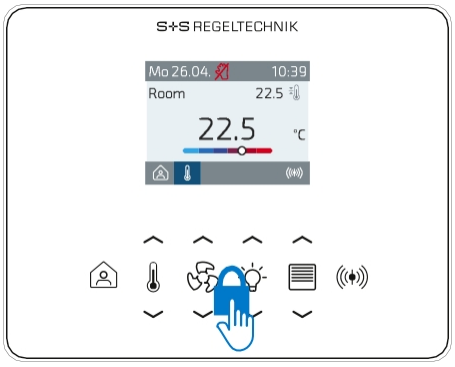



**Fig. 020** Icon in header – key lock active

**SETPOINT TEMPERATURE**
Display and adjustment

**Data register**

**Room climate controlled by BMS**
RCBBMS_409_bitField

## **3 .0 General temperature menu** (setpoint temperature adjustment)

The setpoint temperature is set using the UP ^ and **DOWN** arrow keys ⌄ on the **TEMPERATURE** icon ( ) (Fig. 021).

**The BMS** can be used to **temporarily disable manual adjustment (manual mode) for the** user. . This lock is not shown on the display.

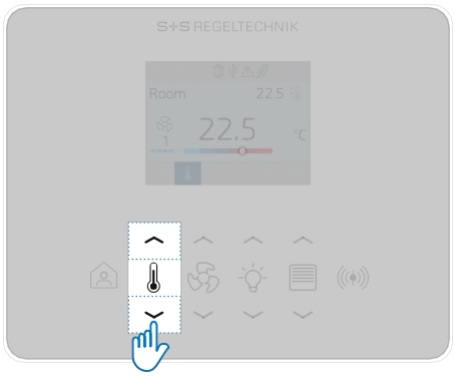



**Fig.** 021 Setpoint temperature adjustment via arrow keys

**Display**

In the temperature menu, the actual temperature, unit, setpoint temperature, operating mode, designation, and current fan speed can be shown or hidden (Fig. 022).
The display is configured via the Modbus register.

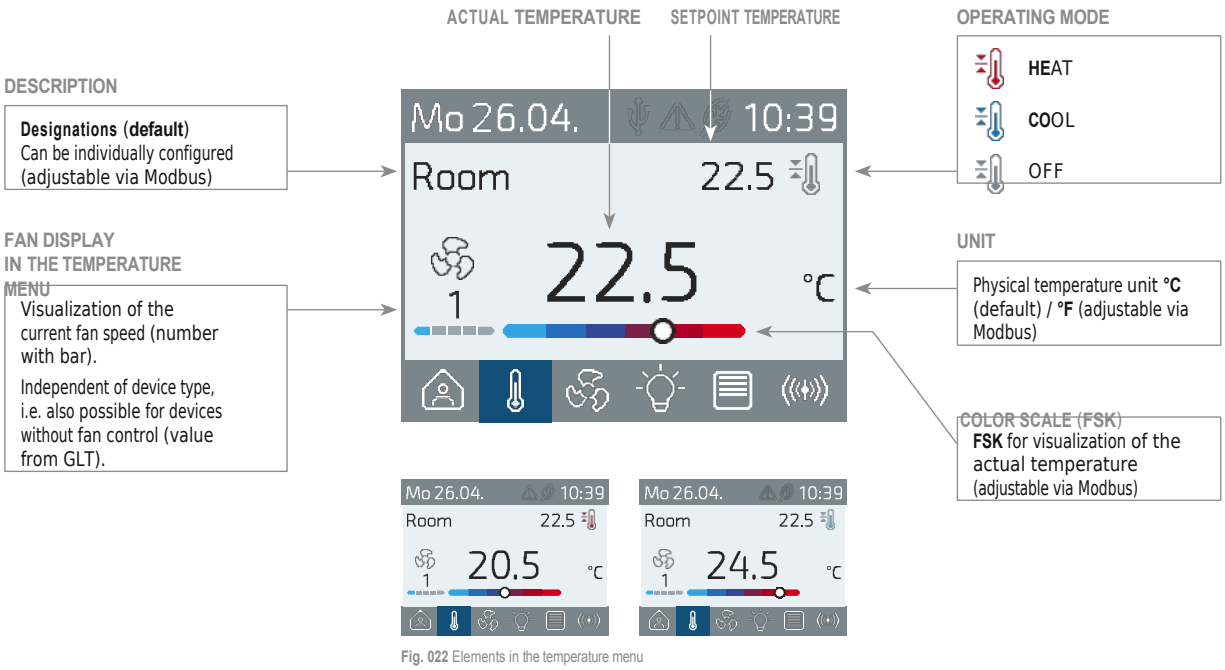



**Fig. 022** Elements in the temperature menu

**Configuration register**

**Actual temperature assignment**
CurrentTemp_Mapping_3650

**Temperature unit**
Temp_Unit_2010

**Display of setpoint temp**
Setpoint_Temp_Display_3602

**Actual temperature display**
CurrentTemp_Display_3651

**Data register**

**Temp Sensor 1 int. value**
TempS1Int_Value_100

**Temp Sensor 2 ext. value**
TempS2Ext_Value_106

**Temp sensor 3 bus value**
TempS3Bus_Value_120

## 3.1 Actual temperature

**A** total of three **temperature channels** are available. These can be assigned in the configuration register using the Actual temperature parameters. The **values** of the individual channels are stored in the data register (read or read/write register).

1. Temperature channel: **Internal sensor** (default)
   Parameter: **Temp Sensor 1 int. Value**
2. Temperature channel: **External sensor** (input must be configured accordingly) Parameters:
   **Temp Sensor 2 ext. Value**
3. Temperature channel: **Bus value**
   Parameter **Temp Sensor 3 bus value**

The temperature **unit** can be configured for all channels. **The** default **°C** can be changed to **°F**.

The **color scale** (**FSK**) is assigned to the actual temperature and is used to better visualize cold or warm environments. Each sensor has its own FSK, which is set to a value range in °C when delivered.
to a value range in °C. When changing to °F, the FSK must be adjusted. (For configuration, see chapter 5)

The **designation** is assigned to the sensor and can be configured for each of the three **temperature** channels **(internal/external/bus)** using the **Temp Sensor ... Designation** parameter
f o r each of the three temperature channels (internal/external/bus). (For details, see Chapter 5)

The **display** of the actual temperature can be hidden or replaced with another sensor (e.g., relative humidity or CO2) using the **Actual Temperature Display** parameter.

## 3.2 Setpoint temperature

The display of the **setpoint** temperature can be configured as follows using the **Display Setpoint Temp** parameter:

- **No display**
- **Setpoint temp absolute** (default)
- **Setpoint temp. offset**

Alternatively, the **Display setpoint temp** parameter can be used to display a different sensor instead of the setpoint temperature (e.g., relative humidity or CO2). If set to Alternative and the setpoint temperature is changed using the buttons, the display jumps to the setpoint temperature for a moment and then switches back to the alternative.

The absolute **setpoint** temperature (**Setpoint Temp Absolute**) is calculated from the sum of the setpoint and offset. The setpoint (**Setpoint Temp**) is set via the bus or the configuration software.
The offset (**setpoint temp. offset**) can be changed during operation using the buttons or the bus.

The limits for the setpoint adjustment via the buttons can be specified using the **Setpoint Temp Offset Min-Max** parameter.

The values **Setpoint Temp** and **Setpoint Temp Offset Min-Max** are stored in volatile memory (VRAM) and are reset to default when the device is restarted. The default values can be specified using the two parameters **Setpoint Temp after device restart** and **Setpoint Temp Offset Min-Max after device restart**.

The setpoint gradation is set using the **Setpoint Temp Offset Step Size** parameter.

**Configuration register**

**Setpoint temp offset step size**
Setpoint_Temp_Offset_StepSize_3600

**Display operating mode**
OpMode_Display_3601

**Target temperature after device restart**
Setpoint_Temp_AfterReboot_3603

**Setpoint temp offset min-max after device restart**
Setpoint_Temp_Offset_MinMax_AfterReboot_3604

**Display fan speed Temperature menu**
Fan_DisplayInTempMenu_3764

**Data register**

**Setpoint Temp**
Setpoint_Temp_400

**Setpoint temp offset**
Setpoint_Temp_Offset_401

**Setpoint temp absolute**
Setpoint_Temp_Absolute_402

**Setpoint temp offset min-max**
Setpoint_Temp_Offset_MinMax_403

**Operating mode status**
OpMode_Status_404

## 3.3 Operating mode

The following **icons** are displayed to indicate the current operating mode:
**COOL (** ) **HEAT (** ) **OFF (** Heating/cooling off)

The display of the icons can be hidden using the **Operating mode display** parameter.

## 3.4 Fan display

The display of the current fan speed (number with bar) in the temperature menu can be hidden or displayed using the parameter **Fan speed display** in **the temperature** menu.

**Note:** The display of the fan speeds in the temperature menu is independent of whether the device has fan control or not. For devices without fan control, the fan speeds are specified
fan stages is specified exclusively by the BMS.

The operation and configuration of the fan control are explained in the following chapter 4, "Fan menu."

## FAN CONTROL

Display and adjustment

**Configuration register**

**Fan speed display**
**Temperature menu**
Fan_DisplayInTempMenu_3764

**Data register**

**Room climate controlled by BMS**
RCBBMS_409_bitField

### 4.0 **Fan menu general** (fan adjustment)

The **fan menu** is only available for device types **with** fan adjustment.
The fan can be adjusted manually (manual mode) by the user using the **UP** ( ) and **DOWN** ( ) arrow keys on the **FAN** icon ( ) (Fig. 023).

Regardless of the device type, the **fan speeds** can be set **in the temperature menu.** via the GLT (see section 3.4 'Fan display').

The BMS can be used to temporarily disable manual adjustment (manual mode) for the user via the parameter **Room climate Controlled By BMS** . This lock is not shown on the display.

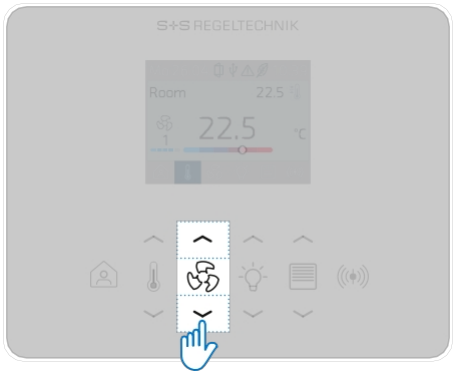



Fig. 023 ' ' Fan adjustment via arrow keys

**Display**

The fan menu can display the set fan stages, number of fan stages, operating states (Auto / Off) and designations (Fig. 024). The display is configured via the Modbus register.

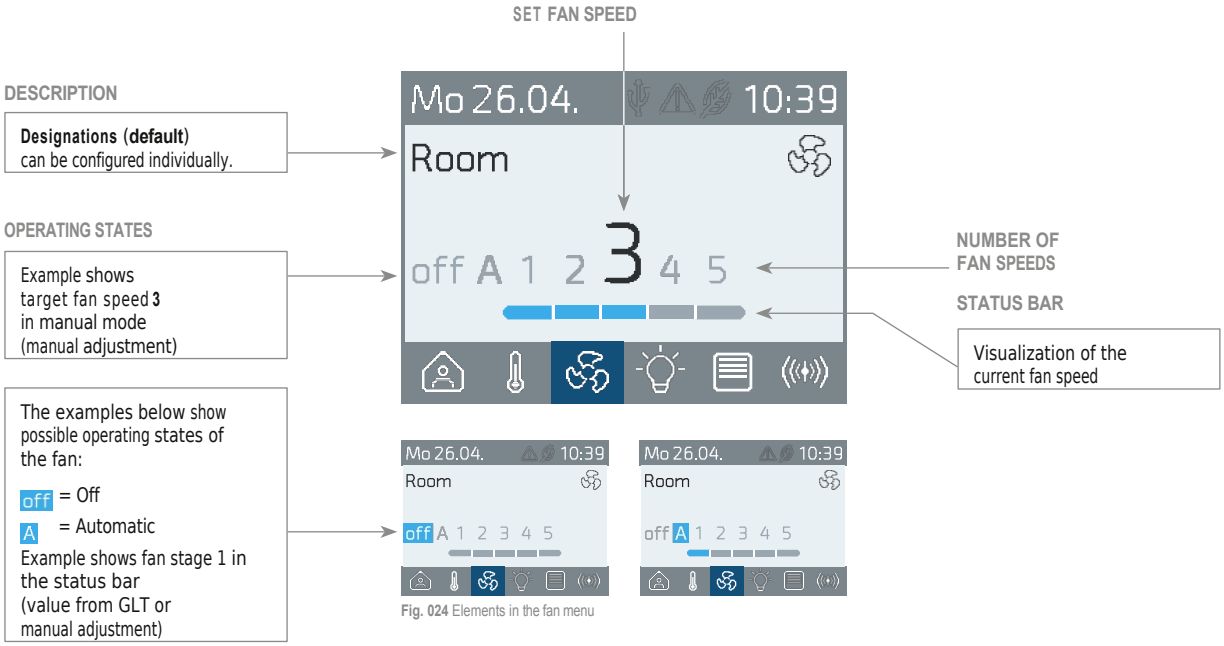



Fig. 024 Elements in the fan menu

**Configuration register**

**Number of fan speeds**
Fan_NumberOfSteps_3762

**Enable fan auto off in manual mode**
Fan_EnableAutoOff_3763

**Fan label**
Fan_Label_3750-3761

**Data register Fan speed**

**Auto mode**
Fan_AutoMode_406

**Setpoint fan level**
Setpoint_Fan_Level_407

**Room climate controlled by BMS**
RCBBMS_409_bitField

## 4.1 Number of fan stages

The number of fan speeds (1-5) depends on the device type of the fan being operated. The corresponding number is entered via the parameter **Number of fan speeds** to obtain a realistic display.

## 4.2 Operating status of the fan (Auto / Off)

The two operating states of the fan, 'Auto' and 'Off', are set via the parameter **Fan** enable **Auto Off** for manual operation by the operator on site.

**Auto**= Fan in automatic mode (default)

**Off** = Fan off

The behavior of the controller is described in Chapter 9, "Controllers."

## 4.3 Fan designation

Default designations for the fan are stored for each language (see chapter HMI structure). Regardless of this, the designation can be changed individually using the **Fan designation** parameter. A maximum of 12 characters are available for this.

## 4.4 Target fan speed

The entries for fan control in normal operation are made using the two parameters **Fan level Auto mode** and **Setpoint fan** level (see table).

| | **Status 1** Manual mode | **Status 2** Automatic mode |
|---|---|---|
| **Fan level Auto mode** Fan_AutoMode_406 | 'Manual | 'Auto |
| **Desired fan speed** Setpoint_Fan_Level_407 | 'Off / 1...5' | Value from control (see Chapter 9 'Controller') |

If automatic mode is selected using the touch buttons or the GLT (status 2), the internal controller specifies the fan speed (Off / 1...5).

The last change takes precedence in auto mode (touch buttons or GLT).
The GLT can temporarily disable manual adjustment (manual mode) for the user via the parameter **Room climate controlled by BMS** (holding register bit-coded incl. coil mapping).

**SENSORS &**
**SENSOR MENU**

Display, configuration, and calibration

## 5.0 **General sensor menu** (sensor display)

To access the **sensor menu**, press the **SENSOR** button(((•))) ly (Fig. 025).
The first enabled sensor then appears on the display. Press the sensor button again to switch to the next enabled sensor.

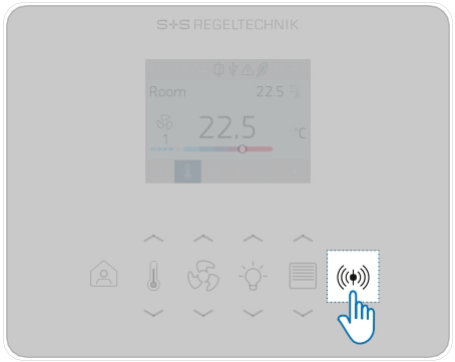



Fig. 025 Calling up the sensor menu

**Sensors and display**

All devices are equipped with a **digital temperature and humidity sensor** as standard.
**Internal sensors** for CO2 and VOC are available as options (depending on the device type).

**External sensors** can be written to the device and displayed via the bus. In addition, a **passive sensor** can be connected directly to the device at the input.

**The display** shows the current sensor values as numerical values with units and, if necessary, as a color scale (Fig. 026). The display is configured via the Modbus register.

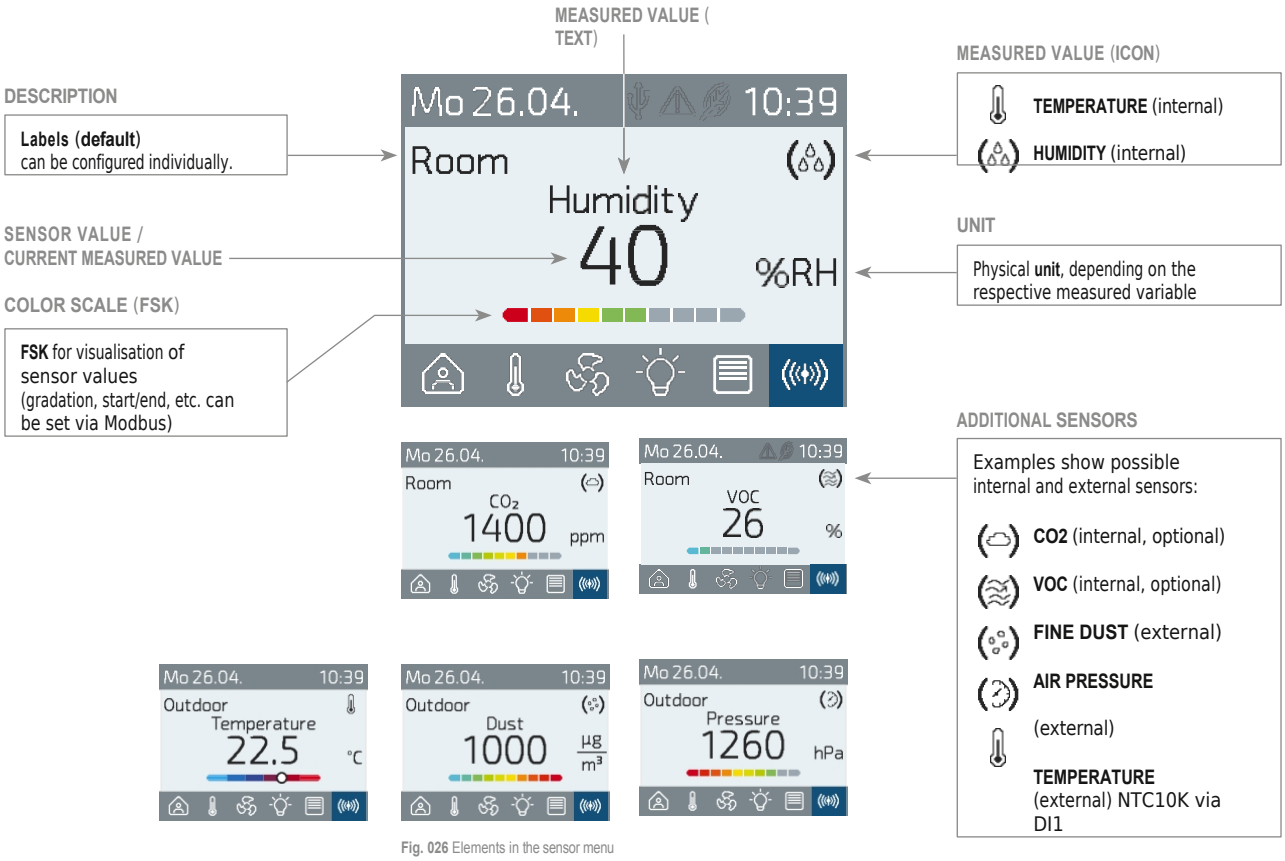



Fig. 026 Elements in the sensor menu

Configuration register

**Temperature unit**
Temp_Unit_2010

**Pressure sensor 2 bus unit**
PressureS2Bus_Unit_3516

**VOC sensor 2 bus unit**
VOCS2Bus_Unit_3316

## 5.1 Configuration of the sensor menu

All internal and external sensors (except for the internal temperature sensor) are enabled for display by default (= -enabled sensor **menu display**).

As soon as a measured value is available to the device, it is displayed in the corresponding sensor menu. The following table shows all sensors that can be displayed in the sensor menu, including the register addresses.

**Physical unit**
The temperature unit can be changed for all temperature channels via the **Temperature** unit parameter (default °C / °F).

If the **air pressure** (value from GLT) is to be shown on the display, the unit can be changed via The parameter **Pressure Sensor 2 Bus Unit** must be selected (default hPa / Pa / mbar / inWC).

For the display of an external VOC sensor (value from GLT), the unit can be selected via the **VOC Sensor 2 Bus Unit** parameter (default % / ppb).

**Color scale (FSK)**
For quick visualization, the measured value is displayed below the numerical value as a color scale (default). This can be hidden for the respective sensor channel using the **FSK display** parameter. or individually configured using the **FSK start** and **FSK end** parameters (see table).

**Designation**
**Default designations for the sensors** are already stored in each language for all sensors. Regardless of this, each designation can be changed individually using the **Sensor designation** parameter. A maximum of 12 characters are available for this.

| | | Display in the sensor menu | | | | Color scale (FSK) | | Designation |
|---|---|---|---|---|---|---|---|---|
| **Register table Sensors** (excerpt) with holding addresses | | Value... | Offset<br>Offset... | Averaging duration<br>Averaging Time... | Display Sensor menu<br>EnableIn Sensor menu... | FSK Display<br>EnableColor Scale... | FSK Start / End<br>ColourScale_ Start/End... | Label<br>Label... |
| **Internal sensors** | (depending on type) | | | | | | | |
| Temp Sensor 1 | TempS1Int_... | 10 | 2312 | 2313 | 2317 | 2318 | 2314 / 2315 | 2300-2311 |
| RH Sensor 1 | HumS1Int_... | 101 | 2412 | 2413 | 2417 | 2418 | 2414 / 2415 | 2400-2411 |
| CO2 sensor 1 | CO2S1Int_... | 102 | 2512 | 2513 | 2517 | 2518 | 2514 / 2515 | 2500-2511 |
| VOC sensor 1 | VOCS1Int_... | 103 (ppb)<br>104 ( | – | 2613 | 2617 | 2618 | 2614 / 2615 | 2600-2611 |
| **Passive external sensor** | (input DI1) | | | | | | | |
| Temp Sensor 2 | TempS2Ext_... | 106 | 2912 | 2913 | 2917 | 2918 | 2914 / 2915 | 2900-2911 |
| **External sensors** | (values from GLT) | | | | | | | |
| Temp Sensor 3 | TempS3Bus_... | 12 | – | – | 3017 | 3018 | 3014 / 3015 | 3000-3011 |
| RH Sensor 2 | HumS2Bus_... | 121 | – | – | 3117 | 3118 | 3114 / 3115 | 3100-3111 |
| CO2 sensor 2 | CO2S2Bus_... | 122 | – | – | 3217 | 3218 | 3214 / 3215 | 3200-3211 |
| VOC sensor 2 | VOCS2Bus_... | 123 | – | – | 3317 | 3318 | 3314 / 3315 | 3300-3311 |
| PM Sensor 2 | PMS2Bus_... | 124 | – | – | 3417 | 3418 | 3414 / 3415 | 3400-3411 |
| Pressure sensor 2 | PressureS2Bus_... | 125 | – | – | 3517 | 3518 | 3514 / 3515 | 3500-3511 |

Data register

**CO2 Sensor 1 int. automatic calibration**
CO2S1Int_AutoCalibr_302

## 5.2 Calibration of internal CO2 and VOC sensors

Devices with integrated CO2 and/or VOC sensors perform calibration automatically. Regular ventilation of rooms with fresh air increases the measurement accuracy of the sensors.
The automatic calibration of the CO2 sensor is activated (default) when the device is delivered. The automatic calibration of the VOC sensor cannot be deactivated.

For **automatic calibration** (CO2/VOC), only a regular supply of fresh air is required. The device detects this condition and automatically performs self-calibration.

Proceed as follows for self-calibration:
Once a week, open all windows completely for 15–20 minutes or set the ventilation system to outside air. If possible, everyone should leave the room ($CO_2$) and the release of volatile organic compounds/mixed gases (VOC) should be prevented.

**Manual calibration** (CO2) can be performed independently of automatic calibration. Proceed as follows for manual calibration: First, open all windows completely for 15–20 minutes or set the ventilation system to outside air. If possible, everyone should leave the room.

Data register

**CO2 sensor 1 int. reset (auto zero)**
CO2S1Int_ResetAutozero_300

Start the **autozero** process via the bus or the RYMConfig software.
Keep the window open or leave the ventilation system set to outside air. After **10 minutes,** the manual calibration process (CO2) is complete.
The bus value for Autozero jumps back to **OFF** when activated.

E /
**ABSENCE**
Display and
configuration

[Configuration register]

**Presence Absent Function enable**
Presence_Function_3800

[Data register]

**Presence Status**
Presence_Status_405

**Room climate Controlled By BMS**
RCBBMS_409_bitField

**Devices with 24 V supply:**

**Input 1 and input 2 may only be switched against GND (potential-free)!**

**Applying voltage to both inputs will destroy the device!**

**Devices with 230V power supply:**

**Input 2 is a 230V input (see connection diagram!).**

**The power supply and input must be in the same phase.**

## 6.0 **Presence menu general** (presence change)

Press the **PRESENCE** button to open the presence menu (Fig. 027) and a presence change is executed. In the "absent" status, device operation is defined via **Presence Absent Function Enable**.

The GLT can temporarily disable the PRESENCE button via the parameter **Room climate Controlled By BMS** .

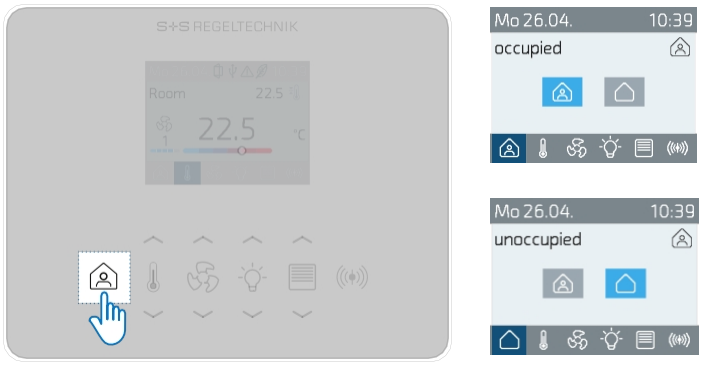



**Fig. 027** Calling up the presence menu

**Display and description**

The active presence status is indicated by the symbols **OCCUPIED** or **UNOCCUPIED** .

The terms in the respective language are permanently stored and cannot be changed by the user.

| **Language** | | |
|---|---|---|
| English (default) | occupied | unoccupied |
| German | present | absent |
| French | présent | absent |
| Spanish | presente | ausente |
| Italian | present | assente |
| Russian | занят | свободно |

**Change of presence**

The room occupancy is stored in the **Presence Status** tab and the icon "occupied" or " unoccupied" above it. The **Presence Status** tab can be influenced in three ways:

- Via the PRESENCE **button** on the device
- Via the **Presence Modbus** tab
- Via the digital inputs **DI1** / **DI2**

**PRESENCE**

Logic

## 6.1 Presence status

The following simplified diagram shows how the parameters for changing presence status are interdependent/influence each other (Fig. 028):

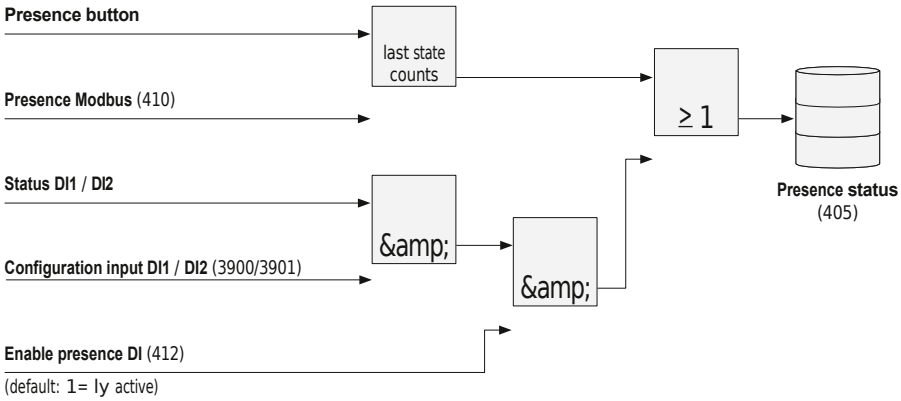



Fig. 028 Presence change

**Configuration register Input**

**1 Config.**
Input1_Config_3900

**Input 2 config.**
Input2_Config_3901

**Presence Absent Function enable**
Presence_Function_3800

**Enable presence DI after device restart**
Enable_PresenceDI_Reboot_3801

**Data register status**

**DI1 input**
D1Input_Status_126

**Status of DI2 input**
D2Input_Status_127

**Modbus presence**
Presence_Mod_410

**Presence status**
Presence_Status_405

**Enable presence DI**
Enable_PresenceDI_412

The **Modbus presence** parameter and the **presence button** on the device are equivalent. The last status set determines the **presence status.**

If a digital input (DI1 or DI2) is used as **a presence contact**, it has priority and determines the **presence status**.

As long as the presence detector reports presence at DI, the **presence Modbus** or the **presence** button.

The two digital inputs DI1 and DI2 can be used as **presence contacts.** via the parameters **Input 1 Config.** and **Input 2 Config.**

To change the **presence status** via the digital inputs, the parameter **Enable presence DI** must be set to 'active'.

**Button enable when absent**

Operation of the device while the **Presence Status** parameter is set to 'absent' can be configured as follows using the **Presence Absent Function Enable** parameter:

1. Changing the presence status to 'present' via the presence menu (default). Navigation through all menus is possible, but no setpoint adjustment is possible.
2. Change the presence status to 'present' by pressing any button. Navigation through all menus and setpoint adjustment possible.
3. No status change possible, presence status remains 'present'. Navigation through all menus and setpoint adjustment possible.

**DIGITAL INPUT DI1 & DI2**

Configuration register

**input 1 config.**
Input1_Config_3900

**Input 2 config.**
Input2_Config_3901

Data register Status

**DI1 input**
D1Input_Status_126

**Status of DI2 input**
D2Input_Status_127

**HeaderIconStatus_408**
HeaderIconStatus_...

**Header icons Modbus**
HeaderIconModbus_411_bitField

**Enable Icon DI**
Enable_IconDI_413

**Devices with 24 V supply:**

**Input 1 and input 2 may only be switched against GND (potential-free)!**

**Applying a voltage to both inputs leads This could damage the device!**

**Devices with 230V supply: Input 2**

**is a 230V input (see connection diagram!).**

**The power supply and input must be in the same phase.**

## 7.0 General inputs

The digital inputs **DI1** and **DI2** are used to detect a switching operation via a potential-free contact.

The type of digital inputs can be configured using the parameters **Input 1 config.** (DI1) and **Input 2 config.** (DI1).

## 7.1 Inputs as presence contacts

(see Chapter 6.0 'Presence')

## 7.2 Inputs as contacts for header icons

The symbols in the header can be switched via the GLT (see Chapter 2.1 'HMI structure') or via a configured DI input.
The room climate icons trigger specific controller functions (see Chapter 9 'Controllers').

During normal operation, the following room climate icons can be displayed simultaneously (Fig. 029):
Window contact – Dew point – Frost protection – ECO Mode

In the event of a malfunction or active access via the USB-C interface, the following status message icons are **automatically** displayed (Fig. 030): USB-C interface connected – Malfunction / Alarm

When a status message ends, the display automatically returns to the configured room climate icons. The appearance and position of the header icons are permanently programmed in the device and cannot be changed.


**Fig. 029** Header – Room climate


**Fig. 030** Header – Status messages

The configured symbols are shown or hidden using the **Header Icons Status** parameter. The register can be influenced in two ways:

- Via the **Header Icons Modbus** tab
- Via the digital inputs **DI1** / **DI2**

## HEADER ICONS

Logic

### 7.3 Header Icons Status

The following simplified diagram shows how the parameters of the header icons are interdependent/influence each other (Fig. 031):

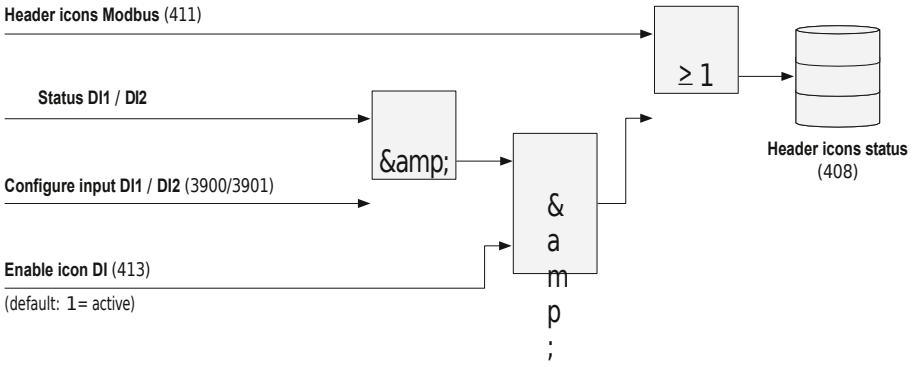



Fig. 031 Input Frost protection / Window / Dew point / ECO

| Icon | Input 1 config<br>Input1_Config_3900<br>Input 2 config<br>Input2_Config_3901 | Status DI1 input<br>D1Input_Status_126<br>Status of DI2 input<br>D2Input_Status_127 | HeaderIconStatus_408_bitField<br>depending on **HeaderIconsModbus** (411)<br>**DI icon enable** (413)<br>1= active→ Icon displayed | |
|---|---|---|---|---|
| | 13= Frost protection **normally open** | 0 Open= | Depends on **HeaderIconsModbus** (411, **bit 0**) | **Bit 0** |
| | | 1= **closed** | 1= a c t i v e → Icon Frost protection displayed | |
| | 14= frost protection **opener** | 0= **open** | 1= **active**→ Icon Frost protection displayed | |
| | | 1= closed | Depends on **HeaderIconsModbus** (411, **bit 0**) | |
| 4 | 3= Window contact **normally open** | 0= open | Depends on **HeaderIconsModbus** (411, **bit 1**) | **Bit 1** |
| | | 1= **closed** | 1= **active**→ Icon Window contact displayed | |
| | =4 Window contact **opener** o p e n | 0= **open** | 1= **active**→ Icon Window contact displayed | |
| | | 1= closed | Depends on **HeaderIconsModbus** (411, **bit 1**) | |
| | 5= Dew point monitor **normally open** | 0= open | Depends on **HeaderIconsModbus** (411, **bit 2**) | **Bit 2** |
| | | = **closed** | 1= a c t i v e → Icon dew point displayed | |
| | 6= dew point monitor normally **closed** | 0= **open** | 1= a c t i v e → Icon dew point displayed | |
| | | 1= closed | Depending on **HeaderIconsModbus** (411, **bit 2**) | |
| | 15= ECO **normally open** | 0= open | Depends on **HeaderIconsModbus** (411, **bit 3**) | **Bit 3** |
| | | 1= **closed** | 1= **active**→ Icon ECO Mode displayed | |
| | 16= ECO **opener** | 0= **open** | 1= **active**→ Icon ECO mode displayed | |
| | | 1= closed | Depends on **HeaderIconsModbus** (411, **bit 3**) | |
| | 11= Alarm **normally open** | 0= open | Depends on **HeaderIconsModbus** (411, **bit 4**) | **Bit 4** |
| | | 1= **closed** | 1= a c t i v e → Icon Alarm/fault displayed | |
| | 12= alarm normally **closed** | 0= **open** | 1 = a c t i v e → icon alarm/fault displayed | |
| | | 1= closed | Depends on **HeaderIconsModbus** (411, **bit 4**) | |

**TOUCH BUTTON E EXTENSION**

Configuration and order options
Additional pairs of buttons for lighting and sun protection (depending on model)

## 8.0 Touch button extension general

In addition to the basic models (temperature/fan), device variants with additional button pairs for **controlling lighting and sun protection** are available (Fig. 032-037).

The device type must be selected according to the desired light or sun protection circuits. Subsequent changes or additions to **the touch button assignment** are not possible.

The numbering of the light or sun protection circuits in **the Modbus register** is fixed and depends on the **code number** of the touch button extension (see table).

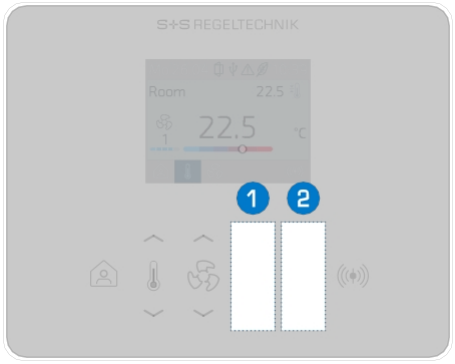



Fig. 032 Example Type 1401 (basic model)

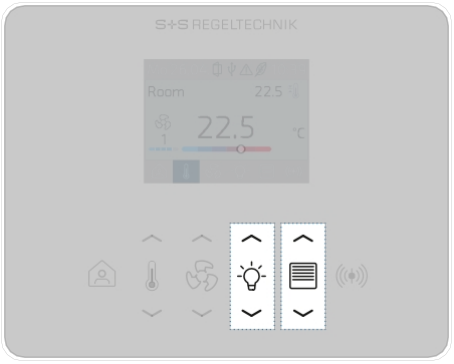



Fig. 033 Example Type **1401–LB**

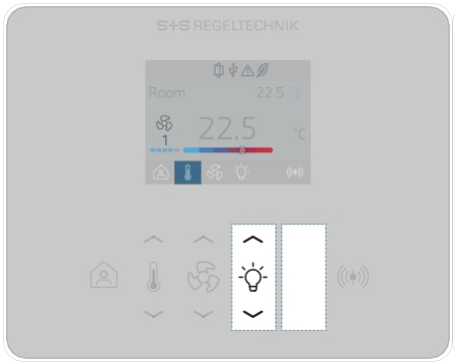



Fig. 034 Example Type **1401–L**

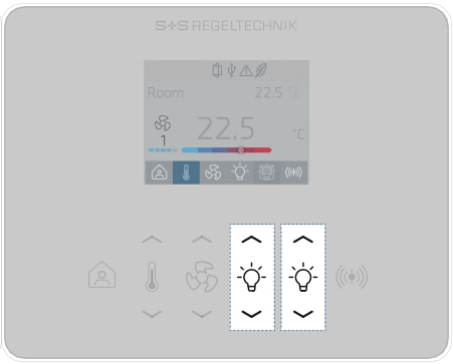



Fig. 035 Example Type **1401–LL**

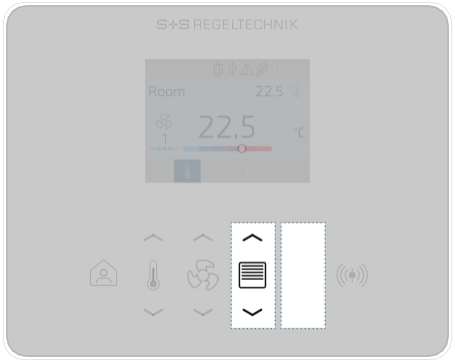



Fig. 036 Example type **1401–B**

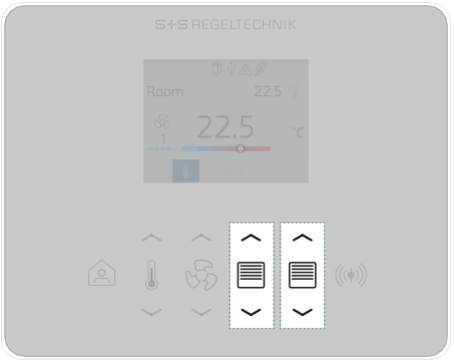
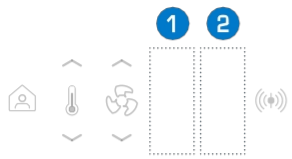



Fig. 037 Example Type **1401–BB**

| **Assignment variants for additional key pairs** (printing on front of device) | **Key extension** 1 Associated linked data register | **Key extension** 2 Associated linked Data register | **Order variants for additional key pairs** (type designation) |
|---|---|---|---|
|  | (not assigned) | (not assigned) | **Basic models**<br>Without key expansion<br>Type 13xx (temp.)<br>Type 14xx (temp. + fan) |
|  | **Light 1**<br>L_AutoMode_1100_bitField (bit0)<br>L_LightStatus_1102_bitField (bit0)<br>L1_KeyStatus_1120<br>L1_Dimm_Value_1121 | **Sun protection 2**<br>SP_AutoMode_700_bitField (bit1)<br>SP2_KeyStatus_730<br>SP2_Position_Value_731<br>SP2_Angle_Value_732 | **1x light / 1x sun protection**<br>Button extension 1+2<br>Type **13xx-LB**<br>Type **14xx-LB** |
|  | **Light 1**<br>L_AutoMode_1100_bitField (bit0)<br>L_LightStatus_1102_bitField (bit0) | (not assigned) | **1x light**<br>Button extension 1<br>Type **13xx-L**<br>Type **14xx-L** |
|  | **Light 1**<br>L_AutoMode_1100_bitField (bit0)<br>L_LightStatus_1102_bitField (bit0)<br>L1_KeyStatus_1120<br>L1_Dimm_Value_1121 | **Light 2**<br>L_AutoMode_1100_bitField (bit1)<br>L_LightStatus_1102_bitField (bit1)<br>L2_KeyStatus_1130<br>L2_Dimm_Value_1131 | **2x light**<br>Button extension 1+2<br>Type **13xx-LL**<br>Type **14xx-LL** |
|  | **Sun protection 1**<br>SP_AutoMode_700_bitField (bit0)<br>SP1_KeyStatus_720<br>SP1_Position_Value_721<br>SP1_Angle_Value_722 | (not assigned) | **1x sun protection (blind)**<br>Key extension 1<br>Type **13xx-B**<br>Type **14xx-B** |
|  | **Sun protection 1**<br>SP_AutoMode_700_bitField (bit0)<br>SP1_KeyStatus_720<br>SP1_Position_Value_721<br>SP1_Angle_Value_722 | **Sun protection 2**<br>SP_AutoMode_700_bitField (bit1)<br>SP2_KeyStatus_730<br>SP2_Position_Value_731<br>SP2_Angle_Value_732 | **2x sun protection (blind)**<br>Button extension 1+2<br>Type **13xx-BB**<br>Type **14xx-BB** |

**Note:**
Even if only one sun protection device is controlled in variant **1x light / 1x sun protection** (**LB**), the Modbus registers **Sun protection 2** are valid. The numbering or designation of the register is based on the **code number** of the touch button extension, i.e. **Light 1** / **Sun protection 2**.

**SUN PROTECTION CONTROL**
Display and symbols

Configuration register Sun protection display
SP_Display_4201

Data register sun protection auto
SP_AutoMode_700_bitField

## 8.1 **Sun protection menu** (sun protection adjustment)

The **sun protection menu** is only available on device types **with** sun protection adjustment.
Manual adjustment of the sun protection (manual mode) by the user
This is done using the **UP** ( ) and **DOWN** ( ) arrow keys on the **SUN PROTECTION** icon ( ) (Fig. 038).

The BMS can temporarily disable manual adjustment (manual mode) for the user using the **Sun protection Auto** parameter for the user. When the lock is active, adjustment is carried out exclusively by the BMS. This lock is indicated on the display as **Automatic mode** A .

The sun protection menu can be permanently deactivated using the **Sun protection display** parameter. The user can still control the sun protection using the corresponding arrow keys. The display remains unchanged (e.g. in the temperature menu).

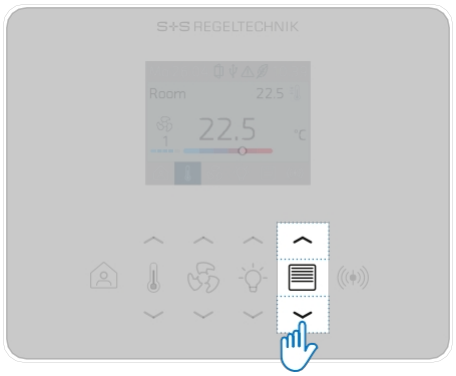



Fig. 038 Sun protection adjustment via arrow keys

### Display

In the sun protection menu, the position (up/down)
and slat angle (turned left - horizontal - turned right), operating states (Auto) and designations can be displayed (Fig. 039). The display is configured via the Modbus register.

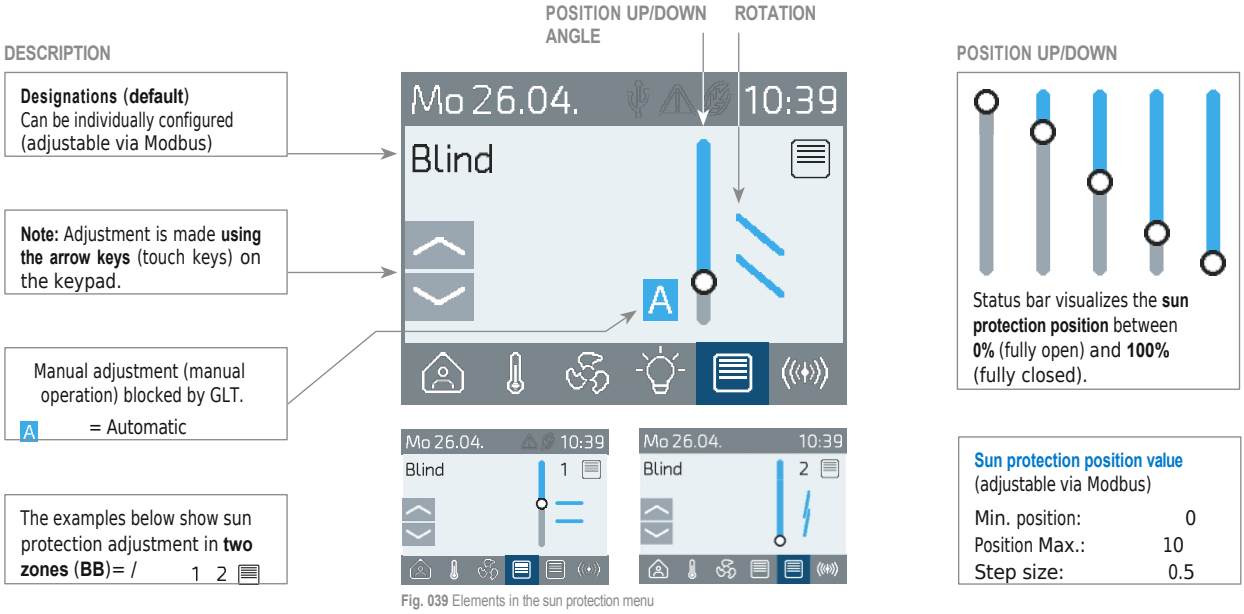
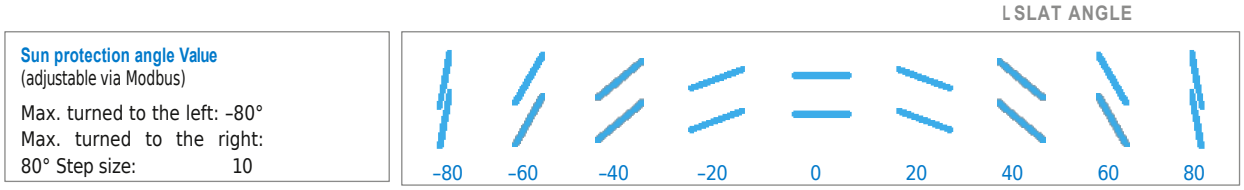



Fig. 039 Elements in the sun protection menu



## SUN PROTECTION CONTROL

Configuration and adjustment

**Configuration register Sun protection Designation**

**Sun protection type**
SP1_Type_4264
SP2_Type_4314

**Sun protection operating mode**
SP1_OpMode_4263
SP2_OpMode_4313

**Data register Sun protection button status**

**Sun protection position value**
SP1_Position_Value_721
SP2_Position_Value_731

**Sun protection angle value**
SP1_Angle_Value_722
SP2_Angle_Value_732

**Designation**

Default designations are already stored in every language for the sun protection.
Regardless of this, each designation can be changed individually using the **Sun protection designation** parameter. A maximum of 12 characters are available for this.

**Sun protection types**

The following variants can be selected using the **sun protection type** parameter:

- **Sun protection position** (up/down)
- **Sun protection slat angle** (rotation of the slats)
- **Sun protection position (+ ) Slat angle ( ) (default)**

The position of the sun protection is written using the **Sun protection position value** parameter, and the slat angle of the slats is written using the **Sun protection angle value** parameter.
This is done either by the GLT or by the user in 'Default' operating mode (see description of sun protection adjustment in 'Default' operating mode).

**Operating mode and button status**

The following variants can be configured using the **Sun protection operating mode** parameter:

- **'Short-long button'** for fast bus line (default)
  A short (< 1 s) or long (> 1 s) button press is recorded in **the Sun protection button status** data register. After reading, the GLT writes back the value **'not** pressed'.
  The BMS writes the position and angle to the **Sun protection Position Value** data register and **Sun protection angle value**. The GUI is adjusted.
- **'Press and** hold' for fast bus line (default)
  In **the sun protection button status** data register, the button press is recorded until the user releases the button. After release, the device resets the value to **'not pressed**'. The GLT writes the position and angle to the **sun protection position value** data register and **sun protection angle value**. The GUI is adjusted.
- **'Default'**
  If the user presses one of the two buttons, the position and angle are written directly to the **Sun protection position value** and **Sun protection angle value** registers. The GUI is adjusted. The GLT retrieves the values as default values.
  For the relationship between button press and the adjustment of position and angle, see the following description of sun protection adjustment in operating mode 'Default'.

### Sun protection adjustment in 'Default' operating mode (manual mode)

The user can adjust the setting using the arrow keys (touch keys) as follows:

**Configuration register Sun protection position step size**
SP1_PositionStepSize_4265
SP2_PositionStepSize_4315

**Sun protection position min**
SP1_PositionMin_4267
SP2_PositionMin_4317

**Sun protection position max**
SP1_PositionMax_4268
SP2_PositionMax_4318

**Position** (up/down)

- Short press UP ^ (< 1 s) reduces the **sun protection position value** by the set **sun protection position step size** (default: 0.5%)
- Short press **DOWN** v ( < 1 s) increases the **sun protection position value** by the set **sun protection position step size** (default: 0.5%)
- Press and hold **the UP button** (^ ) for longer than 1 second to automatically decrease the value depending on the set step size until one of the arrow buttons is pressed again or **the sun protection position Min** is reached (default: 0%, complete light incidence).
- Long press **DOWN** v (> 1 s) automatically increases the value depending on the set step size until one of the two arrow buttons is pressed again or **the sun protection position Max** is reached (default: 100%, no light incidence).

**Configuration register Sun protection angle step size**

**Sun protection angle min**
SP1_AngleMin_4269
SP2_AngleMin_4319

**Sun protection angle max**
SP1_AngleMax_4270
SP2_AngleMax_4320

**Slats angle** (rotation of the slats)

- Pressing **the UP button** briefly (^ , < 1 s) reduces the **sun protection angle value** by the set **sun protection angle increment** (default: 10°)
- Briefly press **DOWN** v **(**< 1 s) to increase the **sun protection angle value** by the set **sun protection angle step size** (default: 10°)
- Long press UP ^ ( < 1 s) automatically decreases the value depending on the set step size until one of the arrow buttons is pressed again or **the sun protection angle min** is reached (default: 0°).
- Press and **hold DOWN** (v ) for longer than 1 second to automatically increase the value depending on the set increment until one of the arrow buttons is pressed again or **the maximum sun protection angle** is reached (default: 80°).

**LIGHT CONTROL**

Display and symbols

Configuration register

**Light display**
L_Display_5301

Data register **light**

**auto**
L_AutoMode_1100_bitField

## 8.2 **Light menu** (light adjustment)

The **light menu** is only available for device types **with** light adjustment.
Manual light adjustment (manual mode) by the user is carried out using the **UP** ^ and **DOWN** v arrow keys on the **light** icon (Fig. 040).

The BMS can temporarily disable manual adjustment (manual mode) for the user via the **Light Auto** parameter for the user. This lock is indicated on the display as **automatic mode** A
.

The light menu can be permanently deactivated using the **Light Display** parameter.
The operator can still control the room lighting using the corresponding arrow keys. The display remains unchanged (e.g., in the temperature menu).

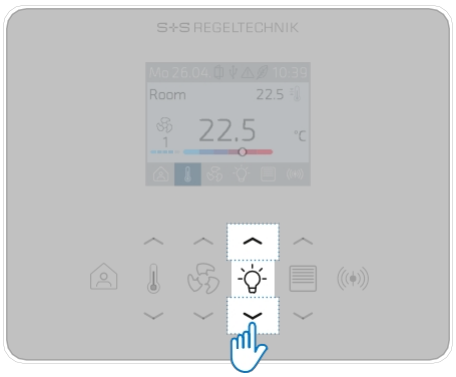



**Fig.** 040 Light adjustment via arrow keys

### Display

All statuses (off/on, dimming value 0...100%), operating statuses (Auto) and designations can be displayed in the light menu (Fig. 041). The display is configured via the Modbus register.

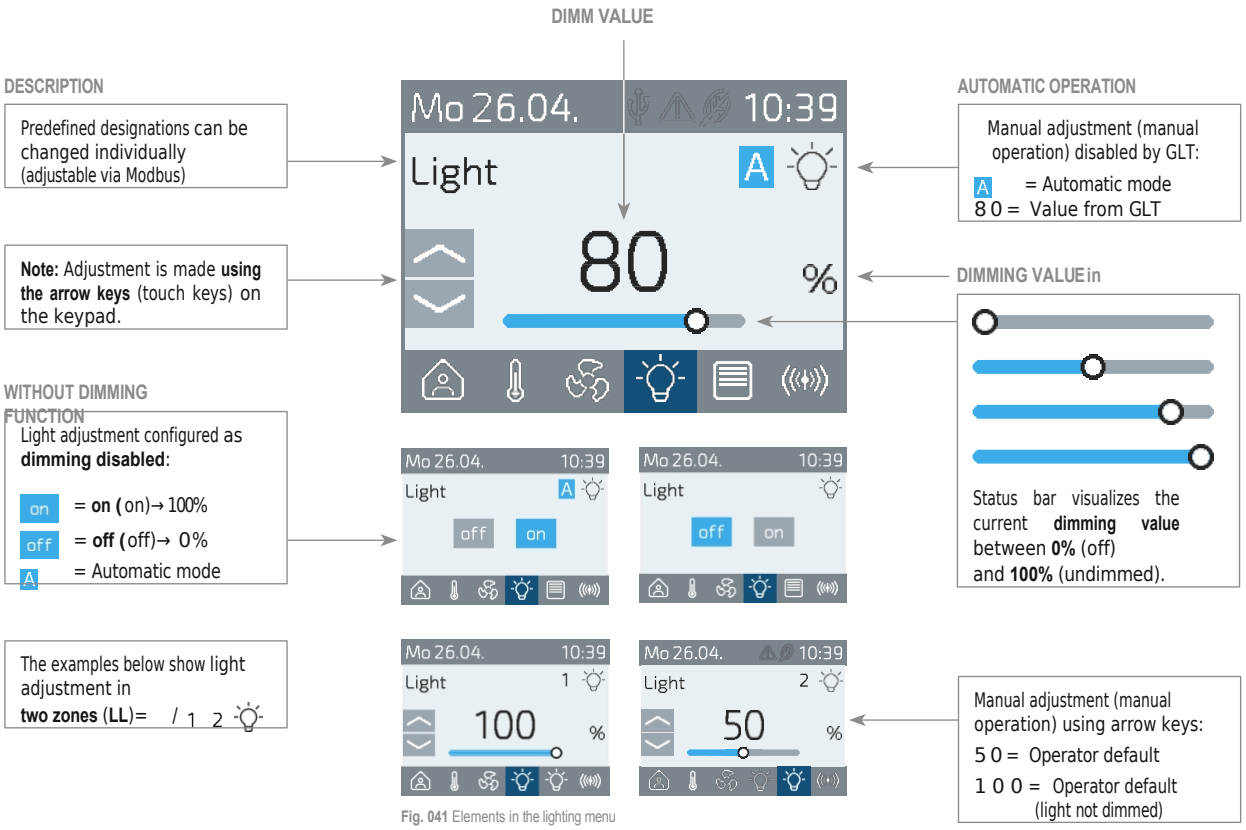



**Fig. 041** Elements in the lighting menu

## LIGHT CONTROL

Configuration and adjustment

**Light configuration**

**register Designation**
L1_Label _5350-5361 L2_Label _5400-5411

**Light dimmable**
L1_Dimmable_5363
L2_Dimmable_5413

**Light operating mode**
L1_OpMode_5364
L2_OpMode_5414

**Data register Light**

**Push button status**

**Light dimming value**
L1_Dimm_Value_1121
L2_Dimm_Value_1131

**Light all states**
L_LightStatus_1102_bitField

**Designation**

Default names for the light are already stored in each language.
Regardless of this, each designation can be changed individually using the **Light designation** parameter. A maximum of 12 characters are available for this purpose.

**Light types and states**

The following light types can be selected using the **Light dimming capability** parameter:

- **Light dimming disabled** (off: 0% / on: 100%)
- **Light dimming enabled** (dimming value: 0...100%) (**default**)

The dimming value is written using the **Light Dimming Value** parameter.
The description is entered either by the GLT or by the user in the 'Default' operating mode (see description of light adjustment in the 'Default' operating mode).

The parameter **"Light all states"** is mapped to the coil register and linked to the holding parameter "**Light dim value":**

- **Dimming value= 0%** (by user or GLT)→ bit in **Light all states** to 0
- **Dimming value> ely 0%** (by user or GLT)→ bit in **Light all states** to 1

All lights can be switched on or off with a bit change (0/1) using the parameter **Light all states** (Coil Mapping). The dimming value is set to 0% or 100%.
Note: The device does not retain the previous value.

Example

**Light 1** has a dim value of 50% (dimmed). This results in the following parameter entries:
**Light 1 Dimming** value= 50, **Light all states** bit 0= 1 (Coil Mapping)
The GLT now changes **all states** to **light** (bit 0) or from 1 to 0 in the corresponding coil register. The **light dim value** parameter follows automatically and then has the value 0.

Example 2

**Light 1** has a dimming value of 0% (light off). This results in the following parameter entries:
**Light 1 Dimming** Value= 0, **Light all states** bit 0= 0 (coil mapping)
The GLT now switches to **Light all states** (bit 0) or from 0 to 1 in the corresponding coil register. The **Light Dimming Value** parameter follows automatically and then has the value 100.

**Operating mode and button status**

The following variants can be configured using the **Light operating mode** parameter:

- **Short-long push button** (default)
  A short (< 1 s) or long (> 1 s) button press is recorded in **the Light Button Status** data register. After reading, the GLT writes back the value **'not** pressed'.
  The GLT writes the dimming value back to the **Light Dimming Value** data register. The GUI is adjusted.
- **Push button hold**
  The button press is recorded in **the Light Button Status** data register until the user releases the button. After the button is released, the device resets the value to **'not pressed**'.
  The GLT writes the dimming value back to the **Light Dimming Value** data register. The GUI is adjusted.
- **Default**
  If the user presses one of the two buttons, the dimming value is written directly to the data register.
  **Light dimming value** written. The GUI is adjusted. The GLT retrieves the values as default settings.
  For the relationship between button press and adjustment of the dimming value
  see the following description of sun protection adjustment in operating mode 'Default'.

## Light adjustment in operating mode 'Default' (manual mode)

The user can adjust the setting using the arrow keys (touch keys) as follows:

**Configuration register Light dimming step size**

Light dimming activated (dimming value: 0...100%)

- Briefly press **the UP button** (^) (< 1 s) to increase the **light dimming value.** to adjust the set **light dimming step** (default: 10%)
- Pressing **the DOWN button** briefly (v , < 1 s) reduces the **light dimming value** by the set **light dimming step size** (default: 10%)
- Press and hold the **UP** button (^) for longer than 1 second to automatically set the value to 100%.
- Long press DOWN v (> 1 s) automatically sets the value to 0%.

Light dimming deactivated (off: 0% / on: 100%)

Pressing **the UP button**^ or **DOWN** button v (regardless of how long you hold it down)
The value in **the Light Dimming Value** data register is set to 0% (off) or 100% (on).

**CONTROLLER**

General and configuration

## 9.0 Controller general

The RYMASKON® **1000 controllers** are based on the RYMASKON® **1000 interface**.

While the interface has no outputs and only makes the data points available on the bus, the controllers have integrated controllers and outputs for controlling valves, fan coils, fans, etc.
The available controller types with different outputs can be
can be found in the type table and the connection diagrams (see 'Device data').

**Configuration register**

**Operating mode after device restart**
ContrOpMode_AfterReboot_8053

**Data register**

**Operating mode default Modbus**
ContrOpMode_Setpoint_1607

**Changeover status**
ChangeOver_Status_1600

**Heating or cooling mode**

The specification for heating or cooling mode can be made in two ways:

1. Setting via the GLT:
   **Operating mode setting Modbus**

   0= Off
   1= Cool Auto (heating disabled→ $Y_H$= 0%)
   2= Heating Car (Cooling disabled→ $Y_K$ = 0%)
   3= Auto cooling and heating (default)

   The default value after device restart is configured via the parameter
   **O p e r ating mode after device restart**.

2. Change-over:
   **Change-over status**

   0= Changeover disabled (default)
   1 = Cooling mode (heating control circuit disabled)
   2= Heating mode (cooling control loop disabled)

   An active changeover (cooling/heating) has priority over **the Modbus operating mode setting**. The options for changing the **changeover status** are described in section 9.2 'Changeover'.

   **Important:**
   In changeover mode, the heating and cooling outputs are controlled in parallel i.e. both outputs receive the same heating or cooling output.
   The exception to this is when the secondary control circuit is used (see Section 9.4.2 'Secondary control circuit (temperature controller)').

**Configuration register**

**Controller type 2. Control loop**
2.ContrLoopType_8044

**Data register**

**Operating mode Modbus default**
ContrOpMode_Setpoint_1607

**Changeover status**
ChangeOver_Status_1600

**Control loops**

The RYMASKON® **1000 controller** has up to three independent control circuits:

1. **Control loop** (temperature control)
   - Main control loop for temperature control
   - Specification for heating or cooling mode via the parameters **Operating mode Modbus** or **changeover status**
   - Control of the heating, cooling, or 6-way valve output

2. **Control loop** (temperature control)
   - Auxiliary control loop for temperature control
   - Only works in changeover mode (together with 1st control loop)
   - Activation via parameter **Controller type 2nd control loop**
   - Control of cooling output

3. **Control loop** (fan/RCV control)
   - Only for type RYMASKON 143xC / 144xC / 145xC / 146xC (fan coil controller)
   - Follows heating/cooling (default)
   - Can be configured for humidity, CO2, and VOC control (RCV control, only dehumidification, CO2 reduction, VOC reduction)
   - Control of the 'fan' output

**Configuration register**

**Dead zone comfort**
DeadBand_Comfort_8006

**Dead zone ECO**
DeadBand_ECO_8007

**Presence override in ECO mode**
Occupied_OverrECO_8002

**Change-Over DI / Temp**
CangeOver_DITemp_8054

**Data register header**

**icon status**
HeaderIconStatus_ECO_408_bit3

**Operating mode Modbus default**
ContrOpMode_Setpoint_1607

**Change-over status**
ChangeOver_Status_1600

**Comfort mode**

Comfort mode is equivalent to the presence status 'present'.
The controller is in normal operation. In comfort mode, the dead zone between heating and cooling is set to the configured **comfort dead zone** (default: 1°C).

The dead zone is only active if the parameter **Operating Mode Modbus Default** is set to 'Cooling and Heating Auto' and the changeover is deactivated (**Changeover Status**).

**ECO mode**

An active ECO mode can be accessed via the **Header Icons Status** parameter. The options for activating/deactivating ECO mode are described in Chapter 7, "Digital inputs & header icons."

In ECO mode, the dead zone between heating and cooling is automatically set to the configured **ECO dead zone** (default: 4°C).

The dead zone is only active if the parameter **Operating Mode Modbus Default** is set to 'Cooling and Heating Auto' and the changeover is deactivated (**Changeover Status**).

If the presence function is used at the same time, the **Presence override in ECO mode** parameter can be used to configure whether the presence status 'present' overrides active ECO mode (overtime function).

**Note:**
If ECO mode and changeover are switched via the DI inputs
, the changeover has priority. If the changeover is set to a DI input via the **Changeover DI / Temp** parameter, the same input cannot be configured for ECO mode at the same time.

**Configuration register**

**Setpoint shift Presence Absent**
Setpoint_TempShift_Unocc_8000

**Behavior Setpoint Temp Offset on Presence Change**
Setpoint_Temp_Offs_PresChange_8001

**Change-over DI / Temp**
ChangeOver_DITemp_8054

**Data register Presence**

**Status**
Presence_Status_405

**Setpoint Temp**
Setpoint_Temp_400

**Setpoint Temp Offset**
Setpoint_Temp_Offset_401

**Operating mode Modbus default**
ContrOpMode_Setpoint_1607

**Changeover status**
ChangeOver_Status_1600

**Presence**

The presence status can be retrieved via the **Presence Status** parameter.
The options for changing the presence status are described in chapter 6 'Presence'. In the 'absent' state, the controller performs the following steps:

1. If the controller is configured for cooling or heating mode, the temperature setpoint (**Setpoint Temp**) is lowered (in heating mode) or increased (in cooling mode) by the parameter **Setpoint Temp Offset Presence Absent**.
2. If the controller is configured for cooling and heating mode, the dead zone is changed to twice the value of the parameter **Setpoint Temp Offset Presence Absent**.
3. The setpoint offset (**Setpoint Temp Offset**) set by the user is reset to 0° . The parameter **Behavior Setpoint Offset on Presence Change** can be used to set whether the original setpoint offset should be restored when 'present' .

**Note:**
If presence and changeover are to be switched via the DI inputs, changeover has priority. If the changeover to a DI input is set via the **Changeover DI / Temp** parameter, the same input cannot be configured as a presence contact at the same time.
, the same input cannot be configured as a presence contact at the same time.

**Standby (controller off)**

Standby (Off) is configured via the parameter **Operating mode Modbus default**. The buttons, display, and building protection remain active.
The controllers maintain the actual temperature within the building protection (see Chapter 9.1 'Temperature setpoint (main control loop)').

**Configuration register**

**Anti-jam (valve protection)**
Anti-jam_8052

**Underfloor heating heat protection sensor assignment**
UnderfloorHeatProtection_Sensor_8050

**Underfloor heating limit value**
UnderfloorHeatProtection_Limit_8051

**Min. runtime RODO heating cooling**
RODO_MinRuntime_HeatCool_8029

**Delay Switch Heating Cooling**
DelaySwitch_Heat/Cool_8030

The anti-jam function ensures that the valves do not stick when not in use for long periods of time. To do this, the device briefly activates the valves:

- **The heating and cooling output** is activated for 5 minutes (valve open).
- **The 6-way valve** is set to 10 V for 5 minutes and then to 0 V.

The inactivity time is specified via the **Anti-Jam** parameter (default: 3 days). This function is deactivated with the value '0'.

**Underfloor heating limit value**

If the limit value is exceeded, the device reduces the heating output to 0%. The value is specified using the **Floor heating limit value** parameter (default: 34 °C).

The limit value monitoring is activated automatically when a temperature sensor via the parameter **Floor heating heat protection sensor assignment**.

**Minimum runtime RO/DO output for heating/cooling**
(heat pump function, only with 2-point control)

The digital heating or cooling output RO/DO remains in the ON state for the configured minimum running time after switching on, regardless of the heating or cooling output ($Y_H$ / $Y_K$ ) of the controller.

The time is specified via the **Min. runtime RODO heating cooling** parameter. With the value '0' (default), this function is deactivated.

If a switchover between heating and cooling occurs during active monitoring of the minimum running time, the outputs are switched directly and monitoring of the running time is restarted.

**Delay when switching heating/cooling**
(heat pump function)

The switch between the two control sequences Heating and Cooling is delayed. The Heating or Cooling output is only enabled after the configured delay time has elapsed.

The time is specified via the parameter **Delay switch heating cooling**. With the value '0' (default), this function is deactivated.

**Comfort dead band**

configuration register
DeadBand_Comfort_8006

**Dead band ECO**
DeadBand_ECO_8007

**Frost protection**
Frost_Protection_8041

**Heat protection**
Heat_Protection_8042

Data register

**Setpoint Temp**

**Absolute**
Setpoint_Temp_Absolute_402

**Temperature controller setpoint**
Controller_Setpoint_Temp_1616

**Operating mode Modbus default**
ContrOpMode_Setpoint_1607

**Changeover status**
ChangeOver_Status_1600

**Header icons Status (window contact)**
HeaderIconStatus_WindowContact_408_bit1

## 9.1 Temperature setpoint (main control loop)

The parameterization, adjustment, and display of the temperature setpoint are described in Chapter 3.2 'Setpoint Temperature'.
The controller has additional functions.

**Controller setpoint temperature ($T_{setReg}$)**

The reference variable for temperature control (setpoint) is stored in **the controller setpoint temperature** ($T_{setReg}$). The setpoint is composed as follows.

In operating mode 'Cooling and heating auto':

$$T_{setpointReg} = \text{setpoint temp absolute} - \frac{\text{dead zone}}{2}$$ (Heating mode)

$$T_{setpointReg} = \text{Setpoint temp absolute} + \frac{\text{Dead zone}}{2}$$ (Cooling mode)

With active building protection:

$T_{setpointReg}$ = **Frost protection** (Heating mode)

$T_{setpointReg}$ = **Heat protection** (Cooling mode)

Other

$T_{setpointReg}$ = **Setpoint temp absolute** (Heating or cooling mode)

**Dead zone**

The dead zone is only active in 'Cooling and heating auto' operating mode.
Within the dead zone, the control variable ($Y_H$/ $Y_K$) remains at the configured minimum value (default: 0%).

**Building protection (frost and heat protection)**

Building protection is active when changeover is deactivated and one of the following conditions is met:

- **Operating mode Modbus default** is set to 'Off'.
- **Window contact** is set to 'open'.
  For configuration, see Chapter 7 'Digital inputs and header icons'.

Building protection sets the **controller setpoint temperature** to the configured parameters **frost protection** and **heat protection**. The dead zone is deactivated in this case.

The controllers remain switched off until the temperatures of the protective functions are reached. If the actual temperature reaches the temperature of the frost or heat protection, the controller is switched on again and the corresponding output is activated.

When frost protection is active, the symbol "❄" is shown in the display header (see chapter "Symbols").

**Configuration register**

**Change-Over** DI/ **Temp**
ChangeOver_DITemp_8054

**Change-over limit value for cooling**
CangeOver_TempCooling_8055

**Change-over limit value for heating**
CangeOver_TempHeating_8056

**Data register**

**Operating mode default Modbus**
ContrOpMode_Setpoint_1607

**Change-over Modbus**
ChangeOver_Modbus_1602

**Changeover status**
ChangeOver_Status_1600

## 9.2 Change-over

As an alternative to the Modbus specification, heating or cooling operation can be controlled via the changeover. In changeover mode, the heating and cooling outputs are
are controlled in parallel, i.e. both outputs receive the same heating or cooling output.
The exception to this is when the secondary control loop is used
(see Section 9.4.2 'Secondary control loop (temperature
controller)').

The changeover is used in heating and cooling systems in which the heat exchanger (FBH, cooling ceiling, radiator, etc.) is started up in a 2-pipe system. A control valve is installed upstream of the heat exchanger to regulate the flow of the medium. The control valve does not distinguish between heating and cooling mode.

The switchover between heating and cooling medium takes place at an upstream mixer (4-pipe system for simultaneous alternating heating and cooling) or
is provided by the cooling/heating generator depending on the season (only cooling in summer, only heating in winter).

If the medium is switched, this must be communicated to the RYMASKON controller via the changeover signal (Modbus or DI). The following parameters are available for configuration/presetting:

- **Changeover** DI/**Temp** (default: changeover deactivated)
- **Change-over Modbus** (higher priority)

Alternatively, the device automatically detects the changeover based on the flow temperature of the medium. For this purpose, the external temperature sensor can be connected to the flow pipe
or the flow temperature can be transmitted to the device via Modbus (temperature bus).
transfer. In this case, the **Change-Over DI/Temp** parameter must be set to external or bus temperature sensor. The temperature limits are defined via the
**Change-over cooling limit value** and **Change-over heating limit value**.

The following example (**Fig. 901**) shows a climate control system with seasonal changeover. The control valve on the heat exchanger is connected to the heating output AO1 (terminal 7) of the RYMASKON 132xC device type. In winter ( heating mode), only the heating controller is active. When switching to cooling mode in summer, the changeover signal of the refrigeration unit switches and only the cooling controller is active.

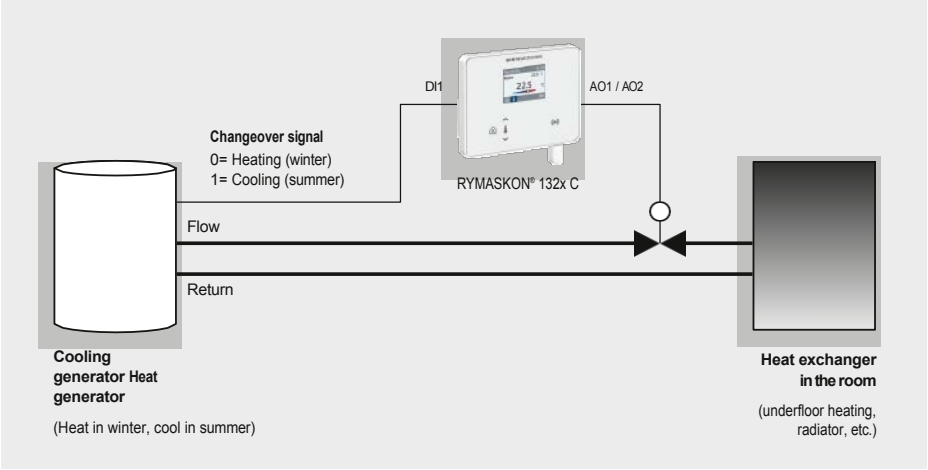



Fig. 901 C h a n g e - o v e r | 2-pipe system

An active changeover (cooling/heating) takes precedence over **the Modbus operating mode setting**. The status can be retrieved via the **Changeover status** parameter.

**Note:** If changeover is configured via the **Changeover DI/Temp** parameter
a switching contact or external temperature sensor at the input, the corresponding input cannot perform any other function.
Any value change via the bus is reset.

Configuration register

**Changeover DI / Temp**
CangeOver_DITemp_8054

**Input 1 Config**
Input1_Config_3900

**Input 2 config**
Input2_Config_3901

Data register header

**icons status**
HeaderIconStatus_DewPoint_408_bit2
HeaderIconStatus_WindowContact_408_bit1 =1

**Controller setpoint temperature**
Controller_SidePoint_Temp_1616

## 9.3 Dew point and window contact

An active dew point or window contact can be called up via the **Header Icons Status** parameter. The options for changing the status are described in chapter 7 'Digital inputs and header icons'.

If the dew point or window contact and the changeover are to be switched via the DI inputs, the changeover has priority. If the changeover is assigned to a DI input via the parameter C h a n g e -over **DI / Temp**, the same input cannot be configured as a dew point or window contact at the same time.

**Dew point**
An active dew point (condensation present) blocks the cooling controller ($Y_K$= 0%).
Condensation is detected via the **Header Icon Status** parameter.
An external dew point monitor must be used; the device does not detect dew point.

**Window contact**
A triggered window contact (open window) activates building protection (see Section 9.1 'Temperature setpoint (main control loop)').
An open window is detected via the **Header Icon Status** parameter.

## 9.4 Temperature

RYMASKON controllers feature a PI and 2-point controller for heating and cooling. The parameters of the control sequences for heating and cooling can be set separately from one another.

In addition to the main control loop (1st control loop), a secondary control loop (2nd control loop) can be activated, for example to control a secondary room via the RYMASKON controller.

Configuration register

**Controller type heating**
ContrType_Heating_8003

**Controller type cooling**
ContrType_Cooling_8004

### 9.4.1 Main control loop (temperature controller)

**PI controller** (**main control loop**)
The controller types for heating and cooling of the main control loop can be via the parameters **Controller type heating** and **Controller type cooling**. The following parameters influence the PI controller of the main control loop.

| Parameter | Holding address | Range | |
|---|---|---|---|
| **Heating controller type**= PI controller | | | |
| **Proportional band $X_P$ - Heating** | 8 | 0.1...27.0 °C / °F | (default: 2 °C / 4 °F) |
| **Reset time $T_N$ -Heating** | 8014 | 0...1200 minutes | (default: 20 minutes) |
| **Control variable heating min.** | 801 | 0 | (default: 0%) |
| **Control variable heating max.** | 8016 | 0 | (default: 100%) |
| **Controller type** c o o l i n g = P I controller | | | |
| **Proportional band $X_P$ - Cooling** | 8009 | 0.1...27.0 °C / °F | (default: 2 °C / 4 °F) |
| **Adjustment time $T_N$ -Cooling** | 80 | 0...1200 minutes | (default: 20 minutes) |
| **Control variable cooling min.** | 801 | 0 | (default: 0 %) |
| **Control variable cooling max.** | 801 | 0 | (default: 100%) |
| **Heating and cooling** | | | |
| **Control variable Temp Min. deviation** | 801 | 0 | (default: 0.2%) |
| **Control variable behavior Heating/cooling Min.** | 801 | 0<br>0 = At least the set min. value is present at the output as heating/cooling output (default)<br>1= Heating/cooling output is only applied to the output from the set minimum value. | (default: 0) |
| **PWM period** (for DO/RO outputs) | 8 | 5...60 minutes | (default: 30 minutes) |

Configuration PI controller Main control loop (temperature controller)

**PI controller** (**main control loop**)
continued

With the PI controller, the two parameters **Proportional band $X_P$** and reset **time $T_N$** .

The proportional component (P) causes the controlled variable to respond immediately to any temperature difference. The integral component (I) acts over time. The control difference (**$dT_{Reg}$** ) is calculated as follows:

$$dTReg = TSoll\ Reg - Tist$$

The value for $T_{setpointReg}$ and $T_{actual}$ depends on the operating mode and configuration (see sections 9.1 'Temperature setpoint (main control loop)' and 3.1 'Actual temperature').

The resulting control variable (**$Y_H$ / $Y_K$** ) is applied as a PWM signal to an RO/DO output or as a continuous signal to an AO output.

The calculation of the control variable is simplified in the following graphic (**Fig. 902**). From this, the diagram for the control variable as a function of the setpoint/actual temperature can be derived. (**Fig. 903**)

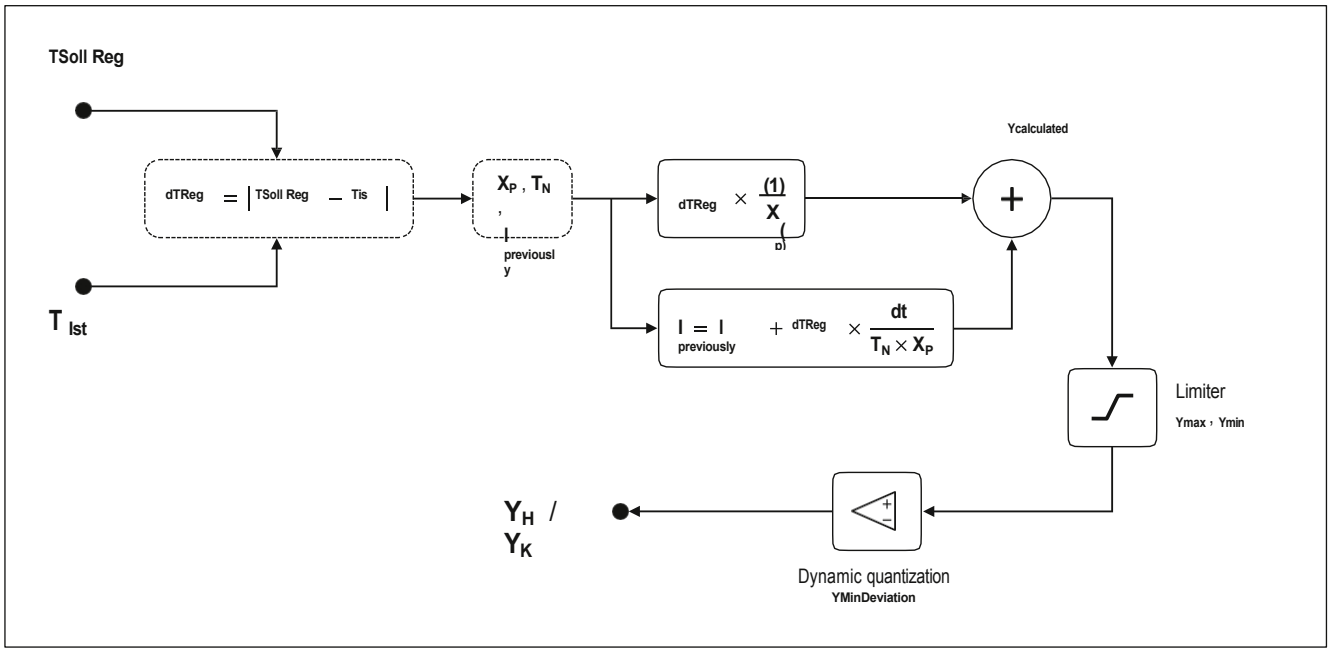
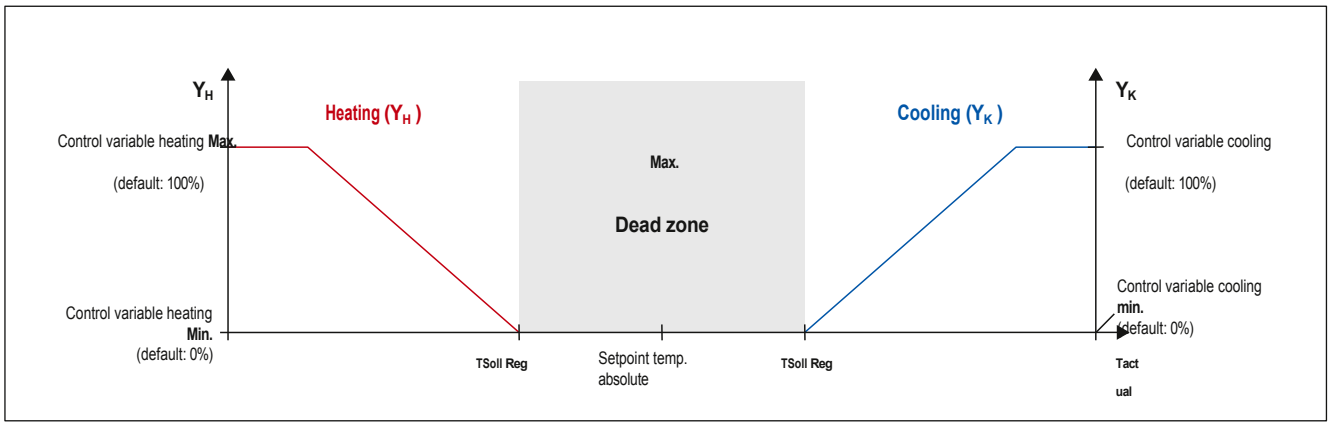



Fig. 902 PI controller (main control loop)| Calculation of the control variables ($Y_H$/ $Y_K$)




PI controller (main control loop)| Control variables ($Y_H$/ $Y_K$) as a function of the setpoint-actual temperature

**PI controller** (**main control loop**)
continued

The limiter is configured using the parameters **Control variable...Max.** and **Control variable...Min.** (see **Fig. 903** and **Table 001**).

The parameter **Behavior Control variable Heating/Cooling Min.** can be used to additionally configure whether at least the set min. value is applied to the output (**Fig. 904**) or whether the calculated control variable $Y_{calculated}$ is only applied to the output once the set min. value has been reached (**Fig. 905**).

The following diagrams show examples with 'Control variable heating Min = 20%'.

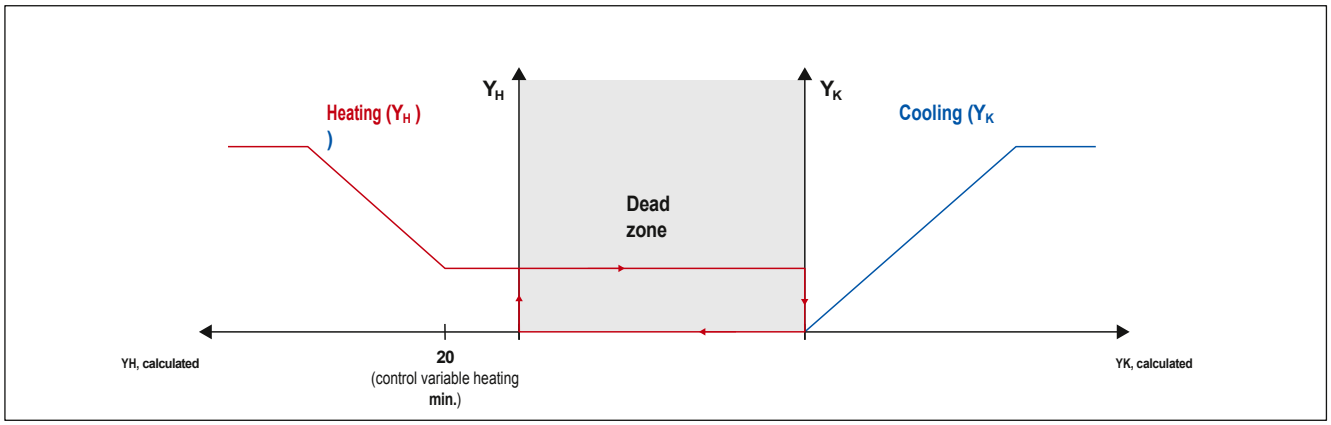



Fig. 904 PI controller (main control loop)| Behavior of control variable heating/cooling **min. = 0**

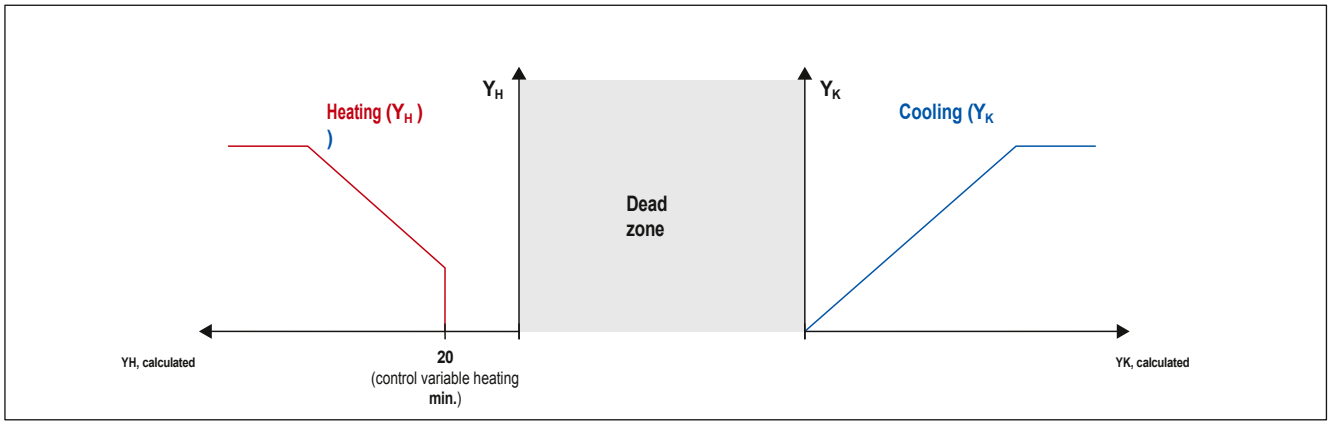



Fig. 905 PI controller (main control loop)| Behavior of control variable heating/cooling **min. = 1**

The output can be quantized linearly (stepwise output change) using the parameter **"Control variable temp min deviation**."
The parameter **"Control variable temp min deviation"** specifies the step height (see **Fig. 902** and **Tab. 001**).

For RYMASKON controllers with RO/DO outputs for heating/cooling , the continuous output signal of the PI controller is output as a PWM value. The period duration is set using the **PWM period duration** parameter.

Example: **PWM period** duration = 40 minutes, control variable $Y_H$ = 25%
→ RO/DO output 'Heating' is switched on for 10 minutes and off for 30 minutes.

Configuration register

**Controller type Heating**
ContrType_Heating_8003

**Controller type cooling**
ContrType_Cooling_8004

**2-point controller (main control loop)**

The controller types for heating and cooling the main control loop can be configured be configured using the **Controller type heating** and **Controller type cooling** parameters. The following parameters influence the 2-point controller of the main control loop.

| Parameter | Holding address | Range | |
|---|---|---|---|
| **Heating controller type**= 2-point controller | | | |
| **Heating control variable Min.** * | 8 | 0...10 | (default: 0 |
| **Control variable heating Max.** *1 | 801 | 0...100 | (default: 100 |
| **Controller type** c o o l i n g = 2-point controller | | | |
| **Control variable cooling Min.** * | 8 | 0...100 | (default: 0 |
| **Control variable cooling Max.** *1 | 801 | 0...100 | (default: 100 |
| **Heating and cooling** | | | |
| **Hysteresis** **Temperature control loop** | 80 | 0...27.0 °C | (default: 1°C / 2 °F) |
| **Control variable behavior heating/cooling Min.** *1 | 8019 | 0<br>0= At least the set min. value is present at the output as heating/cooling output (default)<br>1= No effect on the 2-point controller | (default: 0) |

*1 Parameter only relevant for devices with AO outputs for heating/cooling/6-way valve.
The effects of the parameters on the 2-point controller are analogous to those on the PI controller.

**Tab. 002** Configuration 2-point controller Main control loop (temperature controller)

The behavior of the 2-point controller (main control loop) can be represented schematically as follows (**Fig. 906**).

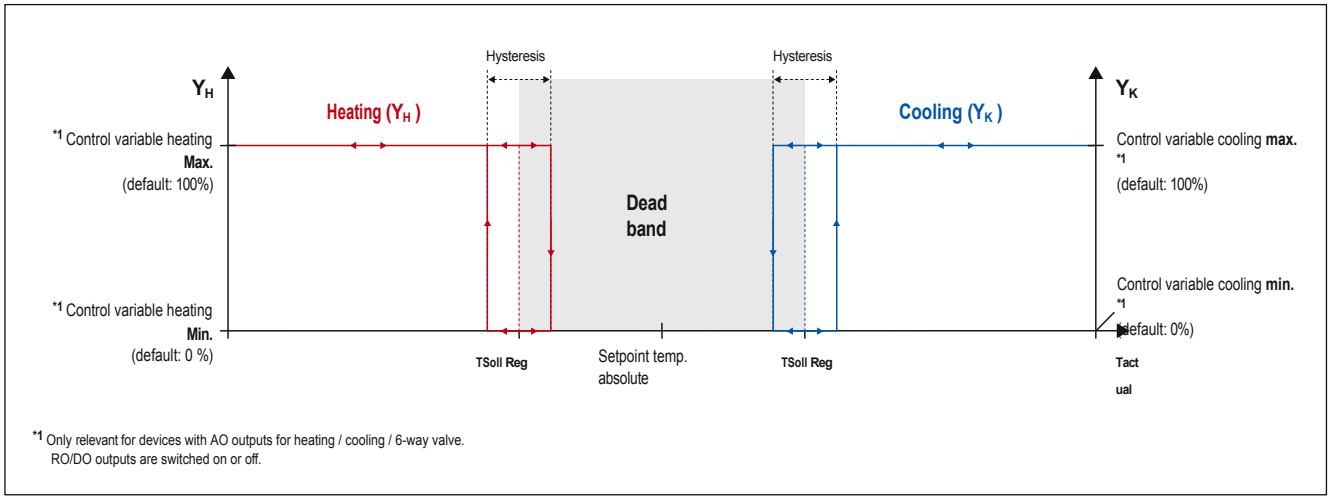



**Fig.** 906 2-point controller (main control loop)| Control variables ($Y_H$/ $Y_K$) as a function of the setpoint/actual temperature

**2-point controller** (**main control loop**)
continued

**Note**
To ensure trouble-free operation, the controller performs a plausibility check of the two parameters **dead zone** and **hysteresis**. The dead zone has priority. If the configuration of the two parameters causes the heating/cooling hysteresis ranges, the hysteresis is automatically adjusted by the device.

The controller output is adjusted to the setpoint value via the parameters **Control variable...Max.** and Control **variable...Min.** (see **Table 002**).
Limit values can be set for devices with AO outputs for heating/cooling/6-way valve. This allows the voltage at the output to be limited.

The following diagram shows the example with 'Control variable heating min= 20%' (**Fig. 907**).

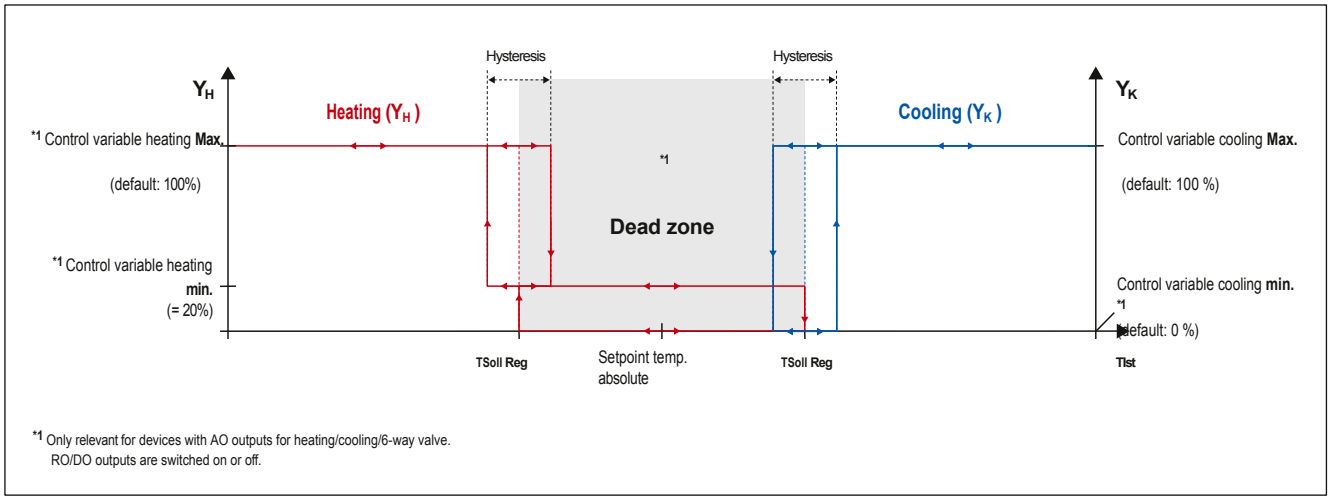



**Fig.** 907 2-point controller (main control loop)| Behavior of controlled variable heating/cooling **Min=0**

**Important for fan coil controllers with AO output for fans**
(RYMASKON 143xC / 145xC / 146xC)

If the main control loop (temperature) is set as a 2-point controller and the configuration is carried out as shown in **Fig. 007,** for example ('Heating control variable Min.= 20 %' and 'Heating/cooling control variable behavior Min.= 0'), the fan switches off at $\mathbf{T}_{\mathbf{setpointReg}}$ + ½ hysteresis, while a signal may still be present at the output for heating.

**Configuration register**

**Controller type 2. Control loop**
2.ContrLoopType_8044

**Setpoint offset 2nd control loop**
2.ContrLoop_SetTempOffset_8049

**Frost protection**
Frost_Protection_8041

**Heat protection**
Heat_Protection_8042

**Sensor assignment 2. Control loop**
2nd control loop sensor mapping

**Data register**

**changeover status**
ChangeOver_Status_1600

**Setpoint temp absolute**
Setpoint_Temp_Absolute_402

## 9.2 Secondary control loop (temperature controller)

The secondary control loop is only possible in changeover mode (together with the main control loop). The activation of changeover mode is described in chapter 9.2 'Changeover'. Furthermore, the parameter **Controller type 2. Control loop** the secondary control loop is activated (PI controller or 2-point controller).

The secondary control loop is connected to the 'Cooling' output.
The main control loop remains on the 'Heating' output and '6-way valve'.

The temperature setpoint of the secondary control loop is linked to the setpoint of the main control loop, but can be shifted by a constant value using the parameter **Setpoint Temp Offset 2nd Control Loop**.

Since the secondary control loop is only operated in changeover mode (heating or cooling), the dead zone is inactive (see Section 9.1 'Temperature setpoint (primary control loop)'). An active window contact activates building protection.

The setpoint of the secondary control loop ($T_{2,Soll}$) is calculated as follows. With active building protection:

| | |
|---|---|
| $T_{2,setpoint}$ = **Frost protection** | (heating mode) |
| $T_{2,setpoint}$ = **Heat protection** | (cooling mode) |

Other

| | |
|---|---|
| $T_{2,setpoint}$ = **Setpoint temp absolute** + **Setpoint temp offset 2nd control loop** | (heating or cooling mode) |

The control difference ($dT_2$) is calculated as follows:

$$dT_{(2)} = T_{2,setpoint} - T_{2,actual}$$

The actual temperature ($T_{2,Actual}$) for the second control loop is specified via the external temperature sensor or via the bus value.
The assignment is made via the parameter **Sensor assignment 2. Control loop**.

Configuration register

**Controller type 2nd control loop**
2.ContrLoopType_8044

**PI controller** (**secondary control loop**)

The controller types of the secondary control loop can be configured using the parameters **Cont**roller **type 2. Control loop**.
The following parameters influence the PI controller of the secondary control loop.

| Parameter | Holding address | Range |
|---|---|---|
| **The secondary control loop** is active as a PI controller when: **Changeover status** = Cooling / heating **Controller type 2nd control loop =** PI controller | | |
| **Sensor assignment 2nd control loop** | 804 | 1 (default: 1)<br>1= external temperature sensor (default)<br>2= Bus temperature sensor |
| **Proportional band $X_P$ 2nd control loop** | 804 | 0.1...27.0 °C / °F (default: 2 °C / 4 °F) |
| **Reset time $T_N$ 2nd control loop** | 804 | 0...1200 minutes (default: 20 minutes) |
| **Control variable Min. 2nd control loop** | 804 | 0 (default: 0%) |
| **Control variable max. 2nd control loop** | 804 | 0...100 (default: 100%) |
| **Setpoint offset 2nd control loop** | 804 | –25.0...25.0 °C / °F (default: 0 °C) |
| **together with main control loop** | | |
| **Control variable Temp Min. deviation** | 801 | 0 (default: 0.2%) |
| **Behavior of control variable heating/cooling Min.** | 801 | 0 (default: 0)<br>0= At least the set min. value is applied to the output as heating/cooling output (default)<br>1= Heating/cooling output is only applied to the output from the set min. value. |
| **PWM period** | 80 | 5–60 minutes (default: 30 minutes) |

**Table** 003 Configuration of PI controller Secondary control loop (temperature controller)

With the PI controller, the two parameters **Proportional band $X_P$ 2nd control loop** and **reset time $T_N$ 2nd** control **loop**.
The proportional component (P) causes the controlled variable to respond immediately to any temperature difference. The integral component (I) acts over time.

**PI controller (secondary control loop)** continued

The function of the 'limiter', 'dynamic quantization' and PWM is analogous to that of the main control loop.

The calculation of the manipulated variable is simplified in the following diagram (**Fig. 908**). From this, the diagram for the control variable as a function of the setpoint/actual temperature can be derived. (**Fig. 909**)

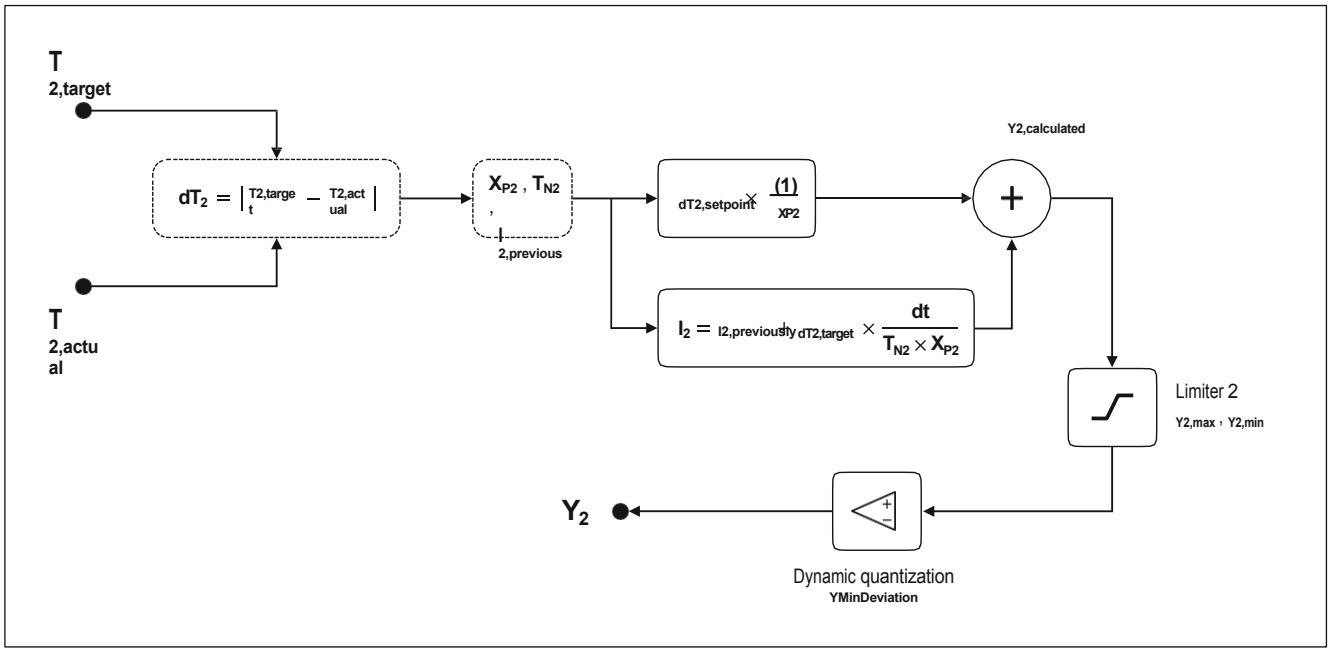



Fig. 908 PI controller (secondary control loop)| Calculation of the manipulated variable ($Y_2$)

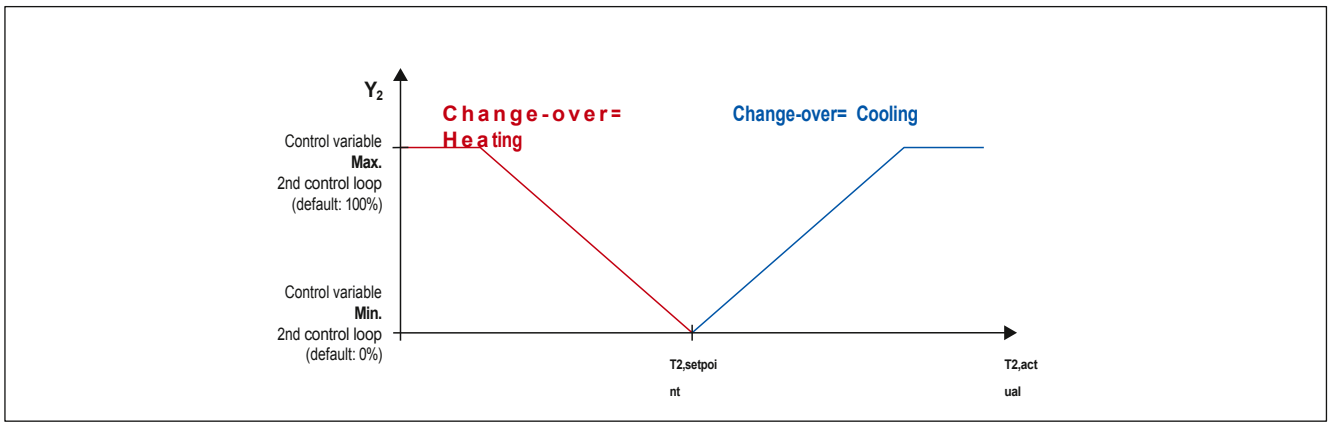



Fig. 909 PI controller (secondary control loop)| Control variable ($Y_2$) as a function of the setpoint-actual temperature

Configuration register

Controller type 2. Control loop
2.ContrLoopType_8044

**2-point controller** (**secondary control loop**)

The following parameters influence the 2-point controller of the secondary control loop.

| Parameter | Holding address | Range |
|---|---|---|
| **The secondary control loop** is active as a 2-point controller when:<br>**Changeover status Changeover** s t a t u s = Cooling / Heating<br>**Controller type 2nd control loop**= 2-point controller | | |
| **Sensor assignment 2nd control loop** | 804 | 1 (default: 1)<br>1= external temperature sensor (default)<br>2= Bus temperature sensor |
| **Control variable Min. 2nd control loop** *1 | 8 | 0...100 (default: 0 %) |
| **Control variable Max. 2nd control loop** *1 | 804 | 0...100 (default: 100%) |
| **Setpoint temp offset 2nd control loop** | 804 | –25.0...25.0 °C / °F (default: 0 °C) |
| **together with main control loop** | | |
| **Hysteresis Temperature control loop** | 8008 | 0...27.0 °C (default: 1°C) |
| **Control variable behavior heating/cooling Min.** *1 | 801 | 0 (default: 0)<br>0= At least the set min. value is present at the output as heating/cooling output (default)<br>1= No effect on the 2-point controller |
| *1 Parameter only relevant for devices with AO outputs for heating/cooling.<br>The effects of the parameters on the 2-point controller are analogous to those on the PI controller. | | |

**Table** 004 Configuration of 2-point controller in secondary control loop (temperature controller)

The behavior of the 2-point controller (secondary control loop) can be represented schematically as follows (**Fig. 910**).

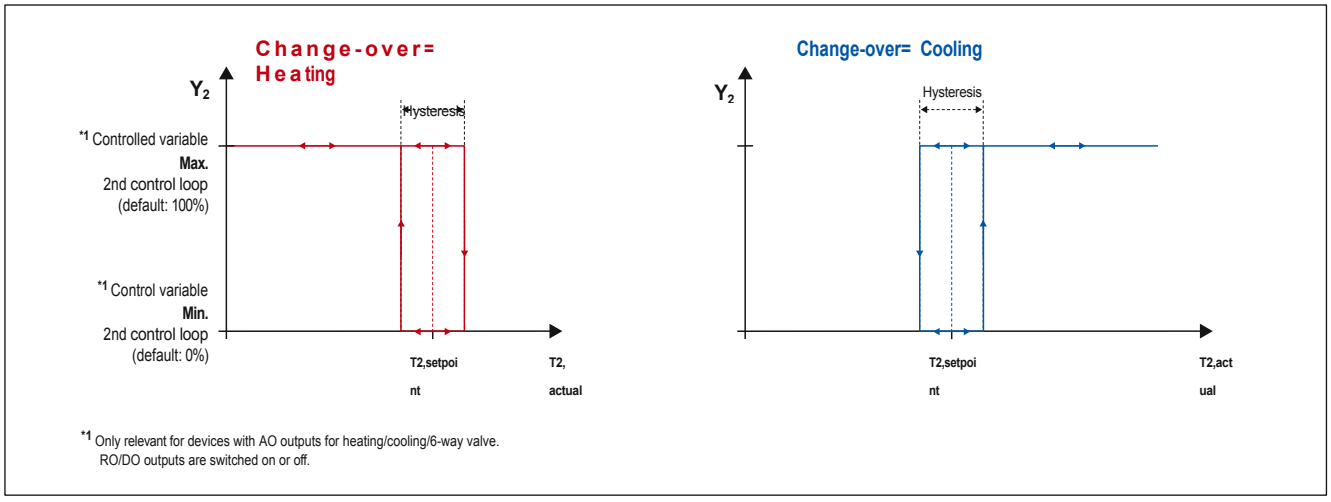



**Fig.** 910 2-point controller (secondary control loop)| Controlled variable ($Y_2$) as a function of the setpoint/actual temperature

The parameters **Control variable max 2nd control loop** and **Control variable min 2nd control loop** (see **Table 004**) can be used to set limit values for the AO output of the 2nd control loop.
This allows the voltage at the output to be limited.

**Configuration register Fan assignment**
FanMapping_8031

**Fan AO output Min.**
AO_FanMin_8032

**Fan AO output max.**
AO_FanMax_8033

**Number of fan stages**
Fan_NumberOfSteps_3762

**Data register**

**Setpoint fan level**
Setpoint_Fan_Level_407

## 9.5 Fan control

Only for type RYMASKON 143xC / 144xC / 145xC / 146xC (fan coil controller)

The fan operating mode can be configured using the **fan assignment** parameter.

In the delivery state, the fan follows the heating or cooling output (see Chapter 9.5.1 'Fan control heating/cooling (fan coil, auto)').

Alternatively, the system can be configured to control RH, CO2, or VOC concentrations (see Section 9.5.2 'Fan control RCV (Auto)').

**Fan assignment**

The **fan assignment** parameter can be used to configure the operating mode of the fan. The general function of the configuration options can be divided into two groups:

- **Fan assignment** = 1...3
  In automatic mode, the fan follows the control deviation of the actual temperature.
- **Fan assignment** = 4...9 The
  RCV control is active
  (see Chapter 9.5.2 'Fan control RCV (Auto)')

The RYMASKON® **1000** controller series has two different output types for controlling a fan:

a) **AO output** (**0...10 V**)
for controlling an **EC fan**

RYMASKON 143xC (1x AO for fan) RYMASKON 145xC (1x AO for fan)
RYMASKON 146xC (2x AO for fans, running in parallel)

b) **RO outputs** (**3 relays**)
for controlling a **3-stage fan**

RYMASKON 144xC (3x RO for fans, 230 V, max. 3 A)

**Manual fan control** (**manual operation**)

The user interface of the fan control and the configuration options of the controller for manual operation are described in chapter 4.X 'Fan'.

In auto mode, the controller controls the fan outputs depending on the heating/cooling or RCV controller. Manual adjustment of the fan speed to OFF or on fan level 1...5, causes the controller to be decoupled from the fan outputs.

The control of the fan output in manual mode differs between AO output (EC fan, 0-10 V) and RO output (3 relays).

The three relays of the RYMASKON 144xC are switched according to the manually set fan speed.

The voltage at the AO output of the RYMASKON 143xC, 145xC, and 146xC is calculated as follows:

$$AO_{LM} = \text{Fan AO output Min} + \frac{\text{setpoint fan speed}}{\text{Number of fan stages}} \times (\text{Fan AO output max.} - \text{Fan AO output min.})$$

**Configuration register Number**

**of fan speeds**
Fan_NumberOfSteps_3762

**Fan mapping**
FanMapping_8031

**Fan start-up time**
Fan_StartUpTime_8035

**Fan follow-up time**
Fan_FollwUpTime_8036

**Hysteresis Temperature control loop**
Hyst_TempContr_8008

**Fan gradient AO**
FanGradient_AO_8037

**Fan AO output min.**
AO_FanMin_8032

**Fan AO output max.**
AO_FanMax_8033

**Fan control variable start**
Fan_ManipVar_Start_8034

**Data register fan**

**level setpoint**
Setpoint_Fan_Level_407

## 9.5.1 Fan control heating/cooling (fan coil, auto)

This section describes the fan control when the fan follows the heating or cooling output in automatic mode.
The configuration options via the **fan assignment** parameter are as follows:

- **Fan assignment = 1** → Fan follows cooling and heating
- **Fan assignment = 2** → Fan follows cooling
- **Fan assignment = 3** → Fan follows heating

**Basic functions of fan control**
(valid for all controller types)

- In automatic mode (406 = 1), the fan control is linked to the main control loop (temperature controller).
- If no heating or cooling output is required in automatic fan mode ($Y_H$ and $Y_K$ = 0 %), the fan output $Y_L$ = 0 % (default: when $Y_L$ = 0 %, the fan is off).
- A safer start-up of the fan can be configured using the **Fan start-up time** parameter. During this time, the fan starts up from a standstill at maximum speed.
- The fan can be switched off with a delay using the **Fan run-down time** parameter.

**Behavior of controller with AO output for fan (0...10 V)**
(RYMASKON 143xC / 145xC / 146xC)

If the controller type for heating/cooling is configured as PI controller, the control variable of the fan ($Y_L$) follows the control variables for heating/cooling ($Y_H$ / $Y_K$). or

$$Y_L = Y_H \quad \text{or} \quad Y_L = Y_K$$

If the heating/cooling controller type is configured as a 2-point controller, the control variable of the fan ($Y_L$) is calculated from the control deviation and the proportional band **fan gradient AO** as follows:

$$Y_{(L)} = \frac{\left| T_{Setpoint\ Reg} - T_{is} + \frac{\text{Hysteresis Temperature control loop}}{2} \right|}{\text{Fan gradient AO}} \times 10$$

The value for $T_{setpointReg}$ and $T_{actual}$ depends on the operating mode and configuration (see Section 9.1 'Temperature setpoint (main control loop)' and Section 3.1 'Actual temperature').

Additional configuration options:

- The min/max value of the fan output can be configured using the parameters **Fan AO output min.** [V] and **Fan AO output max.** [V] (e.g. $Y_L$ = 0...100 % ≙ 2.0...8.0 V).
  If, for example, **AO output min.** is set to > 0 V, the fan also runs when $Y_L$ = 0 %.
- The control variable at which the fan should start can be configured via the parameter **Fan setpoint start**.
  For example, if **Fan setpoint Start** is set to = 20 %, the fan only starts when $Y_L \geq 20$ %.

| **Automatic operation of the fan** (406=1) | | Number of ventilation stages (3762) | | | | |
|---|---|---|---|---|---|---|
| | | **1** | **2** | **3** | **4** | **5** |
| Display Desired fan speed (407) | **0** (off) | $Y_L$ = 0% | $Y_L$ = 0% | $Y_L$ = 0 % | $Y_L$ = 0 % | $Y_L$ = 0 % |
| | **1** | $Y_L$ > 0 % | $Y_L$ > 0 % | $Y_L$ > 0% | $Y_L$ > 0% | $Y_L$ > 0% |
| | **2** | | $Y_L$ > 50% | $Y_L$ > 33% | $Y_L$ > 25% | $Y_L$ > 20% |
| | **3** | | | $Y_L$ > 66% | $Y_L$ > 50% | $Y_L$ > 40% |
| | **4** | | | | $Y_L$ > 75% | $Y_L$ > 60% |
| | **5** | | | | | $Y_L$ > 80% |

**Tab.** 005 Fan power ($Y_L$) and fan speed display for controllers with AO output for fans

**Configuration register Number of fan speeds**
Fan_NumberOfSteps_3762

**Fan control variable start**
Fan_ManipVar_Start_8034

**Fan level 1 delta T**
DeltaT_FanLevel1RO_8038

**Fan level 2 delta T**
DeltaT_FanLevel2RO_8039

**Fan level 3 delta T**
DeltaT_FanLevel3RO_8040

**Controller behavior with RO output for fan (3 relays)** (RYMASKON 144xC)

If the controller type for heating/cooling is configured as PI controller,
the control variable of the fan ($Y_L$ ) follows the control variables for heating/cooling ($Y_H$ / $Y_K$ ). or $Y_L = Y_H$ $Y_L = Y_K$

The fan stages are switched via fixed threshold values of the control variable $Y_L$. The threshold values depend on the number of fan stages (see **Table 006**).
The number is configured using the parameter **Number of fan stages**.

| **PI control (main control loop)** | | Number of fan stages (3762) | | |
|---|---|---|---|---|
| | | **1** | **2** | **3** |
| Display of target fan speed (407) | **1** | $Y_L > 0\%$ | $Y_L > 0\%$ | $Y_L > 0\%$ |
| | **2** | | $Y_L > 50\%$ | $Y_L > 33\%$ |
| | **3** | | | $Y_L > 66\%$ |

**Tab. 006** Fan output ($Y_L$ ) and fan stage display for controllers with RO output for 3-stage fans (RYMASKON 144xC)

The control variable at which the fan is to start can be configured via the parameter **Fan** control **variable start**.
If, for example, **fan control variable start** is set to= 30 %, the fan only starts when $Y_L \geq$ 30 %.

If the controller type Heating/Cooling is configured as a 2-point controller, the fan stages are switched via the temperature difference between the setpoint and actual temperature.

The switching thresholds ($dTL_{L1}$ , $dTL_{L2}$ , $dTL_{L3}$ ) are configured using the parameters **Fan stage 1 delta T**, **Fan stage 2 delta T** and **Fan stage 3 delta T**.
The internal hysteresis (± ly programmed to 0.3 °C / °F) prevents the outputs from flickering when the fan stages are switched (**Fig. 911**).

If **delta T** ($dTL_{L1}$ ) is set to= 0 (default) for **fan stage 1**,
The fan starts running as soon as a heating or cooling request occurs ($Y_H$or $Y_K$> 0%). The internal hysteresis has no influence on the switching threshold $dTL_{L1}$.

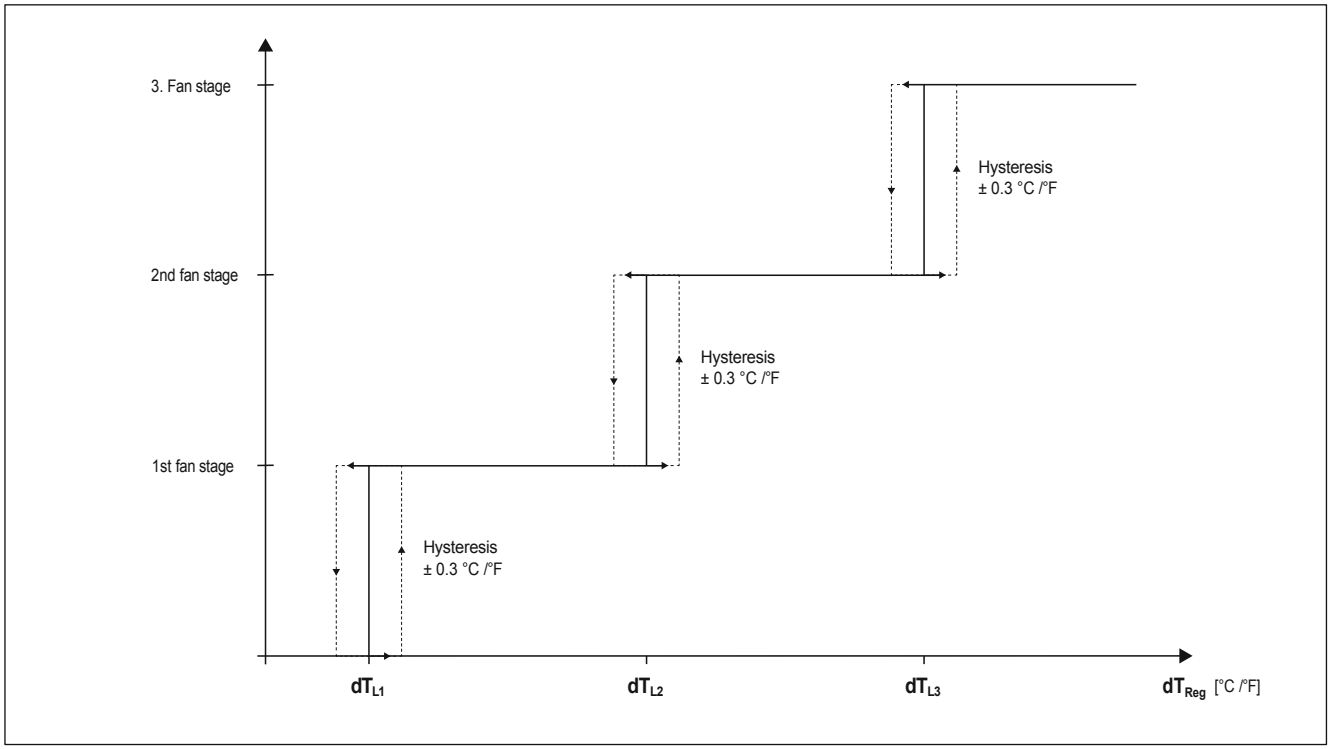



**Fig.** 911 RYMASKON 144xC (3-stage fan) when connected to 2-point temperature control

**Configuration register Fan assignment**
FanMapping_8031

**Controller type RCV**
ContrType_RCV_8201

**Setpoint RCV**
Setpoint_RCV_8200

**Fan start-up time**
Fan_StartUpTime_8035

**Fan follow-up time**
Fan_FollwUpTime_8036

**Data register**

**rHSensor 1 int. value**
HumS1Int_Value_101

**CO2 sensor 1 int. value**
CO2S1Int_Value_102

## 9.5.2 Fan control RCV (Auto)

The AO/RO outputs for controlling a fan can be used to regulate the RH, CO2, or VOC concentration in the room.

The desired measured variable is assigned to the 3rd control loop (fan RCV control) via the **fan assignment** parameter.
The RCV controller is active when an RH, CO2, or VOC sensor is assigned.

The controller type is configured via the **Controller type RCV** parameter.
The setpoint is configured via the **Setpoint RCV** parameter and cannot be changed on the device during operation.

The control difference (**dRCV**) is calculated as follows:

$$dRCV = Setpoint\ RCV - RCV_{actual}$$

The value for $RCV_{actual}$ depends on the assigned sensor via the **Fan assignment** parameter.

**Important**
The control sequence of the RCV is unidirectional.

RH: Dehumidificatio
n CO2 / VOC: Fresh air supply

The air cannot be humidified or enriched with CO2/VOC!

Example 1: **Fan assignment** = Humidity (internal sensor)

| | | | |
|---|---|---|---|
| $RCV_{actual}$ | = **rHSensor 1 Int. value** | = **8** | (80 %RH) |
| $RCV_{setpoint}$ | = **Setpoint RCV** | = **50** | (50 %RH) |

→ $RCV_{(setpoint)} < RCV_{(actual)}$ → Fan is activated

Example 2: **Fan assignment** = Humidity (internal sensor)

| | | | |
|---|---|---|---|
| $RCV_{actual}$ | = **rHSensor 1 Int. value** | = **5** | (50 %RH) |
| $RCV_{setpoint}$ | = **Setpoint RCV** | = **8** | (80 %RH) |

→ $RCV_{(setpoint)} > RCV_{(actual)}$ → Fan is not activated

Example 3: **Fan assignment** = CO2 (internal sensor)

| | | | |
|---|---|---|---|
| $RCV_{actual}$ | = **CO2 sensor 1 Int. value** = | **1500 (** | 1500 ppm) |
| $RCV_{setpoint}$ | = **Setpoint RCV** | = **80** | (800 ppm) |

→ $RCV_{(setpoint)} < RCV_{(actual)}$ → Fan is activated

**Fan start-up time / run-on time**
To ensure that the fan starts up safely, a start-up time can be configured using the **Fan start-up time** parameter (default: 1 s). During this time, the fan starts up from a standstill at maximum speed.

The **fan delay time** parameter (default: 1 s) can be used to delay the fan shutdown.

**Fan assignment**

configuration register
Fan mapping_8031

**Controller type RCV**
ContrType_RCV_8201

**Setpoint RCV**
Setpoint_RCV_8200

Data register

**rHSensor 1 int. value**
HumS1Int_Value_101

**CO2 sensor 1 int. value**
CO2S1Int_Value_102

**PI controller (RCV control loop)**

The RCV controller type can be configured using the **Controller type RCV** parameter. The following parameters influence the PI controller of the RCV control loop.

| Parameter | Holding address | Range | |
|---|---|---|---|
| **Controller type** R C V = PI controller | | | |
| **Setpoint RCV** | 82 | 0...30 | (default: 1000 |
| **Proportional range $X_P$ RCV** | 820 | 0...10,000 | (default: 100) |
| **Reset time $T_N$ RCV** | 820 | 0...60,000 s | (default: 420 s) |
| **Fan control variable start** | 803 | 0...30 | (default: 0%) |
| **Control variable RCV Min. deviation** | 82 | 0...50 | (default: 5 |

**Tab.** 007 Configuration PI controller RCV control loop (fan)

In the PI controller, the two parameters **proportional band $X_P$** and **reset time $T_N$** determine the temporal behavior.

The proportional component (**P**) causes the controlled variable to respond immediately to any RCV difference. The integral component (**I** ) acts over time.
The resulting controlled variable ($Y_{RCV}$ ) is applied as a continuous signal to an AO output fan.

The calculation of the controlled variable is simplified in the following diagram (**Fig. 912**). From this, the diagrams for the manipulated variable as a function of the setpoint-actual RCV can be derived (see **Fig. 913** / **Fig. 914**).

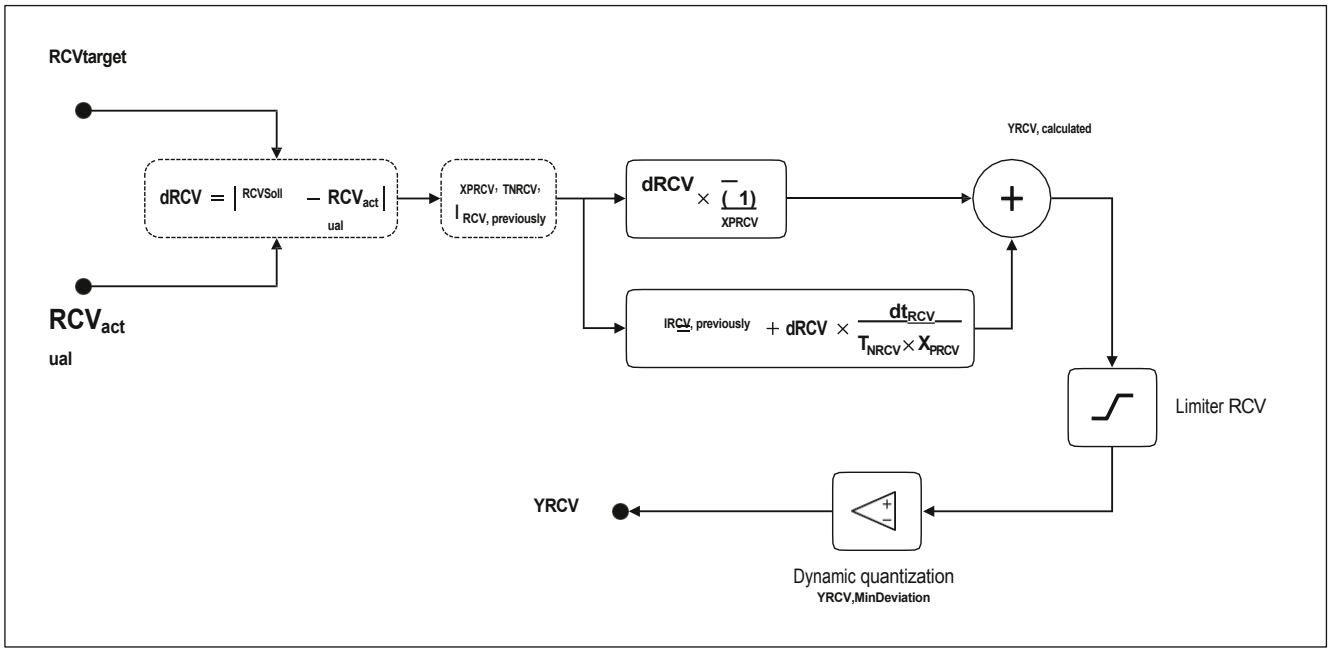



Fig. 912 PI controller (RCV control loop)| Calculation of the manipulated variable ($Y_{RCV}$ )

The 'RCV limiter' is configured via the **Fan control variable start** parameter (see **Fig. 912** and **Table 007**).

The 'Dynamic Quantization' is configured via the parameter **Control Variable RCV Min. Deviation** (see **Fig. 912** and **Tab. 007**).

The calculated control variable is compared with the previous control variable.
If the deviation is less than the value specified in the **RCV Min deviation control variable** parameter, the control variable is not changed.

**PI controller** (**RCV control loop**)
Continued

The following diagrams for the control variable as a function of the setpoint RCV show examples with 'Fan control variable start= **0%** (default)' (**Fig. 913**) and 'Fan control variable start = 20%' (**Fig. 914**).

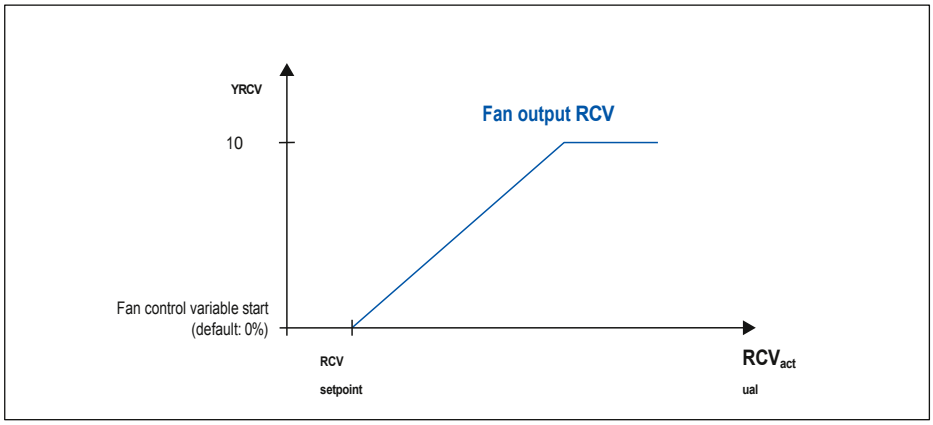



Fig. 913 PI controller (RCV control loop)| Control variable ($Y_{RCV}$ ) as a function of the setpoint-actual RCV

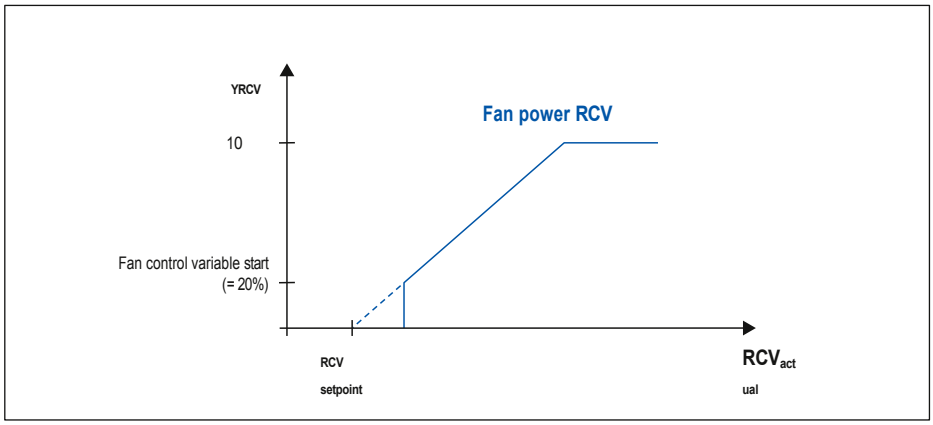



Fig. 914 PI controller (RCV control loop)| Fan control variable start = 20%

**2-point controller** (**RCV control loop**)

The RCV controller type can be configured using the **Controller type RCV** parameter.
The following parameters influence the 2-point controller of the RCV control loop (**Tab. 008**).

**Configuration register Number of fan stages**
Fan_NumberOfSteps_3762

**Controller type RCV**
ContrType_RCV_8201

**Fan AO output min.**
AO_FanMin_8032

**Fan AO output max.**
AO_FanMax_8033

**Data register fan level setpoint**
Setpoint_Fan_Level_407

| Parameter | Holding address | Range | |
|---|---|---|---|
| **Controller type RCV**= 2-point controller | | | |
| **Should RCV** | 8200 | 0...30,000 | (default: 1000) |
| **Hysteresis RCV** | 8204 | 0...30,000 | (default: 50) |

Configuration 2-point controller RCV control loop (fan)

The behavior of the 2-point controller (RCV control loop) can be represented schematically as follows (**Fig. 915**).

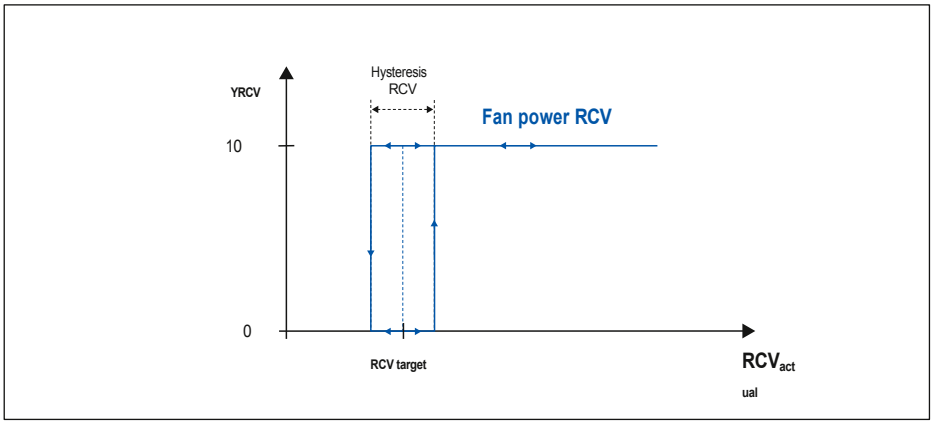



**Fig. 915** 2-point controller (RCV control loop)| Controlled variable ($Y_{RCV}$) as a function of the setpoint-actual RCV

**Behavior of controller with AO output for fan (0...10 V) with RCV control**
(RYMASKON 143xC / 145xC / 146xC)

The min/max value of the fan output can be configured using the parameters **Fan AO output min.** [V] and **Fan AO output max.** [V] (e.g. $Y_{RCV}$= 0...100 % ≙ 2.0...8.0 V).
If, for example, **AO output min.** is set to> 0 V, the fan also runs when $Y_{RCV}$= 0%.

| **Automatic fan operation** (406=1) | | Number of ventilation stages (3762) | | | | |
|---|---|---|---|---|---|---|
| | | **1** | **2** | **3** | **4** | **5** |
| Display Target fan speed (407) | **0** (off) | $Y_{RCV}$= 0% | $Y_{RCV}$= 0% | $Y_{RCV}$ = 0 % | $Y_{RCV}$= 0% | $Y_{RCV}$ = 0 % |
| | **1** | $Y_{RCV}$ > 0 % | $Y_{RCV}$ > 0 % | $Y_{RCV}$ > 0 % | $Y_{RCV}$ > 0 % | $Y_{RCV}$ > 0 % |
| | **2** | | $Y_{RCV}$> 50% | $Y_{RCV}$> 33% | $Y_{RCV}$> 25% | $Y_{RCV}$> 20% |
| | **3** | | | $Y_{RCV}$> 66% | $Y_{RCV}$> 50% | $Y_{RCV}$> 40% |
| | **4** | | | | $Y_{RCV}$ > 75% | $Y_{RCV}$ > 60% |
| | **5** | | | | | $Y_{RCV}$> 80% |

**Table** 009 Fan output ($Y_{RCV}$) and fan stage display for controllers with AO output for fans

**2-point controller (RCV control loop)**
Continued

**Controller behavior with RO output for fan (3 relays) with RCV control**
(RYMASKON 144xC)

The three relays of the RYMASKON 144xC are controlled by switch thresholds during RCV control via switching thresholds (independent of PI or 2-point control).

The fan stages are switched via the RCV difference (**dRCV**) between the target **RCV** and the assigned sensor value of the RCV control. The RCV

difference (**dRCV**) is calculated as follows:

$$\mathbf{dRCV = Setpoint\ RCV - RCV_{actual}}$$

$\mathbf{RCV_{actual}}$ depends on the assigned sensor via the **fan assignment** parameter. The switching

thresholds ($\mathbf{dRCV_{L1}}$ , $\mathbf{dRCV_{L2}}$ , $\mathbf{dRCV_{L3}}$ )
is done using the parameters **Fan level 1 delta RCV**, **Fan level 2 delta RCV** and **Fan stage 3 delta RCV**.

The hysteresis can be configured using the **Hysteresis RCV** parameter and prevents the outputs from flickering when the fan stages are switched (**Fig. 916**).

If **delta RCV** ($\mathbf{dRCV_{L1}}$ )= 0 (default) is set for **fan stage 1**, the fan starts directly when **dRCV** > 0.
The internal hysteresis has no influence on the switching threshold $\mathbf{dRCV_{L1}}$.

**Configuration register**

**Setpoint RCV**
Setpoint_RCV_8200

**Fan assignment**
FanMapping_8031

**Fan level 1 delta RCV**
DeltaRCV_FanLevel1RO_8205

**Fan level 2 delta RCV**
DeltaRCV_FanLevel2RO_8206

**Fan level 3 delta RCV**
DeltaRCV_FanLevel3RO_8207

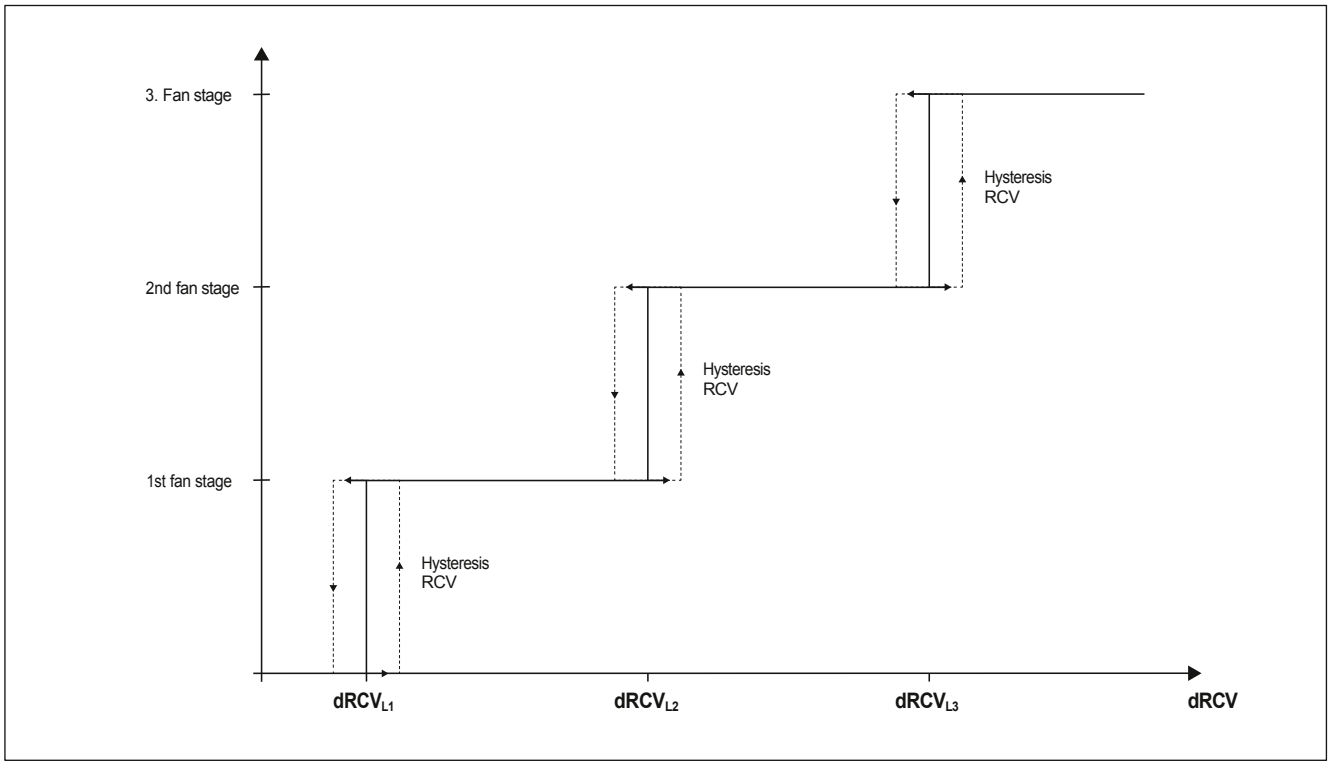



**Fig.** 916 RYMASKON 144xC (3-stage fan) when connected to 2-point RVC control

**Configuration register Direction of**

**action AO Heating**
AODirection_Heating_8025

**Direction of action AO cooling**
AODirection_Cooling_8026

**RODO direction of action Heating**
RODODirection_Heating_8027

**Direction of action RODO Cooling**
RODODirection_Cooling_8028

**Output 6-way valve**
Out6WayValve_8020

**6-way valve generic...**
**6WayValveGen**..._8021 to
6WayValveGen..._8024

**Data register**

**Output AO Heating Controlled By BMS**
AO_OutHeat_BMSContr_1608

**Output AO Cooling Controlled By BMS**
AO_OutCool_BMSContr_1609

**Output 6-way valve controlled by BMS**
AO_Out6WayValve_BMSContr_1610

**RODO heating output controlled by BMS**
RODO_OutHeat_BMSContr_1611

**Output RODO cooling controlled by BMS**
RODO_OutCool_BMSContr_1612

**Output AO Fan Controlled By BMS**
AO_OutFan_BMSContr_1613

**RODO fan output controlled by BMS**
RODO_OutFan_BMSContr_1615

**Fan speed auto mode**
Fan_AutoMode_406

**Target fan level**
Setpoint_Fan_Level_407

## 9.6 Output

The assignment of functions to outputs is permanently stored in the controller.
For example, a heating output cannot be configured to control a fan.

The outputs are designated as follows:

- **Heating** (**AO/DO/RO**)
- **Cooling** (**AO/DO/RO**)
- **6-way valve** (**AO**)
- **Fan** (**AO/RO**)

The GLT can override each individual output.
The parameters **Output...Controlled By BMS** are available for this purpose.
If an output is overridden by the GLT, the outputs are decoupled from the controller.

Note on RYMASKON 136xC / 146xC:
The DO outputs are designed for max. 24 V!

The fan outputs represent a special feature in the event of overriding by the GLT.

If the outputs are overridden by the GLT via the parameters **Output AO Fan Controlled By BMS** (AO fan outputs) or **Output RODO Fan Controlled By BMS** (RO fan outputs)
are overridden by the GLT, the display must be changed via the parameters
**Fan speed auto mode** and **target fan speed** must also be adjusted.

The fan buttons on the device remain active. Pressing the buttons will cause a change on the display and in the parameters, but no change to the fan outputs.

**Automatic calibration**

The outputs perform an automatic calibration each time the device is switched on to ensure voltage accuracy.

During calibration (duration approx. 0.5 s), the outputs switch to 10 V for 0.1 s each and then back to 0 V. The respective output value is then set.

**Direction of action for heating and cooling**

The direction of action for all heating and cooling outputs can be adjusted.
This allows valves that are closed or open when de-energized (NC/NO actuators) to be controlled.

**Configuration register** Direction of action AO Heating
AODirection_Heating_8025

**Direction of action AO cooling**
AODirection_Cooling_8026

**Direction of action RODO heating**
RODODirection_Heating_8027

**Direction of action RODO Cooling**
RODODirection_Cooling_8028

**Output 6-way valve**
Out6WayValve_8020

**6-way valve generic...**
6WayValveGen..._8021 to
6WayValveGen..._8024

**Data register**

**Output AO Heating Controlled By BMS**
AO_OutHeat_BMSContr_1608

**Output AO Cooling Controlled By BMS**
AO_OutCool_BMSContr_1609

**Output 6-way valve controlled by BMS**
AO_Out6WayValve_BMSContr_1610

**RODO heating output controlled by BMS**
RODO_OutHeat_BMSContr_1611

**Output RODO cooling controlled by BMS**
RODO_OutCool_BMSContr_1612

**Output AO Fan Controlled By BMS**
AO_OutFan_BMSContr_1613

**RODO fan output controlled by BMS**
RODO_OutFan_BMSContr_1615

**Fan speed auto mode**
Fan_AutoMode_406

**Target fan level**
Setpoint_Fan_Level_407

## 9.6.1 Heating and cooling output (AO/DO/RO)

The controller output variable of the main and secondary control loops is the manipulated variable **Y.** in the range 0...100 % for PI controllers or 0 / 100 % for 2-point controllers.

The relationships between the manipulated variable and the AO/DO/RO output for heating and cooling, as well as the influence of the parameters **manipulated variable min**, **manipulated variable min behavior**, and **manipulated variable max**, are shown in **Fig. 917**.

The 6-way valve output is described separately (see Section 9.6.3).

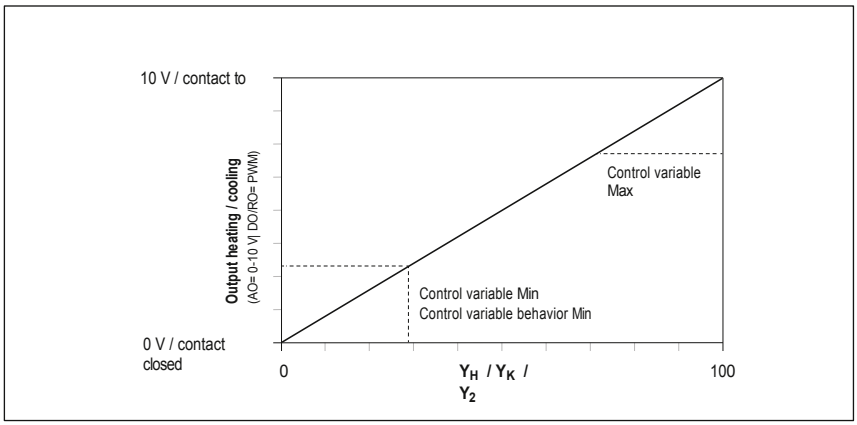



**Fig. 917** AO/DO output| Control variable Temp control ($Y_H$ / $Y_K$ / $Y_2$ ) (default: not inverted)

## 9.6.2 Fan output (AO)

The controller output variable of the fan control loop is the control variable **Y.** in the range 0...100 % for PI controllers or 0 / 100 % for 2-point controllers.

The relationships between the manipulated variable and the AO output Fan, and the influence of the **fan control variable start** parameter are shown in **Fig. 918**
.

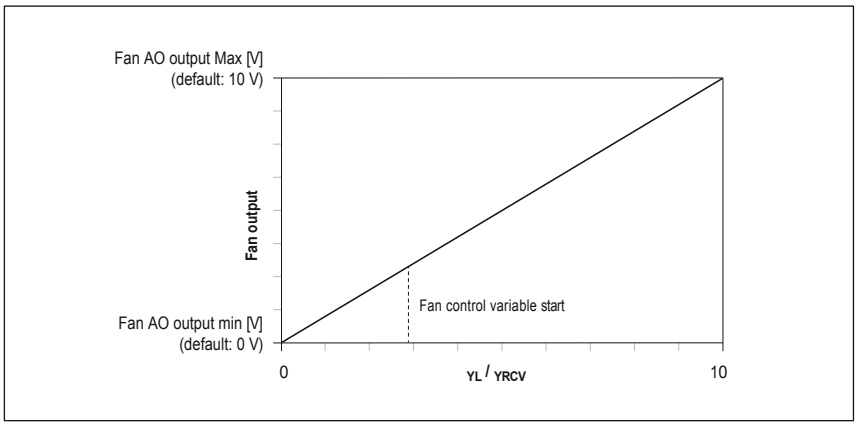



**Fig.** 918 AO o u t p u t | Control variable fan control (YL/ $Y_{RCV}$ ) (default: not inverted)

**Configuration register**

**output 6-way valve**
Out6WayValve_8020

**6-way valve generic...**
**6WayValveGen**..._8021 to
6WayValveGen..._8024

**Data register**

**Output AO Heating Controlled By BMS**
AO_OutHeat_BMSContr_1608

**Output AO Cooling Controlled By BMS**
AO_OutCool_BMSContr_1609

**Output 6-way valve controlled by BMS**
AO_Out6WayValve_BMSContr_1610

**RODO heating output controlled by BMS**
RODO_OutHeat_BMSContr_1611

**Output RODO cooling controlled by BMS**
RODO_OutCool_BMSContr_1612

**Output AO Fan Controlled By BMS**
AO_OutFan_BMSContr_1613

**RODO fan output controlled by BMS**
RODO_OutFan_BMSContr_1615

### 9.6.3 Output 6-way valve (AO)

The **Output 6-way valve** parameter can be used to select different preset 6-way valve types.

In addition, a generic 6-way valve can be configured using the **6-way valve generic...** parameter.
The 6-way valve is deactivated in the delivery state.

Some RYMASKON controller types do not have their own 6-way valve output and are assigned to the heating or cooling output.

These outputs are still overridden via the parameters
**Output AO Heating Controlled By BMS** or **Output AO Cooling Controlled By BMS**,
even if these outputs are configured as 6-way valves.

The configuration options for the preset 6-way valves are listed in the following table (**Tab. 011**).

The following diagrams were created based on the data sheet provided by the manufacturer of the respective 6-way valve (**Figs. 919 - 924**).

| **Output 6-way valve** Address 8020 | **Cooling mode** | **Heating mode** |
|---|---|---|
| **0** (default) | Output 6-way valve follows the heating or cooling output (in both cases) as a continuous signal **0...10 V**. | |
| **1** (generic) | 100 ≙ Values from 8021...8022 [V] | 0 ≙ Values from 8023...8024 [V] |
| **2** (Belimo) | 100 ≙ **2.0...4.7 V** | 0 ≙ **7.3...10 V** |
| **3** (Belimo inverted) | 0 %...100 ≙ **7.3...10 V** | 100 %...0 ≙ **2.0...4.7 V** |
| **4** (Sauter DN15) | 100 ≙ **1.1...3.7 V** | 0%...100 ≙ **6.3...8.9 V** |
| **5** (Sauter DN15 inverted) | 0%...100 ≙ **6.3...8.9 V** | 100 ≙ **1.1...3.7 V** |
| **6** (Sauter DN20) | 100 ≙ **1.6...4.5 V** | 0 ≙ **5.5...8.4 V** |
| **7** (Sauter DN20 inverted) | 0 ≙ **5.5...8.4 V** | 100 ≙ **1.6...4.5 V** |
| **8** | Output 6-way valve follows the heating output | 100 ≙ **0** |
| **9** | 100 ≙ **0** | Output 6-way valve follows cooling capacity |
| **1** | Output 6-way valve follows heating capacity | 10 ≙ **10** |
| **11** | 100%...0% ≙ **10...0 V** | Output 6-way valve follows cooling capacity |

**Tab.** 011 Configuration of the 6-way valve output

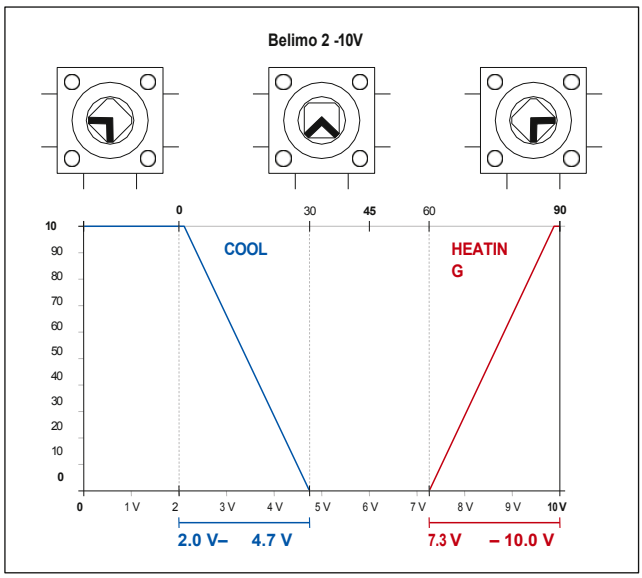



**Fig. 919** 6-way valve| Belimo (address 8020= **2**)

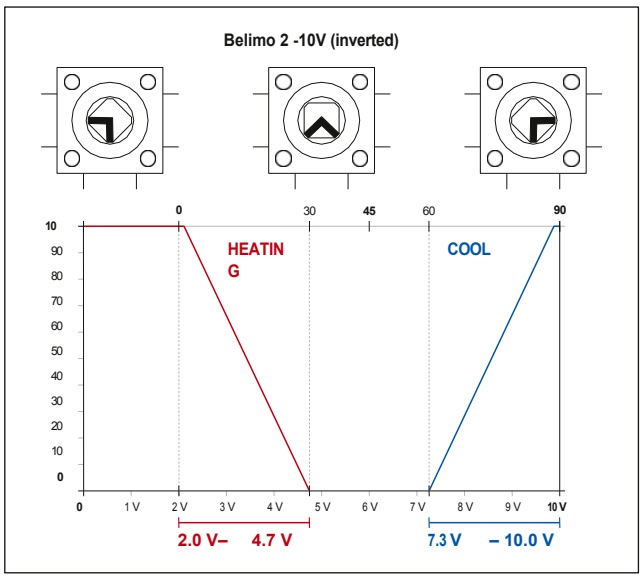



**Fig. 920** 6-way valve| Belimo inverted (address 8020= **3**)

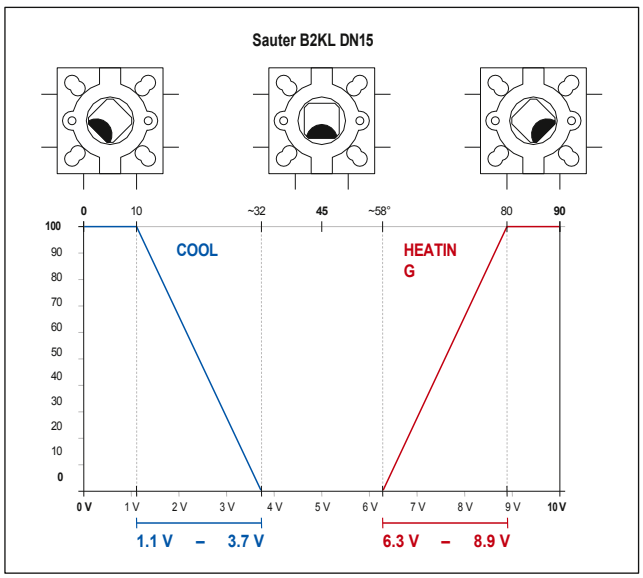



**Fig. 921** 6-way valve| Sauter DN15 (address 8020= **4**)

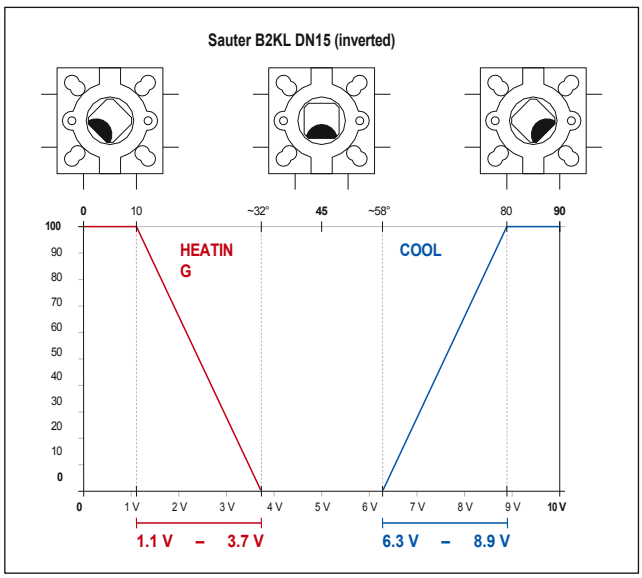



**Fig. 922** 6-way valve| Sauter DN15 inverted (address 8020= **5**)

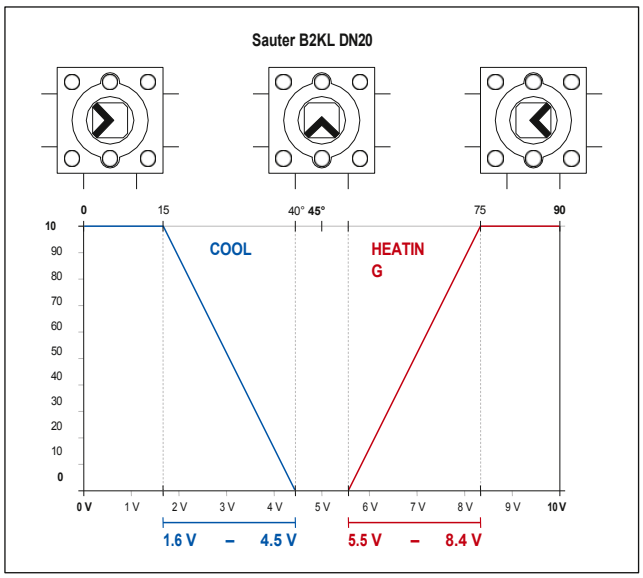



**Fig. 923** 6-way valve| Sauter DN20 (address 8020= **5**)

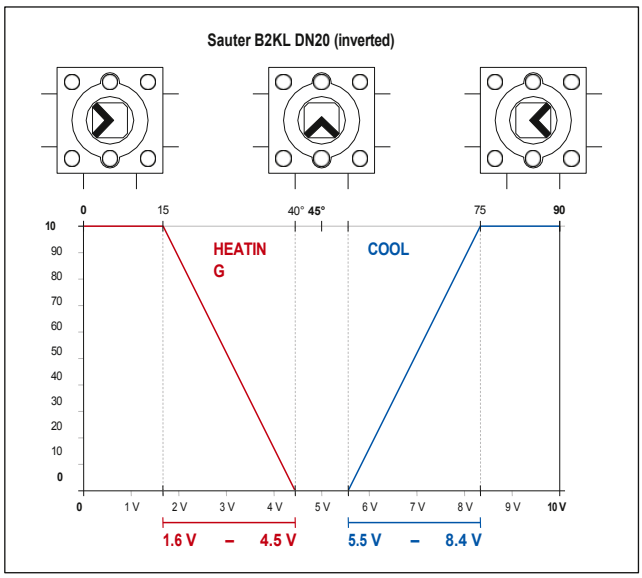



**Fig. 924** 6-way valve| Sauter DN20 inverted (address 8020= **6**)

**Configuration register Time program 1...48 (ZP)**
Holding address 7040...7515

ZP1 and ZP2 as an example:

TP1_Activate_7040
TP1_EventDay_7041
TP1_EventHour_7042
TP1_EventMinute_7043

TP2_Activate_7050
TP2_EventDay_7051
TP2_EventHour_7052
TP2_EventMinute_7053

## 9.7 Time program

There are 48 freely programmable time channels available. Each time channel changes an entry in a Modbus register.

The register address, the new register value, and the weekday and time of the change is done via Modbus or the PC configuration software (**Fig. 925**).

In addition, each time channel can be activated or deactivated individually. The last change takes precedence (manual, Modbus, time program).

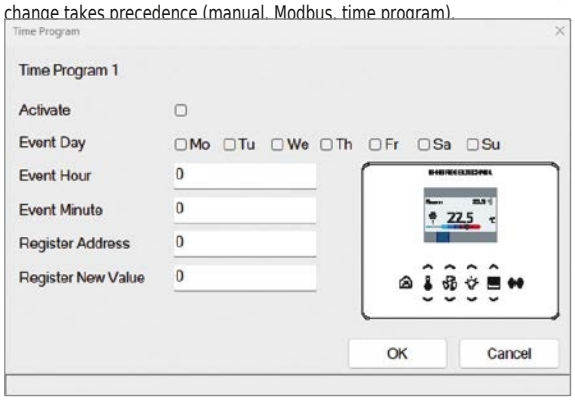



Fig. 925 Time program | Configuration software (PC)

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