

Operating instructions

RYMASKON® 1000 Controller

Controller to control and regulate temperature, fans,
light and sun protection (2 zones)



Room control unit with colour TFT display and capacitive keys (touch keys),
RS485 interface, galvanically isolated, Modbus (RTU) / BACnet (MS/TP)
or W-Modbus / W-BACnet (Wireless)

W-Modbus
W-BACnet



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ABBREVIATIONS

AO	Analogue Output (0-10 V)
BMS	Building Management System
CSC	Colour Scale (sensors)
DI	Digital Input
DO	Digital Output 24 V
dt	Controller Sampling Interval
dT₂	Control Deviation of second control loop
dT_{F1/F2/F3}	Fan Switching Thresholds (temperature) when connected to main control loop as 2-point controller (ON/OFF) (only for type RYMASKON 144xC with 3 relays for multi-step fans)
dT_{Contr}	Control Deviation of main control loop
dRCV_{F1/F2/F3}	Fan Switching Thresholds (RH/CO ₂ /VOC content) when connected to RCV control loop as 2-point controller (ON/OFF) (only for type RYMASKON 144xC with 3 relays for multi-step fans)
GUI	Graphical User Interface
HMI	Human Machine Interface
I	Integral component PI of control loop
PWM	Pulse Width Modulation
RCV	RH/CO ₂ /VOC control
RO	Digital Output 230 V
T_{2,Current}	Current Temperature of second control loop
T_{2,Setpoint}	Setpoint Temperature of second control loop
T_{Current}	Current Temperature of main control loop
T_I	Time Integral
T_{Setpoint Contr}	Setpoint Controller of main control loop
X_p	Proportional Range of PI controller
Y₂	Manipulated Variable Heating / Cooling of second control loop
Y_{calculated}	Calculated Manipulated Variable
Y_H / Y_C	Manipulated Variable Heating / Cooling of main control loop
Y_F	Manipulated Variable Fan coupled to main control loop (Fancoil)
Y_{RCV}	Manipulated Variable Fan for RH/CO ₂ /VOC control (RCV)

INSTALLATION AND COMMISSIONING

Commissioning is mandatory and may only be performed by qualified personnel!

Please read these instructions prior to installation and commissioning, and comply with the specifications that they contain!

Installation must take place while observing all relevant regulations and standards (e.g. such as welding regulations, etc.) applicable at the place where the measurement is taken. It is very important to comply with the following:

- VDE / VDI technical temperature measurements, directives, measurement set-ups for temperature measurements
- EMC directives
- It is imperative to avoid parallel routing of power cables
- We recommend the use of shielded cables with the shielding attached to the DDC / SPS at one side.

Before installing, make sure that the existing technical parameters of the measuring instrument comply with the actual conditions at the place of utilisation, especially:

- Measuring range
- Maximum permissible temperature and humidity
- Protection type and protection class
- Oscillation, vibrations and impacts must be avoided (< 0,5 g)

IMPORTANT NOTES

Only the valid edition of our conditions and the valid "General Conditions for the Supply of Products and Services of the Electrical and Electronics Industry" (ZVEI conditions) and the supplementary clause "Extended Retention of Title" apply as the General Terms and Conditions regulating this purchase.

The following points must also be complied with:

- These instructions must be read before installation and commissioning, and all of the specifications that they contain must be complied with!
- This unit must only be used for its intended purpose, whereby the applicable VDE safety regulations and all regulations issued by the regional and national regulatory authorities, TÜV and local energy providers must be complied with. The purchaser must ensure that the relevant building and safety regulations are complied with, and must avoid hazards of all kinds.
- No warranty or liability claims whatsoever will be accepted for defects and damage arising from improper use of this unit.
- The warranty and liability excludes consequential damage caused by a fault in this unit.
- The units must only be installed and commissioned by qualified personnel.
- Only the technical data and connecting conditions specified by the installation and operating instructions which are included in the scope of delivery of the unit apply. Deviations from the depictions contained in the catalogue are not additionally listed, and are possible as a result of technical progress and the continuous improvement of our products.
- Any alterations made to the unit by the user will void the warranty.
- This unit must not be installed close to sources of heat (e.g. radiators) or their heat flow. Avoid direct solar irradiation or heat radiation from similar sources (powerful lamps, halogen spotlights).
- Operating this unit close to other units that do not comply with EMC directives may influence functionality.
- This unit must not be used for monitoring purposes which serve to protect persons against hazards or injury, as an Emergency Stop switch on systems or machinery, or for any other similar safety-related purposes.
- The housing dimensions and the dimensions of accessories may differ slightly from the specifications of these instructions.
- Changes to these documents are not permitted.
- In cases of complaint, we will only accept complete units returned in their original packaging.
- A circuit breaker for the unit must be provided nearby where the user can easily reach it. The circuit breaker must be labelled as a disconnecting unit for the appliance.



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

- The units must only be connected to an extra-low safety voltage in a de-energised condition. To avoid damaging the unit and prevent faults (e.g. due to voltage induction), use shielded cables, avoid laying them parallel to power cables and observe the EMC directives.
- If power supplies with an output power greater than 15 W are used, additional safety measures (circuit breakers) must be implemented to limit the power output in the event of a fault.
- Commissioning is mandatory and may only be performed by qualified personnel!
- The unit must be operated with power supplied from an approved SELV (Safety Extra Low Voltage) or PELV (Protective Extra Low Voltage) power supply unit with limited rated power up to max. 25 W or with its own 1 A back-up fuse 1 A.



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

- The units must only be connected in a de-energised condition. To avoid damaging the unit and prevent faults (e.g. due to voltage induction), use shielded cables, avoid laying them parallel to power cables and observe the EMC directives.
- Commissioning is mandatory and may only be performed by qualified personnel!
- Minimum cross section of 1 mm²/AWG 18, Temperature range –40 °C to +60 °C, 3 A fuse, cable type acc. to UL 719/VDE 0250-204



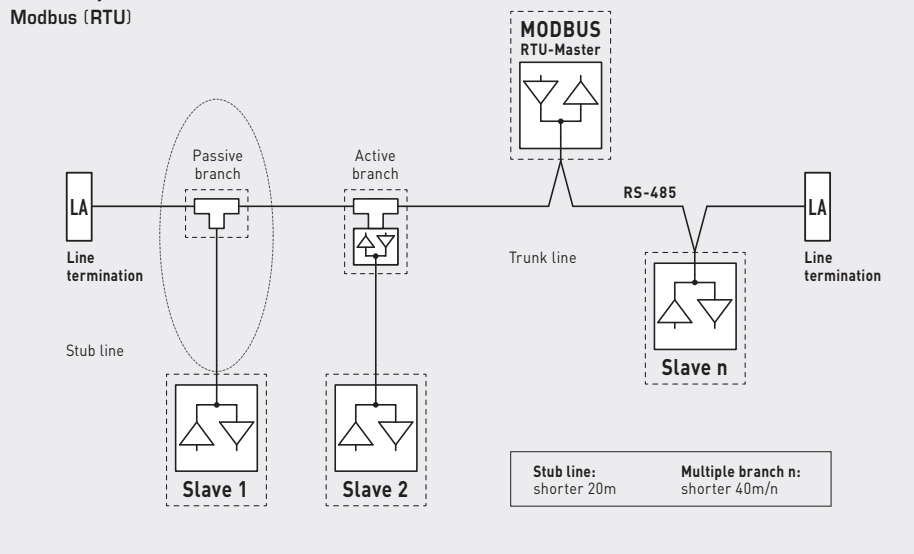
CAUTION!

Danger of electric shock! The housing may contain live parts. Particularly with units in mains voltage operation (usually between 90 V and 265 V), touching live parts may result in personal injury.

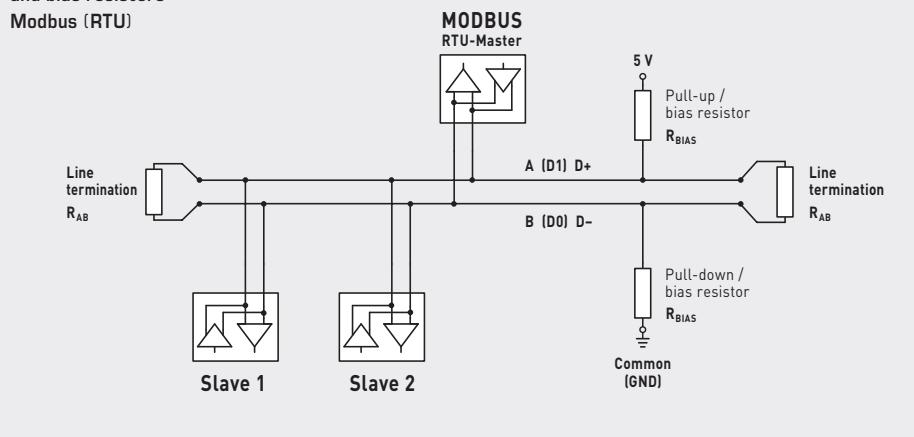
INSTALLATION



**General layout of bus structure
Modbus (RTU)**



**Bus topology with terminating
and bias resistors
Modbus (RTU)**



Terminating resistors may only be installed at the ends of the bus line.

If necessary, the **LA-Modbus** (separate accessory) can be used as a terminating resistor for **RYMASKON**. No more than two line terminators are permitted in networks without repeaters.

The **bias resistors** for bus level definition in the resting state are usually activated at the Modbus master / repeater.

The **node** address can be set from 1 to 247.

Each address may only be assigned once across the entire Modbus network.

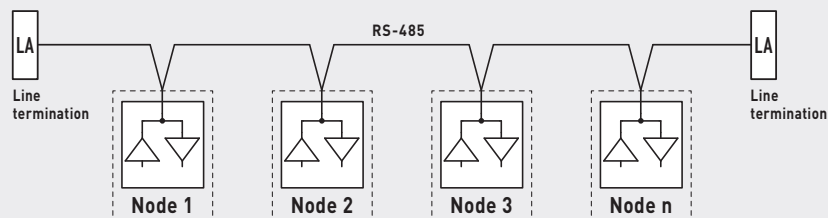
With a greater number of nodes, the bus must be subdivided into several segments separated by repeaters.

The **bus line** must use a twisted-pair cable data line/power supply line and copper mesh wire shield must be used. The line capacitance must be less than 100 pF/m (e.g. Profibus cable). The wiring can be configured as a continuous line or daisy-chain topology, or as a trunk line with branch lines.

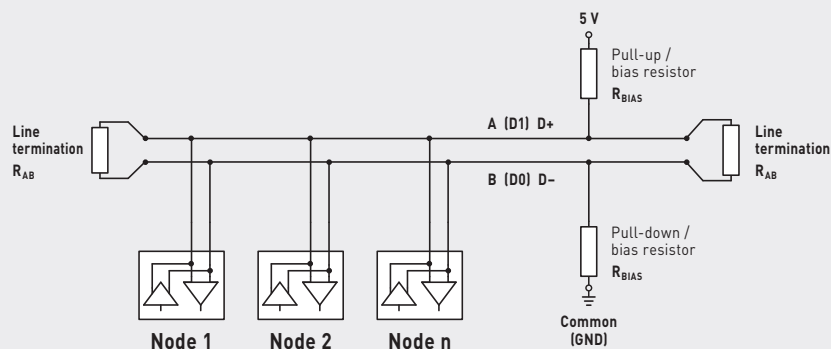
INSTALLATION



General layout of bus structure
 BACnet (MS/TP)



Bus topology with terminating
 and bias resistors
 BACnet (MS/TP)



Terminating resistors may only be installed at the ends of the bus line.

If necessary, the **LA-Modbus** (separate accessory) can be used as a terminating resistor for **RYMASKON**. No more than two line terminators are permitted in networks without repeaters.

The **bias resistors** for bus level definition in the resting state are usually activated at the BACnet MS/TP router.

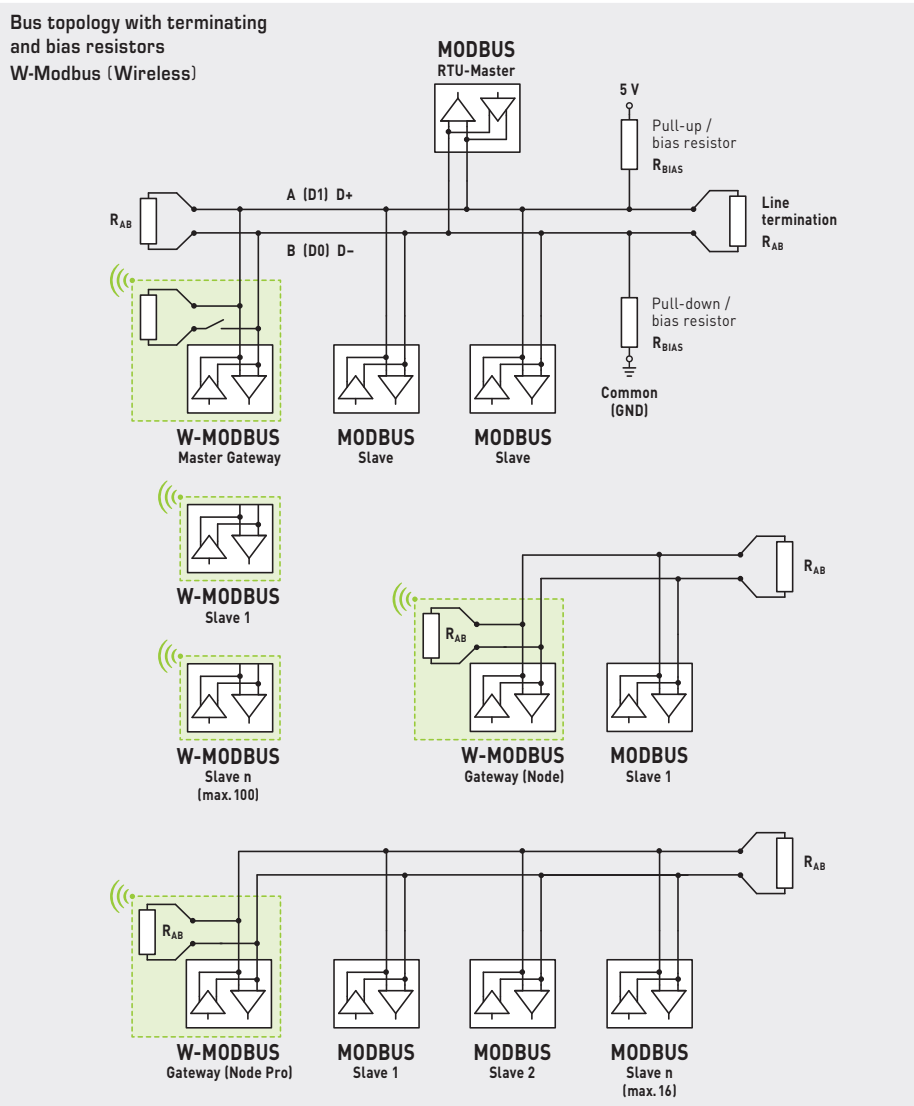
The **node** address can be set from 1 to 127.

Each address may only be assigned once within a BACnet MS/TP segment.

The **bus line** must use a twisted-pair cable data line/power supply line and copper mesh wire shield must be used. The line capacitance must be less than 100 pF/m (e.g. Profibus cable). The wiring must be laid out as a continuous line or daisy-chain topology; branch lines must be avoided or kept to a minimum.

INSTALLATION

W-Modbus



The **W-Modbus protocol** is based on the 2.4 GHz ISM radio band and employs patented frequency hopping technology to maximise reliability and resistance to interference. This means that reliable radio transmission can also be ensured in industrial environments.

In the **W-Modbus network**, up to 100 nodes can communicate with each other over a long distance (up to 500 m in an open field) using one gateway. A standardised wireless module ensures compatibility with all W-Modbus units.

The **W-Modbus sensors** only need to be supplied with power. Only the node addresses are configured manually, the transmission parameters (baud rate and parity) are set automatically. No terminating resistor is necessary. The sensor is then paired to a gateway.

The **GW gateway** (Wireless/RS485) serves as an interface between wired Modbus (RTU) and wireless W-Modbus. Even mixed configurations of wired and wireless Modbus units can easily be integrated into existing network topologies via this gateway.

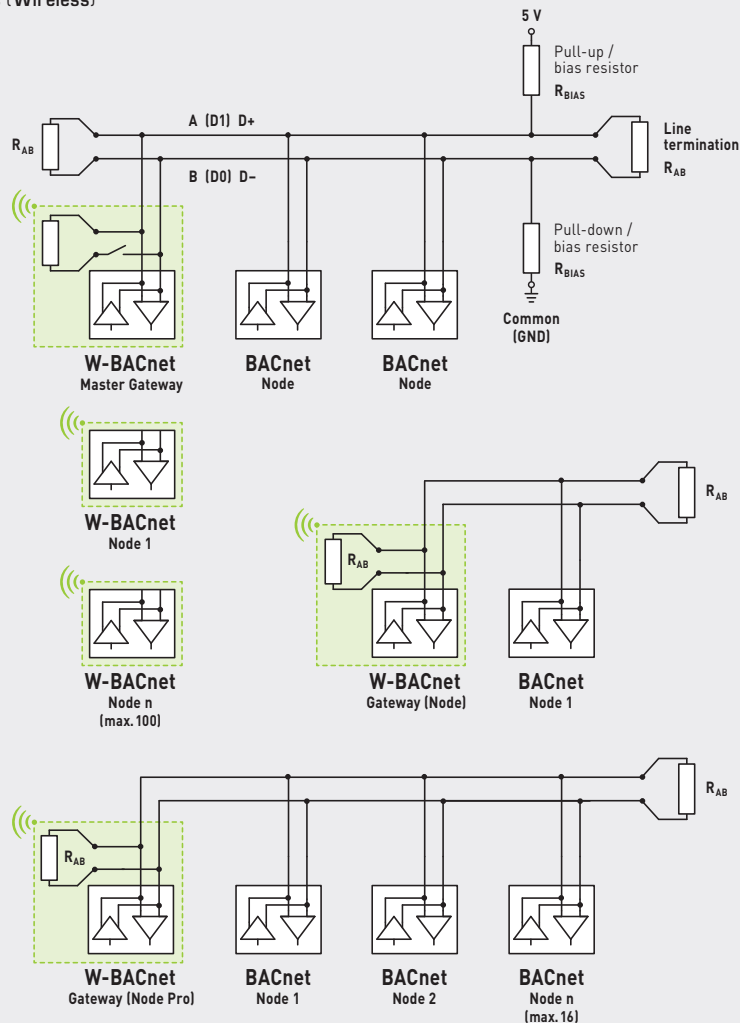
Hiermit Regeltechnik GmbH hereby declares that the radio equipment type
RYMASKON® 1000 Controller (Wireless) complies with the Directive 2014/53/EU.

The full text of the EU Declaration of Conformity can be found at the following Internet address:
www.spluss.de/RYM13111W220000/

INSTALLATION

W-BACnet

Bus topology with terminating and bias resistors
W-BACnet (Wireless)



The **W-BACnet protocol** is based on the 2.4 GHz ISM radio band and employs patented frequency hopping technology to maximise reliability and resistance to interference. This means that reliable radio transmission can also be ensured in industrial environments.

In the **W-BACnet network**, up to 100 nodes can communicate with each other over a long distance (up to 500 m in an open field) using one gateway. A standardised wireless module ensures compatibility with all W-BACnet units.

The **W-BACnet sensors** only need to be supplied with power. Only the node addresses are configured manually, the transmission parameters (baud rate and parity) are set automatically. No terminating resistor is necessary. The sensor is then paired to a gateway.

The **GW gateway** (Wireless/RS485) serves as an interface between wired BACnet (MS/TP) and wireless W-BACnet. Even mixed configurations of wired and wireless BACnet units can easily be integrated into existing network topologies via this gateway.

Hiermit Regeltechnik GmbH hereby declares that the radio equipment type
RYMASKON® 1000 Controller (Wireless) complies with the Directive 2014/53/EU.

The full text of the EU Declaration of Conformity can be found at the following Internet address:
www.spluss.de/RYM13111W220000/

KEY FEATURES

Basic models
(see type table)



- 24 V AC/DC voltage supply or 230 V AC
- Communication via **Modbus** (RTU) / **BACnet** (MS/TP) or **W-Modbus** / **W-BACnet** (Wireless)
- 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)
- **Housing** Iduna 3 (112 x 89.5 x 24 mm), white and black colours, for wall-mounting on in-wall flush boxes, quick and easy installation via push-in terminals
- Integrated temperature and humidity sensor (basic 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 available as an option)
- Power-saving and environmentally friendly thanks to **features** such as brightness adjustment, stand-by, wake-up, etc.
- **CuRA** (Customized Register Assignment) Assignment of individual register addresses for each data point

DESCRIPTION

Introduction

The room control units of the **RYMASKON® 1000** series are designed for control in residential, hotel and office rooms and individually regulate the heating, cooling and fan levels of the internal rooms. The product family is characterised by its elegant design, intuitive operation and the many possible combinations of the individual components.

The room control units **RYMASKON® 1000C** (Controller) are used to control and regulate heating convectors and fan coils. Depending on the type variant, the units are available with analogue outputs (0-10 V) and with digital/relay outputs for controlling heating valves, cooling valves, 6-way valves, staged fans or EC fans. Control takes place via PI, PWM or 2-point/3-point control. The change-over function can be used to operate 2-pipe and 4-pipe systems. The **Communication** is either wired via **Modbus** (RTU) / **BACnet** (MS/TP) or wireless via **W-Modbus** / **W-BACnet** (wireless). The climate parameters on the controller can be adjusted and monitored via the BMS at any time.

In addition to the integrated temperature and humidity sensor, **sensors** for CO₂ and VOC are available as an option. An input for a passive temperature sensor (NTC10K) and an input for a potential-free contact are additionally available. This allows a window contact or a condensation control switch to be connected, for example. This provides all options for air-conditioning of the rooms according to individual requirements.

In addition, the **sun protection** (Venetian blinds, shutters) and **light** (with dimming function) functions can be controlled via bus. Visual indication takes place on a 2" TFT **display**, where as the unit is controlled via capacitive keys (**touch keys**). All unit types are available in the contemporary **housing** Iduna 3 (112 x 89.5 x 24 mm) in white or black colour. Wall-mounting is performed on standard in-wall flush boxes.

DESCRIPTION

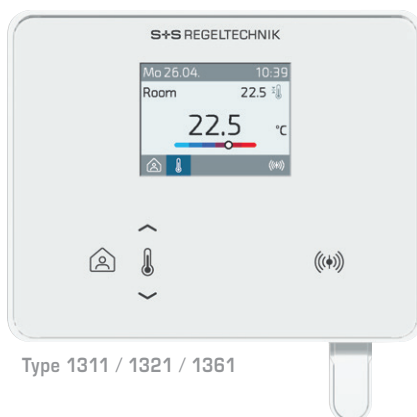
Technical data
(Rev. Data-V40)

TECHNICAL DATA	
Unit type:	room controller for heating convectors or fan coils
Functions:	temperature, fan, sun protection and light (see type table)
System of units:	SI (default) or imperial (can be changed via bus)
Data points:	temperature [°C] [°F], relative humidity [%RH], air quality (VOC) [%] [ppb], carbon dioxide (CO ₂) [ppm], 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
Voltage supply:	24 V AC/DC (± 10 %) or 230 V AC (100-240 V AC)
Communication:	transmission type depends on the unit type (wired or wireless), protocol is configurable (can be changed via bus; bus parameters are retained)
(Cable)	RS 485 interface, galvanically isolated , max. 32 units, • Modbus (RTU), slave, address range 1...247 (9600/19200/38400/57600/115200 baud, 8N1, even/odd parity, 1/2 stop bits) • BACnet (MS/TP), master, address range 0...127 (9600/19200/38400/57600/115200 baud, 8N1, 1 stop bit)
(Wireless)	wireless module (AES-128 encrypted), max. 100 units (per gateway), frequency 2.4 GHz ISM, transmission power 100 mW range max. 500 m (open field) / approx. 50 - 70 m (inside buildings) • W-Modbus (Wireless Modbus), slave, address range 1...247 • W-BACnet (Wireless BACnet), master, address range 0...127
Display:	TFT display , 2" (41 x 30 mm), 320 x 240 x 3 pixels (RGB), LED backlighting, viewing angle ± 85°
Operating elements:	capacitive keys (up to 10 keys, depending on type) for setting the target temperature, fan stages, presence message, sensor values, and for operating sun protection and light
Inputs:	1 Input NTC10K (can be configured as a digital input DI1 , potential-free) 1 Digital input DI2 for potential-free switches (24 V devices) or for potential-loaded switch (230 V devices)
Outputs:	for heating/cooling, 6-way valves, fan, number depends on unit type (see connection diagrams) • Analogue Outputs AO (0-10 V DC, max. 5 mA) as PI controllers • Relay Outputs RO (230 V AC, max. 500 mA, cos φ = 1.0/resistive load) or (230 V AC, max. 3 A, cos φ = 1.0/resistive load) as 2-point/3-point controllers • Digital Outputs DO (I_n 400 mA, short circuit max. 1.2 A) as 2-point/3-point controllers, PWM
Electrical connection:	0.2 - 1.5 mm ² , using push-in terminals
Housing:	plastic, flame retardant (UL 94 V-0), PC/ABS material, colour white (similar 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) in-wall: + 23 mm (D), sensor protection: + 22 mm (H)
Mounting:	wall-mounting on in-wall flush box, Ø 55 mm
Ambient temperature:	0...+50 °C (operation); -30...+70 °C (storage)
Permitted humidity:	0...90 % RH (non-precipitating air)
Protection type:	IP 30 (according to EN 60 529)
Overvoltage category:	OVC1 (at 24 V); OVC2 (at 230 V)
Contamination degree:	PD2
Standards:	CE conformity according to Low-Voltage Directive 2014/35/EU, EMC Directive 2014/30/EU (Cable) or Radio Equipment Directive 2014/53/EU (Wireless)
TEMPERATURE	(basic equipment)
Sensor:	digital temperature sensor, low hysteresis, high long-term stability
Measuring range:	0...+50 °C / +32...+122 °F
Accuracy:	typical ± 0.3 K / ± 0.5 °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:	typical ± 2.0 % (20...80 % RH) at +25 °C / +77 °F, otherwise ± 3.0 %
CARBON DIOXIDE (CO₂)	(optional)
Sensor:	digital photoacoustic NDIR-CO ₂ sensor (non-dispersive infra-red technology), with automatic calibration and high long-term stability
Measuring range:	0...2000 ppm
Accuracy:	typically ± 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 0...2383 ppb ethanol equivalent – non-linear)
Accuracy:	< ± 15 %
Service life:	> 10 years (if used as intended, depending on type and duration of VOC exposure)

BASIC MODELS



Room control units
 for temperature
 adjustment



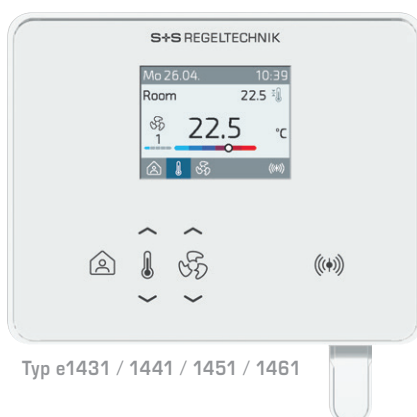
Type 1311 / 1321 / 1361



Type 1312 / 1322 / 1362



Room control units
 for temperature and
 fan adjustment



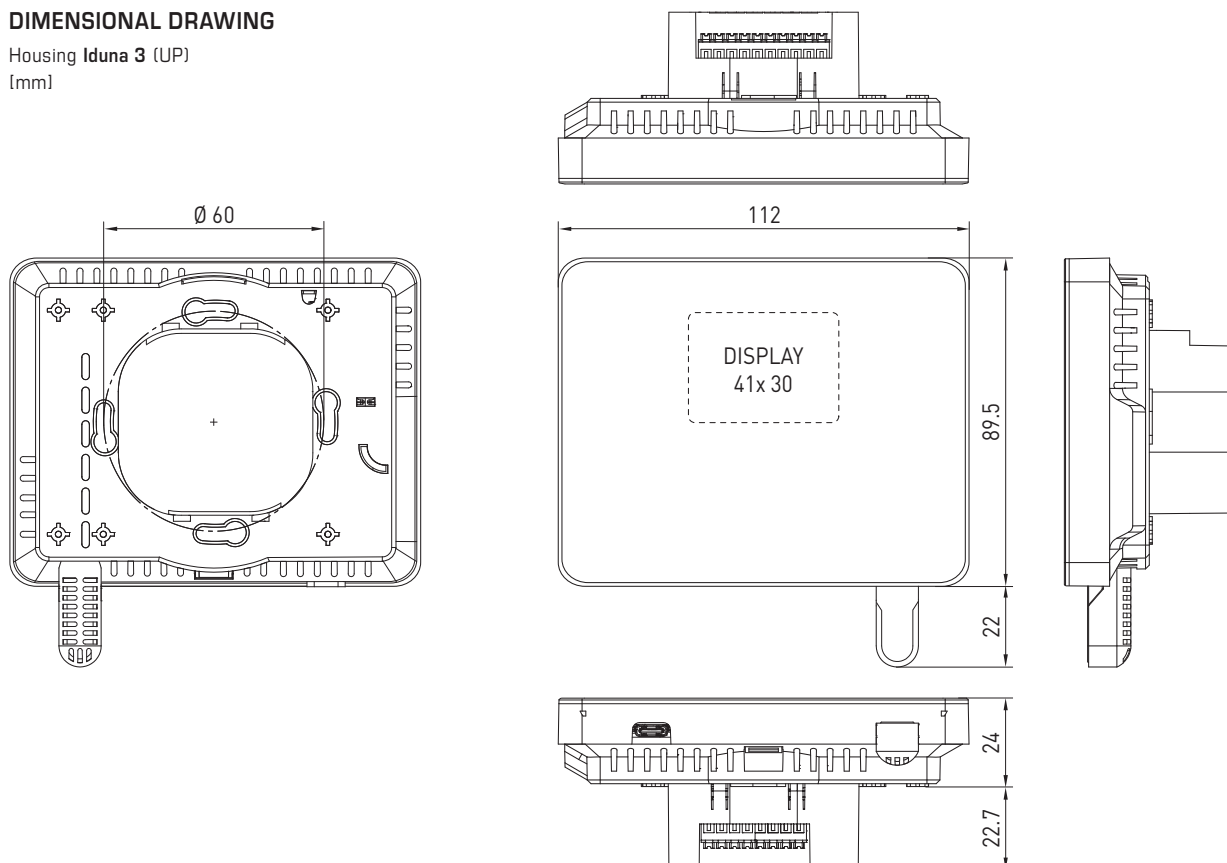
Type e1431 / 1441 / 1451 / 1461



Type 1432 / 1442 / 1452 / 1462

DIMENSIONAL DRAWING

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



CONNECTION



Type 132xC-M (RS485)	24 V
Type 132xC-WM (wireless)	
3 AO (h, c, 6W)	
1 free	
2 free	
3 free	
4 free	
5 A03 0-10V (6-way valve)	
6 A02 0-10V (cooling)	
7 A01 0-10V (heating)	
8 GND (AO)	
9 GND (DI2)	
10 DI2 (potential-free)	
11 UB+ 24V AC/DC	
12 UB- GND AC/DC	
13 NTC10K (DI1 , potential-free)	
14 GND (NTC10K/DI1)	
RTU, MS/TP wireless	
15 RS485 A (D+) free	
16 RS485 B (D-) free	
17 RS485 A (D+) free	
18 RS485 B (D-) free	

Type 136xC-M (RS485)	24 V
Type 136xC-WM (wireless)	
2 AO (h, c) + 2 DO (h, c)	
1 DO2 (NO contact, 400mA, cooling)	
2 DO1 (NO contact, 400mA, heating)	
3 Root/COM (24V, max. 1A res. load)	
4 free	
5 free	
6 A02 0-10V (cooling)	
7 A01 0-10V (heating)	
8 GND (AO)	
9 GND (DI2)	
10 DI2 (potential-free)	
11 UB+ 24V AC/DC	
12 UB- GND AC/DC	
13 NTC10K (DI1 , potential-free)	
14 GND (NTC10K/DI1)	
RTU, MS/TP wireless	
15 RS485 A (D+) free	
16 RS485 B (D-) free	
17 RS485 A (D+) free	
18 RS485 B (D-) free	

Type 131xC-WM (wireless)	230 V
2 RO (h, c) + 1 AO (6W)	
1 free	
2 free	
3 free	
4 R01 Heating relay (solid state, 0.5A)	
5 R02 Cooling relay (solid state, 0.5A)	
6 DI2 (100-240V AC) - Ref N	
7 N (100-240V AC)	
8 L (100-240V AC)	
11 Output 0-10V (6-way valve)	
12 GND (Output 0-10V)	
13 NTC10K (DI1 , potential-free)	
14 GND (NTC10K/DI1)	



Type 143xC-M (RS485)	24 V
Type 143xC-WM (wireless)	
2 AO (h, c, 6W) + 1 AO (f)	
1 free	
2 free	
3 free	
4 free	
5 A03 0-10V (fan)	
6 A02 0-10V (cooling, 6-way valve)	
7 A01 0-10V (heating, 6-way valve)	
8 GND (AO)	
9 GND (DI2)	
10 DI2 (potential-free)	
11 UB+ 24V AC/DC	
12 UB- GND AC/DC	
13 NTC10K (DI1 , potential-free)	
14 GND (NTC10K/DI1)	
RTU, MS/TP wireless	
15 RS485 A (D+) free	
16 RS485 B (D-) free	
17 RS485 A (D+) free	
18 RS485 B (D-) free	

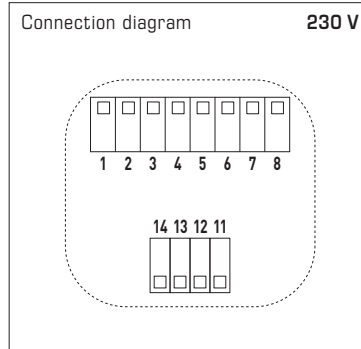
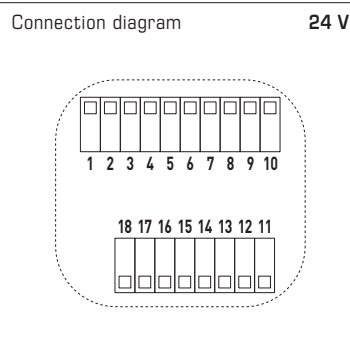
Type 146xC-M (RS485)	24 V
Type 146xC-WM (wireless)	
2 AO (f) + 2 DO (h, c)	
1 DO2 (NO contact, 400mA, cooling)	
2 DO1 (NO contact, 400mA, heating)	
3 Root/COM (24V, max. 1A res. load)	
4 free	
5 free	
6 A02 0-10V (fan)	
7 A01 0-10V (fan)	
8 GND (AO)	
9 GND (DI2)	
10 DI2 (potential-free)	
11 UB+ 24V AC/DC	
12 UB- GND AC/DC	
13 NTC10K (DI1 , potential-free)	
14 GND (NTC10K/DI1)	
RTU, MS/TP wireless	
15 RS485 A (D+) free	
16 RS485 B (D-) free	
17 RS485 A (D+) free	
18 RS485 B (D-) free	

Type 145xC-WM (wireless)	230 V
2 RO (h, c) + 1 AO (f)	
1 free	
2 free	
3 free	
4 R01 Heating relay (solid state, 0.5A)	
5 R02 Cooling relay (solid state, 0.5A)	
6 DI2 (100-240V AC) - Ref N	
7 N (100-240V AC)	
8 L (100-240V AC)	
11 Output 0-10V (Fan)	
12 GND (Output 0-10V)	
13 NTC10K (DI1 , potential-free)	
14 GND (NTC10K/DI1)	

Type 144xC-WM (wireless)	230 V
2 RO (h, c) + 3 RO (f)	
1 R03 Fan level 1 relay (mechanical, 3A)	
2 R04 Fan level 2 relay (mechanical, 3A)	
3 R05 Fan level 3 relay (mechanical, 3A)	
4 R01 Cooling relay (solid state, 0.5A)	
5 R02 Heating relay (solid state, 0.5A)	
6 DI2 (100-240V AC) - Ref N	
7 N (100-240V AC)	
8 L (100-240V AC)	
11 free	
12 free	
13 NTC10K (DI1 , potential-free)	
14 GND (NTC10K/DI1)	



WARNING:
Turn off the power before
starting wiring!



RYMASKON® 1000 C Controller (series)
 Number key for type versions

RYM1-**X****X****X****1**-**X****X****X****0**-**0****X****X**

- Pos. 1-4 Type name**
 RYMASKON 1000 C
- Pos. 5-6 Controller type**
 Setpoint adjustment | outputs
- Temperature
- [1] 2 **RO** (h, c) + 1 **AO** (6W)
 [2] 3 **AO** (h, c, 6W)
 [3] 2 **AO** (h, c) + 2 **DO** (h, c)
 Temperature + Fan
 [4] 2 **AO** (h, c, 6W) + 1 **AO** (f)
 [5] 2 **RO** (h, c) + 3 **RO** (f)
 [6] 2 **RO** (h, c) + 1 **AO** (f)
 [7] 2 **AO** (h, c, f) + 2 **DO** (h, c)
- Pos. 7 Housing colour**
 White
 Black
- Pos. 8 Visual indication**
 TFT display (2.0")
- Pos. 9 Communication**
Modbus (RTU) / **BACnet** (MS/TP)
W-Modbus / **W-BACnet** (Wireless)
- Pos. 10 Sensors**
T [°C/°F], **RH** [%]
T [°C/°F], **RH** [%], **CO2** [ppm]
T [°C/°F], **RH** [%], **VOC** [%]
T [°C/°F], **RH** [%], **CO2** [ppm], **VOC** [%]
- Pos. 11 Voltage supply**
 24 V AC/DC
 230 V AC
- Pos. 12 Mounting**
 on in-wall flush box, Ø55 mm
- Pos. 14-15 Touch key extension** ^{*3}
 Basic model (cf. **Pos. 5**)
 including room occupancy
 + **B** (1 sun protection)
 + **BB** (2 sun protection)
 + **L** (1 light)
 + **LL** (2 light)
 + **LB** (1 light, 1 sun protection)

RYM1]

*1 31]

32]

36]

43]

*1 44]

*1 45]

46]

1]

2]

1]

*2 M]

W]

2]

6]

7]

8]

1]

2]

0]

00]

01]

02]

03]

04]

05]

*1 230 V units

*2 Not with 230 V units

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

Outputs
AO Analogue (0-10 V DC)
RO Relay (230 V AC)
DO Digital (24 V DC)
 (h, c) Heating, Cooling
 (f) Fan
 (6 W) 6-way valve

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

RYMASKON® 13xx C	Controller (basic model) for heating convectors (HC) for temperature adjustment	
-------------------------	---	---

Type / WG02 Control outputs	Communi- cation	Measuring element	Control system	Colour / 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-TH-OTS-WM-FM-W	Wireless	T RH	T - R	white	■	RYM1-3111-W220-000
RYM 1312C-TH-OTS-WM-FM-B	Wireless	T RH	T - R	schwarz	■	RYM1-3121-W220-000
[2] 3 AO (heating, cooling, 6-way valve, 0-10 V)						
RYMASKON® 132x C				Iduna 3		
RYM 1321C-TH-OTS-M-FM-W	RS 485	T RH	T - R	white	■	RYM1-3211-M210-000
RYM 1322C-TH-OTS-M-FM-B	RS 485	T RH	T - R	black	■	RYM1-3221-M210-000
RYM 1321C-TH-OTS-WM-FM-W	Wireless	T RH	T - R	white	■	RYM1-3211-W210-000
RYM 1322C-TH-OTS-WM-FM-B	Wireless	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 resistive load)						
RYMASKON® 136x C				Iduna 3		
RYM 1361C-TH-OTS-M-FM-W	RS 485	T RH	T - R	white	■	RYM1-3611-M210-000
RYM 1362C-TH-OTS-M-FM-B	RS 485	T RH	T - R	black	■	RYM1-3621-M210-000
RYM 1361C-TH-OTS-WM-FM-W	Wireless	T RH	T - R	white	■	RYM1-3611-W210-000
RYM 1362C-TH-OTS-WM-FM-B	Wireless	T RH	T - R	black	■	RYM1-3621-W210-000

RYMASKON® 14xx C	Controller (basic models) for FAN COILS for temperature and fan adjustment	
-------------------------	--	---

Type / WG02 Control outputs	Communi- cation	Measuring element	Control system	Colour / Housing	Display	Item no.
[4] 3 AO (heating, cooling 6-way valve, EC fan, 0-10 V)						
RYMASKON® 143x C				Iduna 3		
RYM 1431C-TH-OTFS-M-FM-W	RS 485	T RH	T F R	white	■	RYM1-4311-M210-000
RYM 1432C-TH-OTFS-M-FM-B	RS 485	T RH	T F R	black	■	RYM1-4321-M210-000
RYM 1431C-TH-OTFS-WM-FM-W	Wireless	T RH	T F R	white	■	RYM1-4311-W210-000
RYM 1432C-TH-OTFS-WM-FM-B	Wireless	T RH	T F R	black	■	RYM1-4321-W210-000
[5] 5 RO (heating, cooling, 230 VAC, max. 500 mA) 3-level fan, 230 VAC, max. 3 A)						
RYMASKON® 144x C				Iduna 3		
RYM 1441C-TH-OTFS-WM-FM-W	Wireless	T RH	T F R	white	■	RYM1-4411-W220-000
RYM 1442C-TH-OTFS-WM-FM-B	Wireless	T RH	T F R	schwarz	■	RYM1-4421-W220-000
[6] 2 RO (heating, cooling, 230 VAC, max. 500 mA) + 1 AO (EC fan, 0-10 V)						
RYMASKON® 145x C				Iduna 3		
RYM 1451C-TH-OTFS-WM-FM-W	Wireless	T RH	T F R	white	■	RYM1-4511-W220-000
RYM 1452C-TH-OTFS-WM-FM-B	Wireless	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 resistive load)						
RYMASKON® 146x C				Iduna 3		
RYM 1461C-TH-OTFS-M-FM-W	RS 485	T RH	T F R	white	■	RYM1-4611-M210-000
RYM 1462C-TH-OTFS-M-FM-B	RS 485	T RH	T F R	black	■	RYM1-4621-M210-000
RYM 1461C-TH-OTFS-WM-FM-W	Wireless	T RH	T F R	white	■	RYM1-4611-W210-000
RYM 1462C-TH-OTFS-WM-FM-B	Wireless	T RH	T F R	black	■	RYM1-4621-W210-000
Communication:	RS 485 (wired) = Modbus (RTU) / BACnet (MS/TP) Wireless = W-Modbus / W-BACnet Communication protocol can be changed via bus (transmission type depends on the unit type)					
Measuring element / control system:	T = Temperature sensor RH = Humidity sensor		T = Temperature F = Fan R = Room occupancy			

OPTIONS		
Measuring elements:	Sensors for CO2 [ppm] and/or VOC [%] (cf. Pos. 10)	extra charge
Control:	Keys for sun protection and/or light (cf. Pos. 14-15)	on request
Optional:	More type versions on request!	

CONFIGURATION

General information and
configuration menu

1.0 General configuration

The unit can be configured in three ways:

- **Display (unit)**
Manual input via Configuration **menu** directly on the unit's display.
(RS485 interface configuration)
- **Configuration Tool (PC)**
Input/upload to the unit via PC using configuration **software** (USB-C interface).
(Configuration of the RS485 interface and configuration of all other unit parameters)
- **BMS (Bus)**
Input to **Modbus register** / **BACnet object** via bus (RS485 interface).
(No configuration of the RS485 interface, otherwise configuration of all other unit parameters)

Configurable bus parameter

Parameter	Value range (RTU)	Value range (MS/TP)
Bus address	1 (default) ... 247	0 (default) ... 127
Baudrate	9600 / 19200 (default) / 38400 / 57600 / 115200 baud	9600 / 19200 / 38400 (default) / 57600 / 115200 baud
Parity / stop bits	NONE (none, 1 stop bit) EVEN (even, 1 stop bit) (default) ODD (odd, 1 stop bit) NONE (none, 2 stop bits)	NONE (none, 1 stop bit) (default)

The bus parameters must be set separately for each protocol. The **Save** parameter ensures that the values are permanently stored in the non-volatile memory (EEPROM) of the unit and are retained if the unit is switched over. The bus protocol can be switched via the configuration menu (unit) or the configuration tool (PC) between **Modbus** (RTU) and **BACnet** (MS/TP).

[Configuration register](#)

[Save to non-volatile
memory \(EEPROM\)](#)
[SaveToEEPROM_2013](#)

[Menu structure](#) [Configuration menu](#)

Configuration (Main)

- 1 **Device Info**
 - Serial Number
 - Device type
 - Device ID
 - Manufacturer
 - Operating time
 - SW Version
 - User Manual (QR code)
- 2 **Bus Protocol**
 - Protocol type
- 3 *(type-dependent)*
 - Modbus / BACnet**
 - Bus Address
 - Baud Rate
 - Parity / Stop Bits
 - W-Modbus / W-BACnet**
 - Bus Address
 - NW State
 - NW Quality
 - GW Pairing (Gateway)
 - Bluetooth (AppMode)
- 4 **Date / Time**
 - Date Format
 - Date Adjust
 - Time Format
 - Time Adjust
 - Summer Time
- 5 **Factory Reset**
 - confirm
- 6 **Save / Exit**
 - confirm
- 7 **Discard / Exit**
 - confirm

1.1 Configuration menu (Display)

The menu is used to configure the RS485 interface via the unit's display. To navigate the menu structure and edit entries, there are additional functions assigned to the **PRESENCE** , **SENSOR**  keys and the **UP**  and **DOWN**  arrow keys for temperature adjustment (see table).

Key assignment in the configuration menu

	BACK	One level back in the menu structure
	CANCEL	Cancel the ongoing editing
	SELECT	Navigate through the list (up/down)
	VALUE	Change the entry value (increase/decrease)
	OK	Confirm the entry value
	NEXT	Next menu level or next editing field of the value

Accessing the configuration menu

To access the configuration menu, you have to press and hold down the **SENSOR** , immediately followed by the **PRESENCE**  key. **Press** both keys together for **3 s** (Fig. 001).

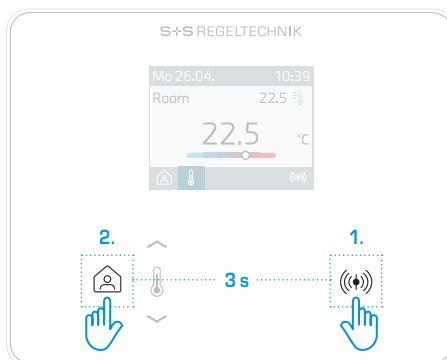


Fig. 001 Accessing the configuration menu

Configuration register

PIN config menu
PIN_2008
(Default: 1111)

Entering the PIN number

After accessing the configuration menu, you first have to enter a 4-digit **PIN** number (Fig. 002).
The **Modbus register** / **BACnet object** can be used to change the number or permanently deactivate the query (default: 1111 / no PIN: 0000).

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

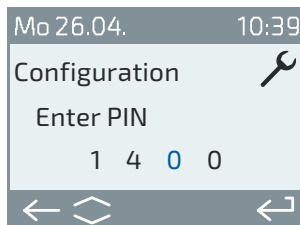


Fig. 002 PIN entry

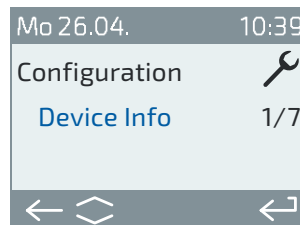


Fig. 003 First entry (Main)

Confirming a value

The value of the entry is initially inactive (Fig. 004).

Activation is via the **SENSOR** (🔊) key.

The **active value** is then displayed in a **focus colour** (Fig. 005).

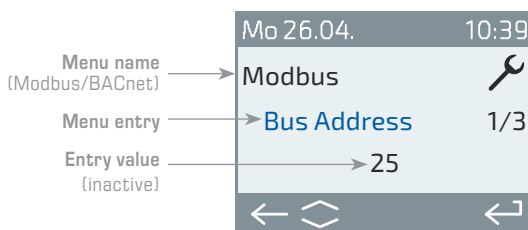


Fig. 004 Editing inactive

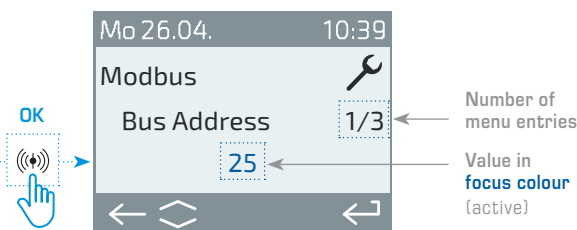


Fig. 005 Active value in focus colour

Factory reset

All parameters can be reset in the **Factory Reset** level (Fig. 006).

After confirming with 'Yes', the unit restores the factory settings (bus parameters are retained) and performs a restart (Fig. 007).

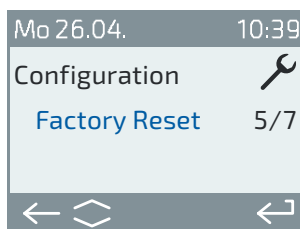


Fig. 006 Accessing factory reset

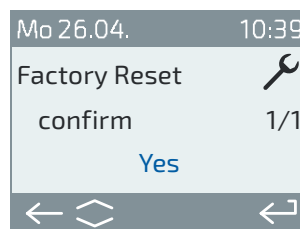


Fig. 007 Factory reset confirmation

Exiting the configuration

Saving and exiting takes place in the **Safe / Exit** level (Fig. 008).

This way, all entered values are saved permanently.

Exiting **without saving** takes place in the **Discard / Exit** level (Fig. 009).

This **cancels** the configuration and all entries are discarded.

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

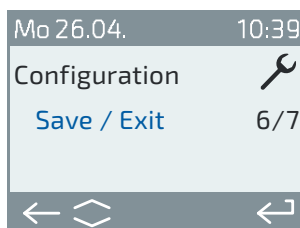


Fig. 008 Saving and exiting

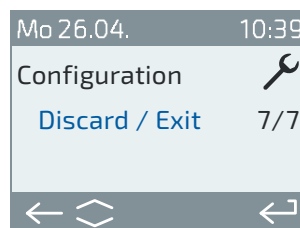


Fig. 009 Exiting without saving

1.2 Configuration software (PC)

The PC software **SplussS-ConfigurationTool** is used to configure the RS485 interface and all other unit parameters. It is also possible to save an existing **unit configuration** within the software and **transfer** it to other units. Thanks to the innovative **CuRA**-function (Customised Register Assignment), each data point can be assigned an individual register address (see chapter 1.5).

The software accesses the bus structure of the unit and can read (r) or read/write (r/w) all values. The configuration options range from the adjustment range of the set values to the brightness setting of the display and the bus parameters. It will still be possible to input data via the **RS485 interface**.

System requirements (PC)

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

Download (exe)

The SplussS-ConfigurationTool can be downloaded online from the download area of the device at <https://www.spluss.de/en/collections/room-controller-rymaskon-controller>

When the program is launched for the first time, **Microsoft Defender** displays a safety notice, which must be confirmed with **"Run anyway"**.

Unit connectivity

The unit is connected via the **USB-C**-interface on the underside of its housing (Fig. 010). You can use a commercially available cable for this (not included in the scope of delivery). The unit does not require an additional power supply.

When accessing the unit, you are prompted to enter the PIN (default 1111). Please make a note of the changed sequence of digits, if necessary. The unit cannot be accessed without a valid PIN.

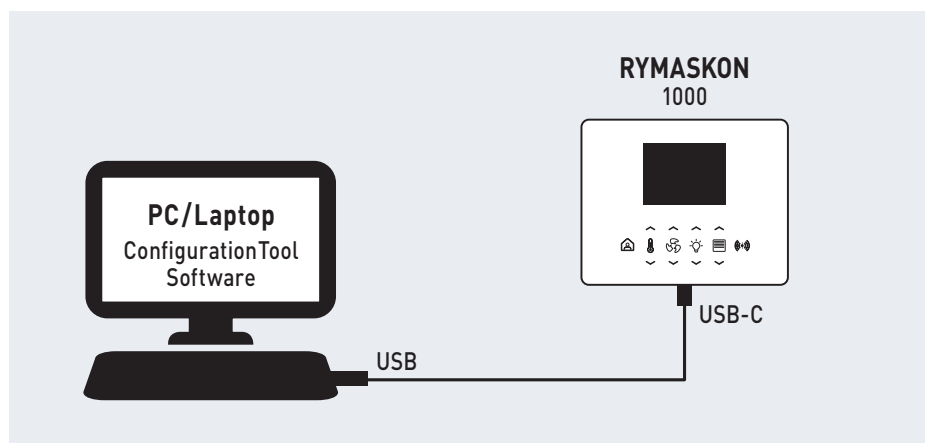


Fig. 010 Connection via USB-C interface

Configuration register

The notes on the side refer to the relevant configuration register.

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

1.3 Configuration register (higher-level system)

In addition to the data points that can be used to operate the unit (data register), the unit can also be configured via Modbus register / BACnet object . Input is made via the BMS (RS485 interface) or by means of the configuration software (PC).

You can find more relevant information in the documents 'Modbus Register Tables' and 'BACnet PICS' provided in the download area of the device at

<https://www.spluss.de/collections/raumregler-rymaskon-controller>

W-Modbus W-BACnet



W-Modbus
App for Apple



W-Modbus
App for Android

W-BACnet
App for Apple



W-BACnet
App for Android



1.4 W-Modbus / W-BACnet (Wireless)

The RYMASKON® 1000 is integrated into a wireless W-Modbus or W-BACnet network using the **configuration menu** (refer to chapter 1.1) directly on the unit (display).

Network connection

The connection to the wireless gateway is established at the **Pairing** level. Deactivation takes place automatically when you exit the Pairing mode on the master gateway. Even the network **status** and network **quality** can be queried via the menu.

App mode

Depending on the bus protocol, the apps can access wireless devices:
Lumenradio **W-Modbus App** for W-Modbus communication
Lumenradio **W-BACnet App** for W-BACnet communication

To do this, **Bluetooth** must first be activated in the configuration menu. The unit then becomes visible for approx. 60 s and can be connected via the app. The connection remains active until you press '**Disconnect**' in the app or activate Pairing on the unit.

The following data is available in app mode:

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

You can find **more information** via the help function in the app. The apps are available for Android and Apple mobile devices through the app store.

Link to Lumenradio **W-Modbus App** for **Apple**:

<https://apps.apple.com/de/app/w-modbus/id6472275984>

Link to Lumenradio **W-Modbus App** for **Android**:

<https://play.google.com/store/apps/details?id=com.lumenradio.wmodbus>

Link to Lumenradio **W-BACnet App** for **Apple**:

<https://apps.apple.com/de/app/w-bacnet/id6472276160>

Link to Lumenradio **W-BACnet App** for **Android**:

<https://play.google.com/store/apps/details?id=com.lumenradio.wbacnet>

1.5 CuRA (Customised Register Assignment)

The configuration software **SplusS-ConfigurationTool** can be used to assign an **individual address** (Modbus register / BACnet objects) to each data point. The individual address assignment can be saved within the software and transferred to other units.

This simplifies the integration of the unit into an existing building automation system and can be done without reprogramming the BMS.

Furthermore, the **CuRA function** can also be used to create Modbus register blocks and thus significantly increase the query speed.

1.6 Time setting (time/date)

The unit has a real-time clock that automatically calculates the **time** and **date**. During commissioning, the time and date must be updated **manually** via the configuration menu (display), via the BMS (Modbus register) or using the configuration software (PC).

The time setting is based on standard time (winter time). It is possible to activate an **automatic time change** to summer time, if necessary.

The configured time is retained in the event of a temporary power interruption.

Configuration register

Time and date

Time_Format_2015

Date_Format_2016

Time_SetSummerWinter_2017

Data register

Time and date

Date_Time_2018*-2023

*BACnet object is located at the first address

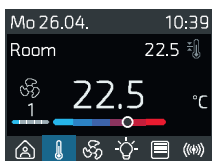
ICONS

Screen areas and explanation of icons

DISPLAY / MENU

APPEARANCE (configurable)

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



Display Darkmode

HOME SCREEN

The default view is the setpoint temperature adjustment with fan levels if necessary.

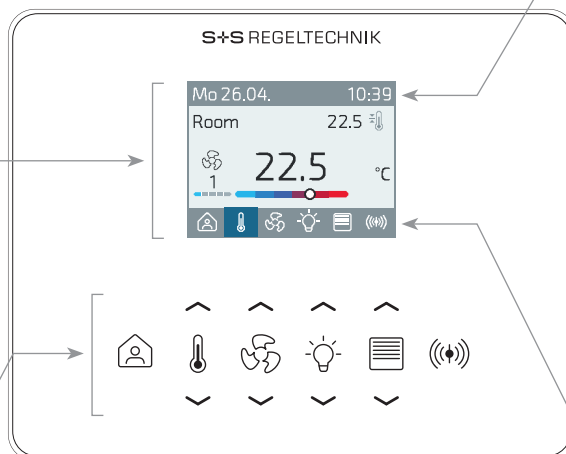
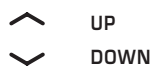


Fig. 011 Icons, using type 1401-LB as an example

KEYPAD (TOUCHKEYS)

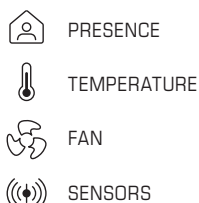
SETPOINT ADJUSTMENT AND MENU ACCESS VIA ARROW KEYS



Note:

Some keys are assigned additional functions in the configuration menu.

BASIC FUNCTIONS MENU ACCESS FOR PRESENCE AND SENSORS



ADDITIONAL FUNCTIONS KEY EXTENSION FOR 1 OR 2 ZONES



Options:

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

HEADER

Mo 26.04. 10:39

STANDARD DISPLAY
Weekday, date, time,
summer/winter time
(can be set via bus).

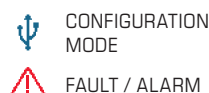
Mo 26.04. 10:39

STATUS DISPLAY
ROOM CLIMATE



Mo 26.04. 10:39

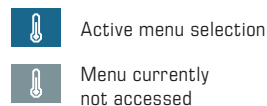
MESSAGES



FOOTER



MENU STATUS
(Options are type-dependent)



Note:

Only functions integrated in the unit type are also displayed as an icon in the footer.

OVERVIEW OF ICONS

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

USER INTERFACE

Layout and
operating modes

[Configuration register](#)

[Darkmode](#)

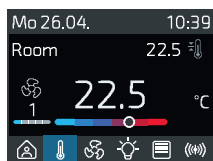
[Display_Darkmode_2024](#)

[Display Brightness](#)

[Display_Brightness_2011](#)

[Language](#)

[Language_2009](#)



Display Darkmode

2.0 User interface, general information

In addition to the bright display view (Fig. 012), you can also activate **darkmode**.
The **brightness** can be individually set.

Six **languages** are available:

German, English (default), Spanish, French, Italian, Russian

Default **labels** are already provided in each language (see top left in the menu content, e.g. Room) for specific environments. Regardless of this, each label can be individually changed.
You can use a maximum of 12 characters for this.

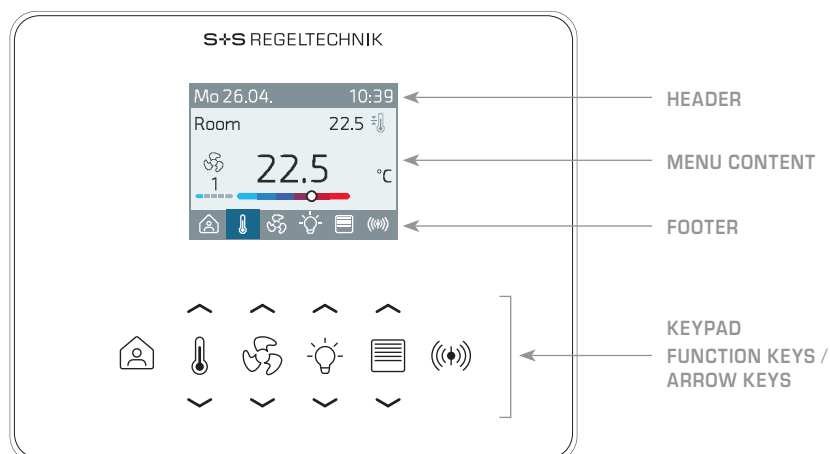


Fig. 012 HMI layout

[Data register](#)

Lock for individual keys
or key pairs:

[Temperature, Fan, Presence](#)
[RCBBMS_409_bitField](#)

[Sun protect](#)

[SP_AutoMode_700_bitField](#)

[Light](#)

[L_AutoMode_1100_bitField](#)

[Configuration register](#)

[Time and date](#)

[Time_Format_2015](#)

[Date_Format_2016](#)

[Time_SetSummerWinter_2017](#)

[Data register](#)

[Time and date](#)

[Date_Time_2018-2023](#)

[Header Icons Modbus](#)

[HeaderIconModbus_411_bitField](#)

2.1 HMI layout (Human Machine Interface)

Keypad (touch keys)

Operation takes place directly via the keypad.

The menus are accessed via the labelled function keys themselves or via the corresponding **UP**  and **DOWN**  arrow keys.

The values in the menu can also be adjusted using the arrow keys.

The **BMS** can temporarily **block** individual keys or key pairs for the user on site.

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

Header on the display (Header)

The **date** and **time** are constantly shown in the header.

In addition to the time and date format, you can also configure an automatic switchover between summer and winter time.

For further relevant information, see chapter 1.6 'Time setting (time/date)'.

The **Header Icons Modbus** parameters can be used to show various icons on the BMS (Fig. 013). If the icons are switched via a configured DI input, you have to observe chapter 7 'Inputs'.
The room climate icons trigger specific controller functions (see chapter 9 'Controller').

In normal operation, you can display the following **room climate** icons in parallel:

Window contact  – Dew point  – Frost protection  – ECO mode 

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

USB-C interface connected  – fault / alarm 

When a status message stops, the display automatically switches back to the configured room climate icons. The appearance and position of the header icons are permanently programmed into the unit and cannot be changed.



Fig. 013 Header - Room climate



Fig. 014 Header - Status messages

USER INTERFACE

Layout and
operating modes

2.1 HMI layout (continuation)

Footer on the display (Footer)

All available functions are shown in the footer (depending on unit type).

The icon of the menu currently open is highlighted in colour in the footer.

The appearance and position of the footer icons are permanently programmed into the unit and cannot be changed.

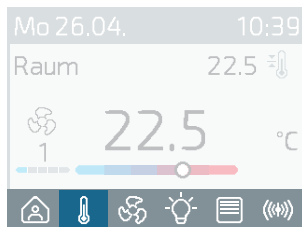


Fig. 015 Footer – Temperature active

2.2 Screen saver

The screen saver helps to reduce energy consumption.

In the default settings, the graphical user interface is automatically deactivated if the unit is not operated for 20 seconds. The screen saver appears.

For this, the display switches to black and only the current temperature display moves within the screen area.

Touching **any key** reactivates the graphical user interface (GUI) and the **Home screen** (Setpoint temperature adjustment) appears on the display.

[Configuration register](#)

[Screen saver](#)

[ScreenSaver_Timeout_2012](#)

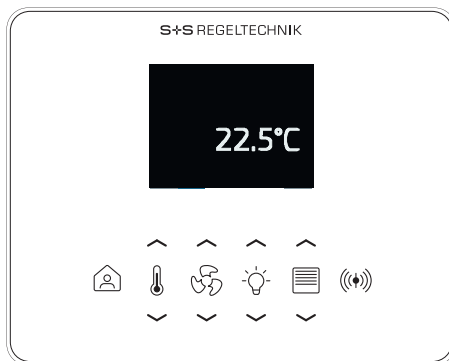


Fig. 016 Screen saver

2.3 Cleaning mode (key lock for 20 s)

To access the cleaning mode, you must press and hold down the **SENSOR** (⦿) key, immediately followed by the **DOWN** (▼) arrow key for the temperature adjustment. Press both keys together for **3 seconds** (Fig. 017).

Immediately afterwards, all buttons are temporarily locked for **20 seconds**. Meanwhile, the **cleaning countdown** counts down on the display (Fig. 018).

After the countdown has finished, the cleaning mode **ends automatically** and the **Home screen** (Setpoint temperature adjustment) appears on the display.

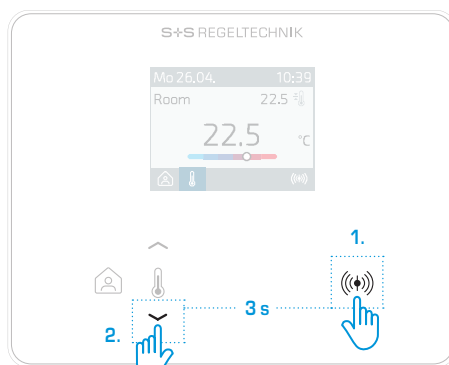


Fig. 017 Accessing the cleaning mode

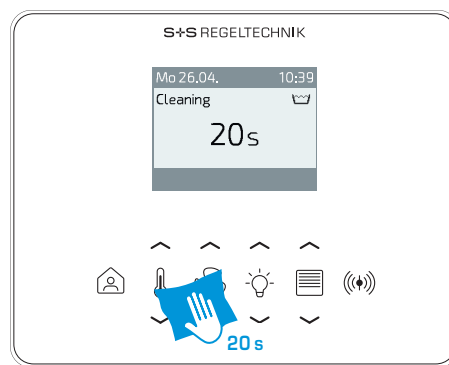


Fig. 018 Cleaning mode - Key lock with countdown



Do not introduce any liquids into the unit! Use exclusively a slightly damp cloth for cleaning. The unit will remain connected to the mains during this time – special care must be taken. No liability is assumed for damage caused by improper cleaning.

2.4 Key lock (child safety lock)

To activate or deactivate the key lock, press and hold the **SENSOR** (⦿) key, immediately followed by the **UP** (▲) arrow key for temperature adjustment. Press both keys together for **3 seconds** (Fig. 019).

The active key lock is indicated in the header by the **LOCKED** (🔒) icon (Fig. 020).

After activation, no setpoint adjustment is possible (the menu can still be accessed).

After deactivation, the Home screen (Setpoint temperature adjustment) appears on the display.

Note: The **BMS** can block individual keys or key pairs for the user on site. This is not indicated on the display. Deactivation is only possible via the BMS.

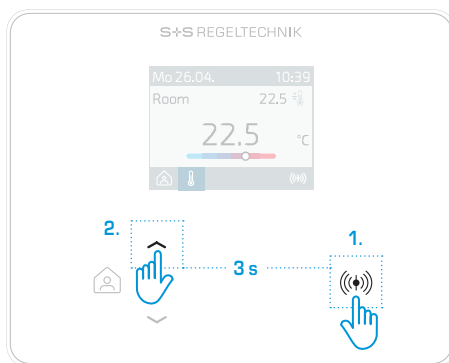


Fig. 019 Activating / deactivating the key lock

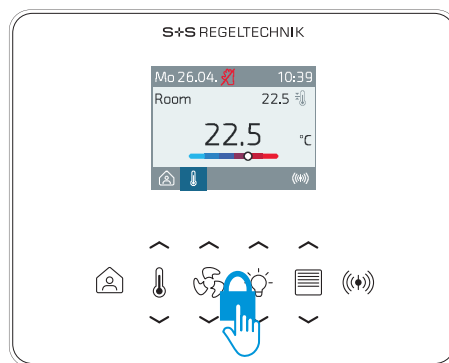


Fig. 020 Icon in header - Key lock active

TEMPERATURE SETPOINT

Display and adjustment

[Data register](#)

[Room Climate Controlled By BMS](#)
[RCBBMS_409_bitField](#)

3.0 Temp menu, general information (Setpoint temperature adjustment)

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

The BMS can use the **Room Climate Controlled By BMS** parameter to temporarily block manual adjustment (Manual mode) for the user. This locking is shown on the display.

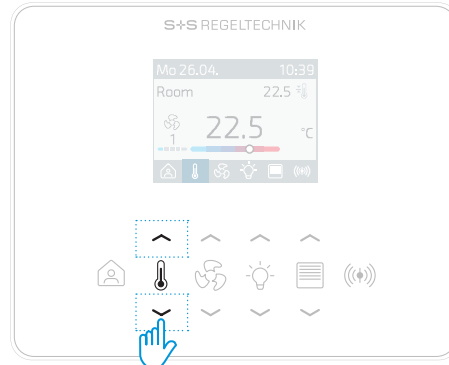


Fig. 021 Setpoint temperature adjustment via arrow keys

Display

In the Temp menu, it is possible to show or hide the current temperature, unit, setpoint temperature, operating mode, label and current fan levels (Fig. 022). The display is configured via the Modbus register / BACnet object.

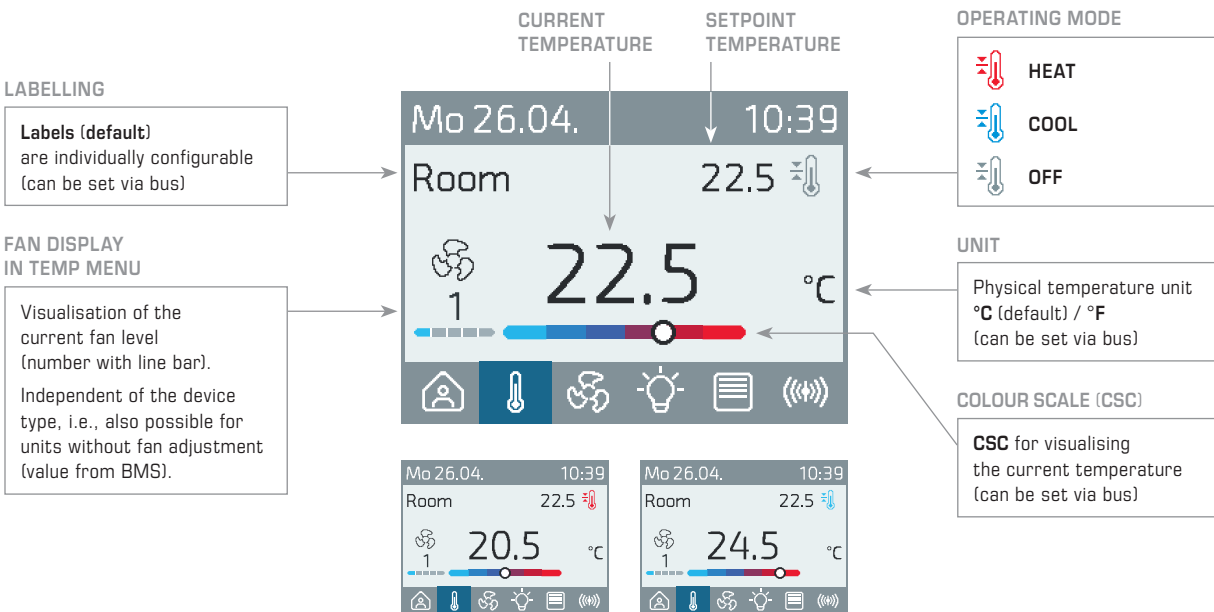


Fig. 022 Temp menu elements

Configuration register

Current Temp Mapping
CurrentTemp_Mapping_3650

Temp unit
Temp_Unit_2010

Display Temp Setpoint
Setpoint_Temp_Display_3602

Display Current Temp
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

Configuration register

Temp Setpoint Offset Step Size
Setpoint_Temp_Offset_StepSize_3600

Display OpMode
OpMode_Display_3601

Temp Setpoint After Reboot
Setpoint_Temp_AfterReboot_3603

Temp Setpoint Offset Min-Max After Reboot
Setpoint_Temp_Offset_MinMax_AfterReboot_3604

Display Fan In Temp Menu
Fan_DisplayInTempMenu_3764

Data register

Temp Setpoint
Setpoint_Temp_400

Temp Setpoint Offset
Setpoint_Temp_Offset_401

Temp Setpoint Absolut
Setpoint_Temp_Absolut_402

Temp Setpoint Offset Min-Max
Setpoint_Temp_Offset_MinMax_403

OpMode Status
OpMode_Status_404

3.1 Current temperature

A total of three **temperature channels** is available. These can be assigned to the current temperature in the configuration tab via the **Current Temp Mapping** parameter.

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: **Externer Sensor** (input must be appropriately configured)
Parameter: **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.

Default °C can be changed to °F.

The **colour scale (CSC)** is mapped to the current temperature and is used for better visualisation of cold or warm environments. Each sensor has its own CSC, which is factory-set to a value range in °C. The CSC must be adjusted when switching to °F.

(For configuration, please see chapter 5)

The **label** is mapped to the sensor and can be configured via the **Temp Sensor...Label** parameter for each of the three temperature channels (internal/external/bus).

(For details, please see chapter 5)

The **display** of the current temperature can be hidden using the **Display Current Temp** parameter or replaced with another sensor (e.g. relative humidity or CO2).

Note: For the **external sensor**, a measuring range of -20...+80 °C / -4...+176 °F applies.

Values outside the valid range are reported and displayed as errors.

3.2 Setpoint temperature

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

- **Nothing displayed**
- **Temp Setpoint Absolut** (default)
- **Temp Setpoint Offset**

Alternatively, you can use the **Display Temp Setpoint** parameter to display another sensor instead of the setpoint temperature (e.g. relative humidity or CO2). If set to Alternative and the setpoint temperature is changed using the keys, the display switches briefly to the setpoint temperature and then switches back to the alternative one.

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

The **Temp Setpoint Offset Min-Max** parameter can be used to specify the limits for the setpoint adjustment via the keys.

The values **Temp Setpoint** and **Temp Setpoint Offset Min-Max** are stored in the volatile memory (VRAM) and are reset to their default after the unit is restarted. The default parameters can be specified via the two **Temp Setpoint After Reboot** and **Temp Setpoint Offset Min-Max After Reboot** parameters.

The setpoint increment is set with the **Temp Setpoint Offset Step Size** parameter.

3.3 Operating mode

The following **icons** are displayed to indicate the current operating mode:

 **COOL** (cooling) –  **HEAT** (heating) –  **OFF** (cooling/heating off)

The icons can be hidden using the **Display OpMode** parameter.

3.4 Fan display

The display of the current fan level (number with line bar) in the Temp menu can be shown or hidden using the **Display Fan In Temp Menu** parameter.

Note: Fan levels are displayed in the Temp menu regardless of whether the unit has or doesn't have fan adjustment. For units without fan adjustment, the fan levels are specified exclusively by the BMS.

The operating principle and configuration of the fan adjustment are explained in the subsequent chapter 4 'Fan menu'.

FAN CONTROL

Display and adjustment

[Configuration register](#)

[Display Fan In Temp Menu](#)
[Fan_DisplayInTempMenu_3764](#)

[Data register](#)

[Room Climate Controlled By BMS](#)
[RCBBMS_409_bitField](#)

4.0 Fan menu, general information (fan adjustment)

The **Fan menu** is only available for unit types **with** fan adjustment.
The user can adjust the fan manually (Manual mode) using the **UP**  and **DOWN**  arrow keys next to the **FAN**  icon (Fig. 023).

The **fan levels** can be displayed in the **Temp menu** by the BMS, regardless of the unit type (see chapter 3.4 'Fan display').

The BMS can use the **Room Climate Controlled By BMS** parameter to temporarily block manual adjustment (Manual mode) for the user. This locking is not shown on the display.

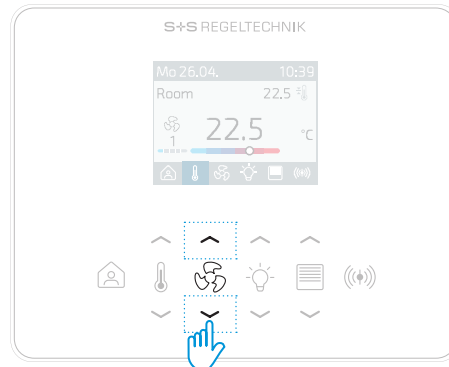
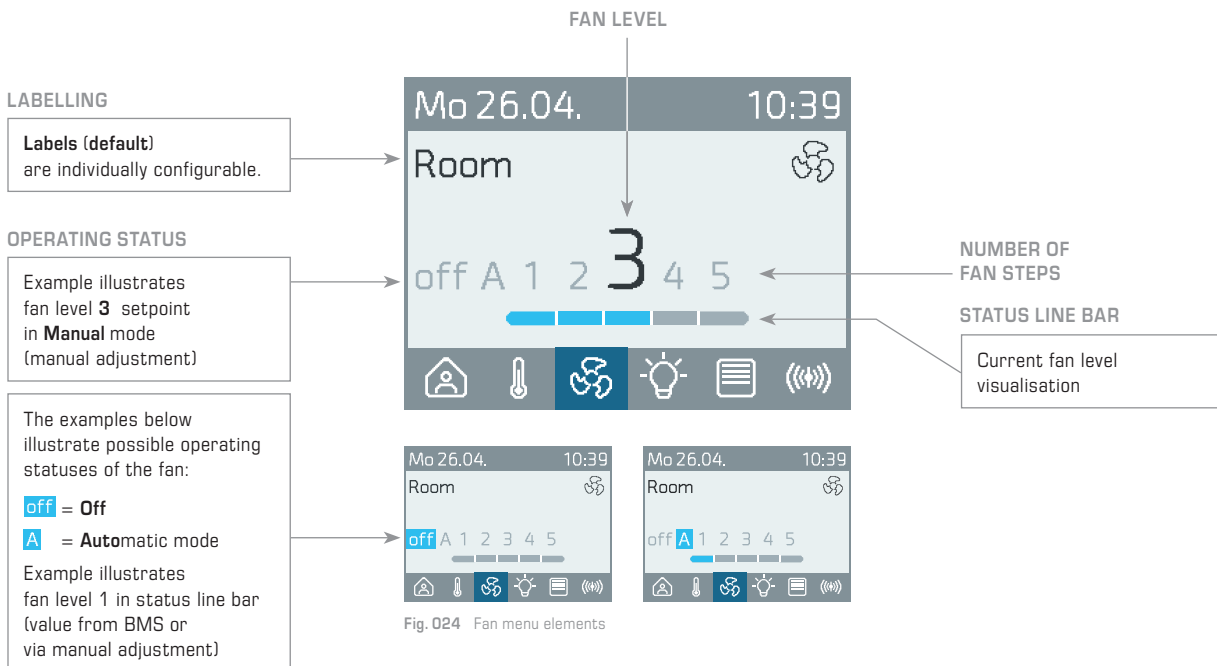


Fig. 023 Fan adjustment via arrow keys

Display

Fan levels, number of fan steps, operating statuses (Auto/Off) and labels can be displayed in the fan menu (Fig. 024).

The display is configured via the Modbus register / BACnet object.



Configuration register

Number of Fan Steps
 Fan_NumberOfSteps_3762

**Enable Fan Auto / Off
 in Manual mode**
 Fan_EnableAutoOff_3763

Fan Label
 Fan_Label_3750-3761

Data register

Fan Auto Mode
 Fan_AutoMode_406

Fan Level
 Setpoint_Fan_Level_407

Room Climate Controlled By BMS
 RCBMS_409_bitField

4.1 Number of fan steps

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

4.2 Fan operating status (Auto / Off)

The two fan operating states, 'Auto' and 'Off', are enabled for Manual mode by the operator on site via the **Enable Fan Auto / Off** parameter.

Auto = fan in Automatic mode (default)

Off = fan off

The behavior of the controller is described in Chapter 9 'Controller'.

4.3 Fan label

Default labels are provided for the fan in each language (see chapter 'HMI layout'). Irrespective of this, the label can be changed individually via the **Fan Label** parameter. You can use a maximum of 12 characters for this.

4.4 Setpoint fan level

The entries for fan control in normal operation are made via the two parameters **Fan Auto Mode** and **Fan Level** (see table).

	Status 1 Manual mode	Status 2 Automatic mode
Fan Auto Mode Fan_AutoMode_406	'Manual'	'Auto'
Fan Level Setpoint_Fan_Level_407	'Off / 1...5'	Value from controller (see chapter 9 'Controller')

If the touch keys or the BMS are used to set it to **Automatic** mode (State 2), the internal controller sets the Fan Level (Off / 1...5).

The last change has priority in Auto mode (touch keys or BMS).
 The BMS can use the parameter **Room Climate Controlled By BMS** (data register bit-coded incl. bit mapping) to temporarily block manual adjustment (manual mode) for the user.

SENSORS & SENSOR MENU

Display, configuration
 and calibration

5.0 Sensor menu, general information (sensor display)

To access the **Sensor menu**, you have to press the **SENSOR** ((⦿)) key (Fig. 025).
 The first activated sensor then appears on the display.
 To switch to the next enabled sensor, press the sensor button again.

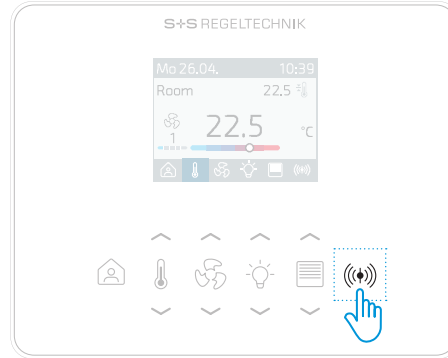


Fig. 025 Accessing the Sensor menu

Sensors and display

All units are equipped with a **digital temperature and humidity sensor** as standard.
Internal sensors for CO₂ and VOC are optionally available (depending on unit type).

External sensors can be written to and displayed on the unit via bus.

In addition, a **passive temperature sensor** can be connected directly via the configured DI1 input on the unit (see Chapter 3.1). For this purpose, a measuring range of $-20...+80^{\circ}\text{C}$ / $-4...+176^{\circ}\text{F}$ applies. Values outside the valid range are reported and displayed as errors.

The current sensor values are shown on the **display** as a numerical value with a unit and, if necessary, also as a colour scale (Fig. 026). The display is configured via the Modbus register / BACnet object (the internal temperature display is disabled by default).

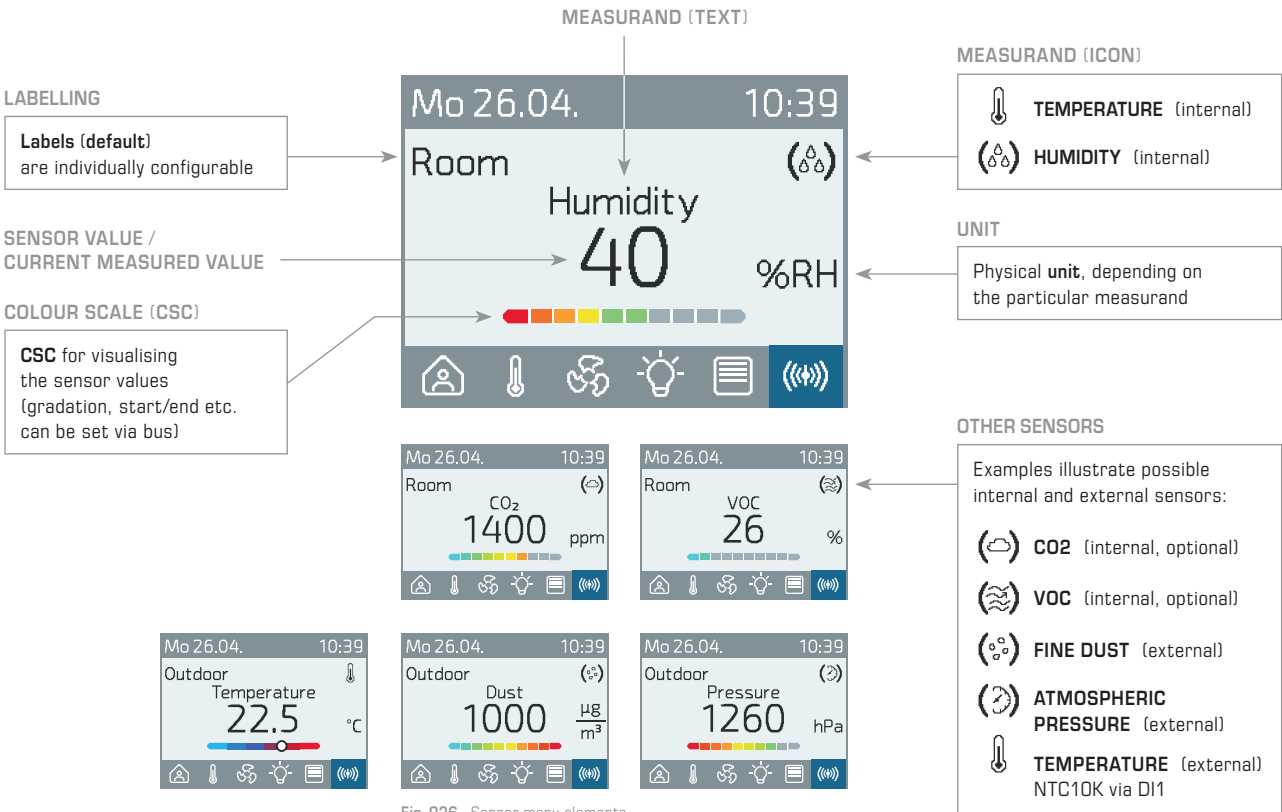


Fig. 026 Sensor menu elements

Configuration register

Temp Unit
Temp_Unit_2010

Pressure 2 Bus Unit
PressureS2Bus_Unit_3516

VOC Sensor 2 Bus Unit
VOCs2Bus_Unit_3316

5.1 Sensor menu configuration

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

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

Physical unit

The temperature unit can be overridden for all temperature channels via the **Temp Unit** parameter (default °C / °F).

If the **atmospheric pressure** (value from BMS) should be indicated on the display, the unit can be selected via the **Pressure Sensor 2 Bus Unit** parameter (default hPa / Pa / mbar / inWC).

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

Colour scale (CSC)

For quick visualisation, the measured value is displayed under the numerical value as a colour scale (default). This can be hidden via the **Show Colour Scale** parameter of the respective sensor channel or configured individually via the **Colour Scale Start** and **Colour Scale End** parameters (see table).

Labelling

All sensors come with default **sensor labels** in each language.

Irrespective of this, each label can be changed individually using the **Sensor Label** parameter. You can use a maximum of 12 characters for this.

Sensor register table (excerpt) with addresses	Display in sensor menu				Colour scale (CSC)		Labelling
	Value Value...	Offset Offset...	Averaging time Averaging Time...	Sensor menu display EnableIn SensorMenu...	CSC display EnableColour Scale...	CSC start / end ColourScale_Start/End...	Labelling Label...
Internal sensors (type-dependent)							
Temp Sensor 1	TempS1Int_...	100	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) 104 (%)	–	2613	2617	2618	2614 / 2615 2600*-2611
External passive sensor (Input DI1)							
Temp Sensor 2	TempS2Ext_...	106	2912	2913	2917	2918	2914 / 2915 2900*-2911
External sensors (Values from BMS)							
Temp Sensor 3	TempS3Bus_...	120	–	–	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

*BACnet object is located at the first address

Data register

CO2 Sensor 1 int. auto calibration
CO2S1Int_AutoCalibr_302

5.2 Calibrating the internal CO2 and VOC sensors

Units with an integrated CO2 and/or VOC sensor perform automatic calibration.

Ventilating the rooms regularly with fresh air increases the measuring accuracy of the sensors.

The automatic calibration of the CO2 sensor is activated by default.

The automatic calibration of the VOC sensor cannot be deactivated.

All that is required for **automatic calibration** (CO2/VOC) is a regular supply of fresh air.

The unit recognises this status and automatically performs self-calibration.

Proceed as follows to perform self-calibration:

Open all windows fully or set the air conditioning system to use outdoor air once weekly for 15 - 20 minutes. If possible, everyone should leave the room (CO2) or else the release of volatile organic substances/mixed gases (VOC) should be prevented.

Data register

CO2 Sensor 1 int. reset auto zero
CO2S1Int_ResetAutozero_300

Manual calibration (CO2) can be carried out independently of automatic calibration.

Proceed as follows to perform manual calibration:

First, open all windows fully or set the air conditioning system to use outdoor air for 15 - 20 minutes. If possible, everyone should leave the room during this time.

Start the **Autozero** process via bus or the RYMConfig software.

Keep the windows open or the air conditioning system set to use outdoor air.

After **10 minutes**, the manual calibration process (CO2) is ready.

The bus value for Autozero jumps back to **OFF** when activated.

PRESENCE / ABSENCE

Display and
configuration

[Configuration register](#)

[Presence Function](#)
[Presence_Function_3800](#)

[Data register](#)

[Presence Status](#)
[Presence_Status_405](#)

[Room Climate Controlled By BMS](#)
[RCBBMS_409_bitField](#)



Devices with 24V supply:

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

Applying voltage
to the two inputs will
destroy the unit!



Devices with 230 V supply:

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

The power supply and
input must be connected
to the same phase.

Input 1 may only be switched to
GND (potential-free)!

Applying voltage to input 1
will destroy the unit!

6.0 Presence menu, general information (changing presence)

The **PRESENCE**  key is pressed to open the Presence menu (Fig. 027) and carry out a presence change. In the 'absent' status, unit operation is defined via **Presence Function**.

The BMS can temporarily disable the PRESENCE key via the **Room Climate Controlled By BMS** parameter.

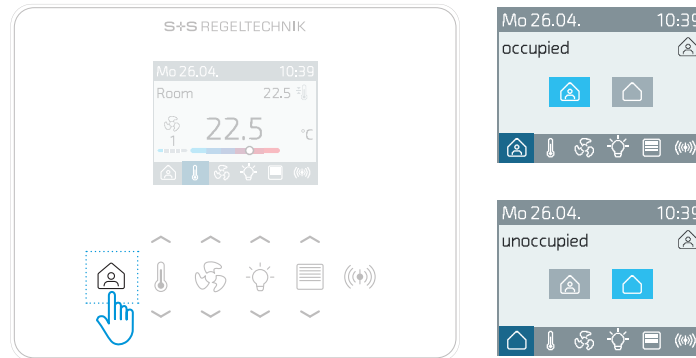


Fig. 027 Accessing the Presence menu

Display and labelling

Active presence status is indicated by the **OCCUPIED**  or **UNOCCUPIED**  icons.

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

Language		
Englisch (default)	occupied	unoccupied
Deutsch	anwesend	abwesend
Französisch	présent	absent
Spanisch	presente	ausente
Italienisch	presente	assente
Russisch	занят	свободно

Presence change

The room occupancy is stored in the **Presence Status** register and the icon 'occupied (present)' or 'unoccupied (absent)' is controlled by this. The **Presence Status** register can be influenced in three ways:

- Via the **PRESENCE key** on the unit
- Via the **Presence Modbus** register
- Via the digital inputs **DI1** / **DI2**

PRESENCE

Logic

6.1 Presence status

You can see how the Presence Change parameters influence each other in the following simplified illustration (Fig. 028):

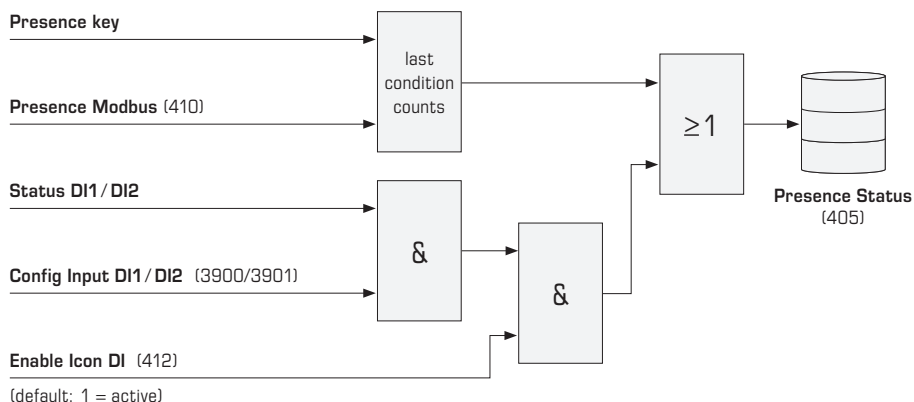


Fig. 028 Presence change

[Configuration register](#)

Input 1 Config
Input1_Config_3900

Input 2 Config
Input2_Config_3901

Presence Function
Presence_Function_3800

Presence Enable DI Reboot
Enable_PresenceDI_Reboot_3801

[Data register](#)

D1 Input Status
D1Input_Status_126

D2 Input Status
D2Input_Status_127

Presence Modbus
Presence_Mod_410

Presence Status
Presence_Status_405

Enable Presence DI
Enable_PresenceDI_412

The **Presence Modbus** parameter and the **presence key** on the unit are equivalent. The last state 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 on the DI is signalling presence, it is not possible to switch to absence via **Presence Modbus** or the **presence key**.

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

To change the **presence status** via the digital inputs, you must set the **Enable Presence DI** to 'enabled'.

Key enable when absent

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

1. Changing the presence status to 'present' via the Presence menu (default).
It is possible to navigate through all menus, but setpoint adjustment is not possible.
2. Changing the presence status to 'present' by pressing any key.
It is possible to navigate through all menus and adjust setpoints.
3. No status change possible, presence status remains 'present'.
It is possible to navigate through all menus and adjust setpoints.

DIGITAL INPUT DI1 & DI2

[Configuration register](#)

[Input 1 Config](#)
[Input1_Config_3900](#)

[Input 2 Config](#)
[Input2_Config_3901](#)

[Data register](#)

[D1 Input Status](#)
[D1Input_Status_126](#)

[D2 Input Status](#)
[D2Input_Status_127](#)

[HeaderIconStatus_408](#)
[HeaderIconStatus_...](#)

[Header Icons Modbus](#)
[HeaderIconModbus_411_bitField](#)

[Enable Icons DI](#)
[Enable_IconDI_413](#)



Devices with 24V supply:

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

Applying voltage
to the two inputs will
destroy the unit!



Devices with 230 V supply:

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

The power supply and
input must be connected
to the same phase.

Input 1 may only be switched to
GND (potential-free)!

Applying voltage to input 1
will destroy the unit!

7.0 Inputs, general information

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

The type of digital inputs can be configured via the parameters **Input 1 Config** (DI1) and **Input 2 Config** (DI2).

7.1 Inputs as presence contact

(see chapter 6.0 'Presence')

7.2 Inputs as contact for Header Icons

The icons in the header can be switched via the BMS (refer to chapter 2.1 'HMI layout') or via a configured DI input.

The room climate icons trigger specific controller functions (see chapter 9 'Controller').

In normal operation, you can display the following **room climate** icons in parallel (Fig. 029):

Window contact  – Dew point  – Frost protection  – ECO mode 

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

USB-C interface connected  – Fault / Alarm 

When a status message stops, the display automatically switches back to the configured room climate icons. The appearance and position of the header icons are permanently programmed into the unit and cannot be changed.



Fig. 029 Header - Room climate



Fig. 030 Header - Status messages

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

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

HEADER ICONS

Logic

7.3 Header Icons Status

You can see how the Header Icons parameters influence each other in the following simplified illustration (Fig. 031):

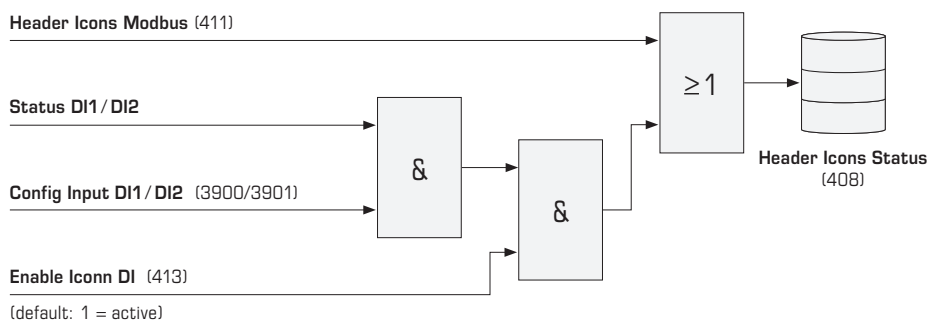


Fig. 031 Frost protection input / window / dew point / ECO

Icon	Input 1 Config Input1_Config_3900 Input 2 Config Input2_Config_3901	D1 Input Status D1Input_Status_126 D2 Input Status D2Input_Status_127	HeaderIconStatus_408_bitField depending on HeaderIconsModbus (411) Enable Icons DI (413) 1 = active → Icon shown	
	13 = Frost protection NO contact	0 = open	depends on HeaderIconsModbus (411, Bit 0)	Bit 0
		1 = closed	1 = active → Frost protection icon shown	
	14 = Frost protection NC contact	0 = open	1 = active → Frost protection icon shown	
		1 = closed	depends on HeaderIconsModbus (411, Bit 0)	
	3 = Window contact NO contact	0 = open	depends on HeaderIconsModbus (411, Bit 1)	Bit 1
		1 = closed	1 = active → Window contact icon shown	
	4 = Window contact NC contact	0 = open	1 = active → Window contact icon shown	
		1 = closed	depends on HeaderIconsModbus (411, Bit 1)	
	5 = Dew point monitors NO contact	0 = open	depends on HeaderIconsModbus (411, Bit 2)	Bit 2
		1 = closed	1 = active → Dew point icon shown	
	6 = Dew point monitors NC contact	0 = open	1 = active → Dew point icon shown	
		1 = closed	depends on HeaderIconsModbus (411, Bit 2)	
	15 = ECO NO contact	0 = open	depends on HeaderIconsModbus (411, Bit 3)	Bit 3
		1 = closed	1 = active → ECO Mode icon shown	
	16 = ECO NC contact	0 = open	1 = active → ECO Mode icon shown	
		1 = closed	depends on HeaderIconsModbus (411, Bit 3)	
	11 = Alarm NO contact	0 = open	depends on HeaderIconsModbus (411, Bit 4)	Bit 4
		1 = closed	1 = active → Alarm/Fault icon shown	
	12 = Alarm NC contact	0 = open	1 = active → Alarm/Fault icon shown	
		1 = closed	depends on HeaderIconsModbus (411, Bit 4)	

TOUCH KEY EXTENSION

Configuration and
 ready-to-order variants
 for additional key pairs
 for light and sun protection
 (type-dependent)

8.0 Touch key extension, general information

In addition to the basic models (temperature/fan) there are also unit variants available with additional key pairs for **controlling the light and sun protection** (Fig. 032-037).

The unit type must be selected according to the desired light or sun protection circuits.
 It is not possible to make subsequent changes or additions to the **touch key assignment**.

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

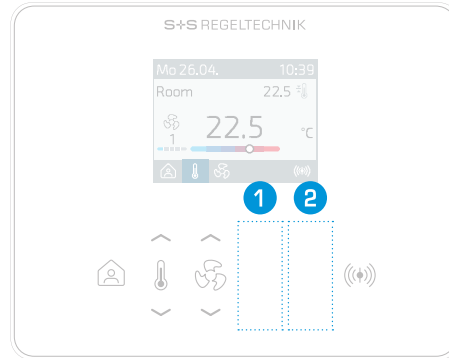


Fig. 032 Example Type 1401 (basic model)

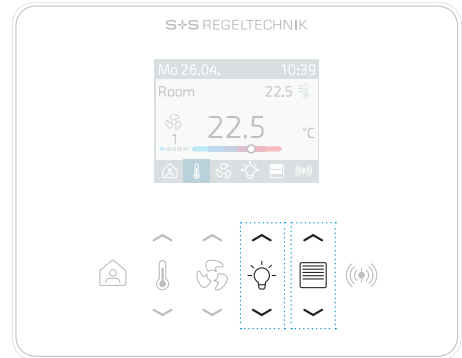


Fig. 033 Example Type 1401-LB

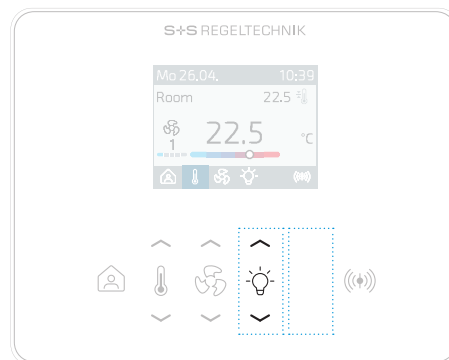


Fig. 034 Example Type 1401-L

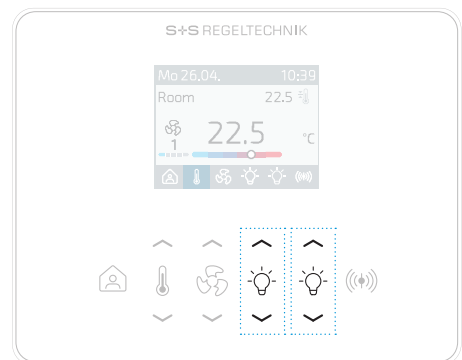


Fig. 035 Example Type 1401-LL

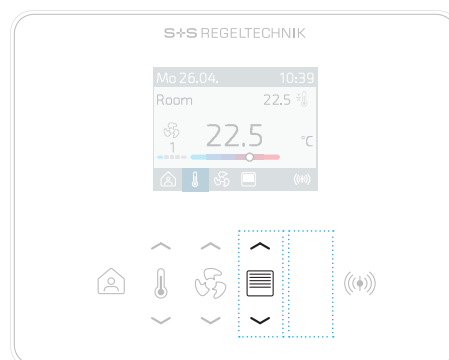


Fig. 036 Example Type 1401-B

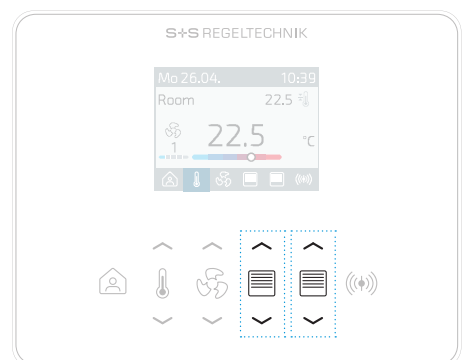
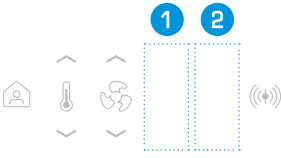
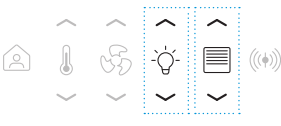
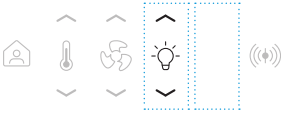


Fig. 037 Example Type 1401-BB

Assignment variants for additional key pairs (Printing on front face of unit)	Key extension		Ready-to-order variants for additional key pairs (Type labelling)
	1 Related linked data register	2 Related linked data register	
	(not assigned)	(not assigned)	Basic models without key extension Type 13xx (Temp.) Type 14xx (Temp.+Fan)
	Light 1 L_AutoMode_1100_bitField (bit0) L_LightStatus_1102_bitField (bit0) L1_KeyStatus_1120 L1_Dimm_Value_1121	Sun protect 2 SP_AutoMode_700_bitField (bit1) SP2_KeyStatus_730 SP2_Position_Value_731 SP2_Angle_Value_732	1x Light / 1x Sun protection (Blind) Key extension 1+2 Type 13xx-LB Type 14xx-LB
	Light 1 L_AutoMode_1100_bitField (bit0) L_LightStatus_1102_bitField (bit0) L1_KeyStatus_1120 L1_Dimm_Value_1121	(not assigned)	1x Light Key extension 1 Type 13xx-L Type 14xx-L
	Light 1 L_AutoMode_1100_bitField (bit0) L_LightStatus_1102_bitField (bit0) L1_KeyStatus_1120 L1_Dimm_Value_1121	Light 2 L_AutoMode_1100_bitField (bit1) L_LightStatus_1102_bitField (bit1) L2_KeyStatus_1130 L2_Dimm_Value_1131	2x Light Key extension 1+2 Type 13xx-LL Type 14xx-LL
	Sun protect 1 SP_AutoMode_700_bitField (bit0) SP1_KeyStatus_720 SP1_Position_Value_721 SP1_Angle_Value_722	(not assigned)	1x Sun protection (Blind) Key extension 1 Type 13xx-B Type 14xx-B
	Sun protect 1 SP_AutoMode_700_bitField (bit0) SP1_KeyStatus_720 SP1_Position_Value_721 SP1_Angle_Value_722	Sun protection 2 SP_AutoMode_700_bitField (bit1) SP2_KeyStatus_730 SP2_Position_Value_731 SP2_Angle_Value_732	2x Sun protection (Blind) Key extension 1+2 Type 13xx-BB Type 14xx-BB

Note on the variant 1x Light / 1x Sun Protection (LB):

The name of the Modbus register / BACnet object depends on the **code number of the touch-key** extension, i.e. **Light 1** / **Sun Protection 2**.

Although this variant only controls one sun protection system, the Modbus register / BACnet object **Sun Protection 2** is valid.

SUN PROTECTION (BLIND) CONTROL

Display and icons

[Configuration register](#)

[Sun protect display](#)
SP_Display_4201

[Data register](#)

[Sun protect auto mode](#)
SP_AutoMode_700_bitField

8.1 Sun Protect menu (sun protection adjustment)

The **Sun Protect menu** is only available for unit types **with** sun protection adjustment. The user can adjust the sun protection manually (Manual mode) using the **UP**  and **DOWN**  arrow keys next to the **SUN PROTECTION**  icon (Fig. 038).

The BMS can use the **Sun protect auto mode** parameter to temporarily block manual adjustment (Manual mode) for the user. When locking is active, the adjustment is carried out exclusively by the BMS. This locking is shown on the display as **Automatic mode** **A**.

The Sun Protect menu can be permanently disabled via the **Sun protect display** parameter. The operator can continue to control the sun protection by visual orientation using the corresponding arrow keys. The display remains unchanged in the process (e.g. in the Temp menu).

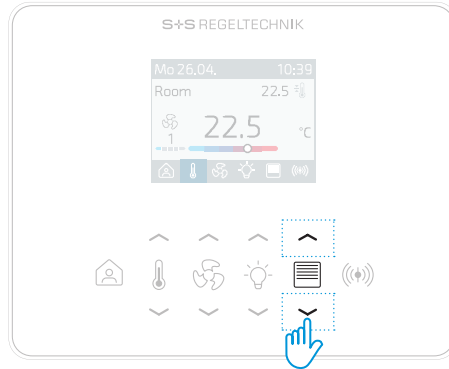


Fig. 038 Sun protection adjustment via arrow keys

Display

In the Sun Protect menu, it is possible to display the position (Up/Down) and the slat angle (turned left - horizontal - turned right), operating statuses (Auto) and labels (Fig. 039). The display is configured via the Modbus register / BACnet object.

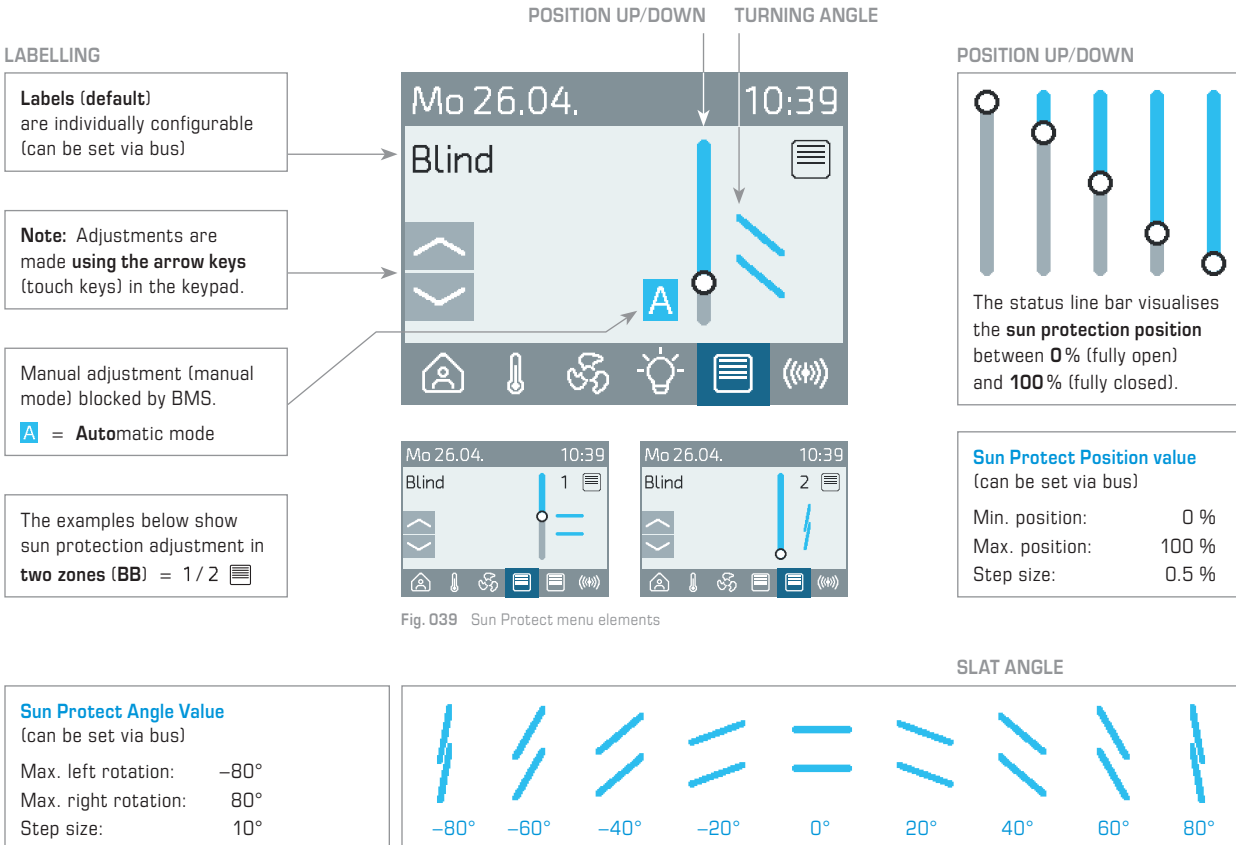


Fig. 039 Sun Protect menu elements

SUN PROTECTION (BLIND) CONTROL

Configuration and adjustment

Configuration register

Sun Protect Label

SP1_Label_4250-4261
SP2_Label_4300-4311

Sun Protect Type

SP1_Type_4264
SP2_Type_4314

Sun Protect OpMode

SP1_OpMode_4263
SP2_OpMode_4313

Data register

Sun Protect Key Status

SP1_KeyStatus_720
SP2_KeyStatus_730

Sun Protect Position Value

SP1_Position_Value_721
SP2_Position_Value_731

Sun Protect Angle Value

SP1_Angle_Value_722
SP2_Angle_Value_732

Configuration register

Sun Protect Position Step Size

SP1_PositionStepSize_4265
SP2_PositionStepSize_4315

Sun Protect Position Min

SP1_PositionMin_4267
SP2_PositionMin_4317

Sun Protect Position Max

SP1_PositionMax_4268
SP2_PositionMax_4318

Configuration register

Sun Protect Angle Step Size

SP1_AngleStepSize_4266
SP2_AngleStepSize_4316

Sun Protect Angle Min

SP1_AngleMin_4269
SP2_AngleMin_4319

Sun Protect Angle Max

SP1_AngleMax_4270
SP2_AngleMax_4320

Labelling

Default labels are predefined in each language for sun protection.

Irrespective of this, each label can be changed individually using the **Sun Protect Label** parameter. You can use a maximum of 12 characters for this.

Sun protection types

The following variants can be selected via the **Sun Protect Type** parameter:

- **Sun Protect Position** (up/down)
- **Sun Protect Slat Angle** (slat rotation)
- **Sun Protect Position + Slat Angle** (default)

The position of the sun protection can be written using the **Sun Protect Position Value** parameter, and for the slat angle of the slats using the **Sun Protect Angle Value** parameter.

Writing is performed either by the BMS or by the user in 'Default' operating mode (see description for sun protection adjustment in 'Default' operating mode).

Operating mode and key status

The following variants can be configured via the **Sun Protect OpMode** parameter:

- **'Short-long key press'** for fast bus line (default)
In the data register **Sun Protect Key Status**, a short (< 1 s) or long (> 1 s) key press is recorded. After reading, the BMS writes back the value **'not pressed'**.
The BMS writes the position and angle back to the data register **Sun Protect Position Value** and **Sun Protect Angle Value**. The GUI is adjusted.
- **'Hold key press'** for fast bus line
The key press is registered in the data register **Sun Protect Key Status**, until the user releases the key. After the key is released, the unit resets the value back to **'not pressed'**.
The BMS writes the position and angle back to the data register **Sun Protect Position Value** and **Sun Protect Angle Value**. The GUI is adjusted.
- **'Setpoint mode'**
If the user presses one of the two keys, the position and angle are written directly to the registers **Sun Protect Position Value** and **Sun Protect Angle Value**. The GUI is adjusted.
The BMS retrieves the values as a default.
For the relationship between pressing the key and adjusting the position and angle, please refer to the description for sun protection adjustment in the 'Setpoint mode' operating mode provided below.

Sun protection adjustment in 'Setpoint mode' operating mode (Manual mode)

The user makes the adjustment using the arrow keys (touch keys) as follows:

Position (up/down)

- Short key press **UP**  (< 1 s) reduces the **Sun Protect Position Value** by the set **Sun Protect Position Step Size** (default: 0.5 %)
- Short key press **DOWN**  (< 1 s) increases the **Sun Protect Position Value** by the set **Sun Protect Position Step Size** (default: 0.5 %)
- Long key press **UP**  (> 1 s) reduces the value automatically depending on the set step size, until one of the two arrow keys is pressed again or **Sun Protect Position Min** is reached (default: 0 %, complete light incidence).
- Long key press **DOWN**  (> 1 s) increases the value automatically depending on the set step size, until one of the two arrow keys is pressed again or **Sun Protect Position Max** is reached (default: 100 %, no light incidence).

Slat angle (slat rotation)

- Short key press **UP**  (< 1 s) reduces the **Sun Protect Angle Value** by the set **Sun Protect Angle Step Size** (default: 10°)
- Short key press **DOWN**  (< 1 s) increases the **Sun Protect Angle Value** by the set **Sun Protect Angle Step Size** (default: 10°)
- Long key press **UP**  (> 1 s) reduces the value automatically depending on the set step size, until one of the two arrow keys is pressed again or **Sun Protect Angle Min** is reached (default: 0°).
- Long key press **DOWN**  (> 1 s) increases the value automatically depending on the set step size, until one of the two arrow keys is pressed again or **Sun Protect Angle Max** is reached (default: 80°).

LIGHTS CONTROL

Display and icons

[Configuration register](#)

[Light display](#)
[L_Display_5301](#)

[Data register](#)

[Light auto mode](#)
[L_AutoMode_1100_bitField](#)

8.2 Light menu (light adjustment)

The **Light menu** is only available for unit types **with** light adjustment.

The user can adjust the light manually (Manual mode) using the **UP**  and **DOWN**  arrow keys next to the **Light**  icon (Fig. 040).

The BMS can use the **Light auto mode** parameter to temporarily block manual adjustment (Manual mode) for the user. This locking is shown on the display as **Automatic mode** **A**.

The Light menu can be permanently disabled via the **Light display** parameter. The operator can continue to control the room lighting by visual orientation using the corresponding arrow keys.

The display remains unchanged in the process (e.g. in the Temp menu).

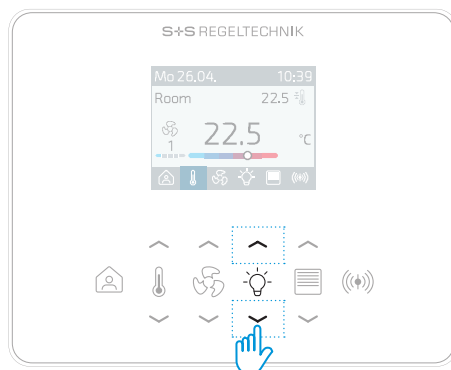


Fig. 040 Light adjustment via arrow keys

Display

In the Light menu, it is possible to display all statuses (Off/On, Dimming value 0...100 %), operating statuses (Auto) and labels (Fig. 041).

The display is configured via the Modbus register / BACnet object.

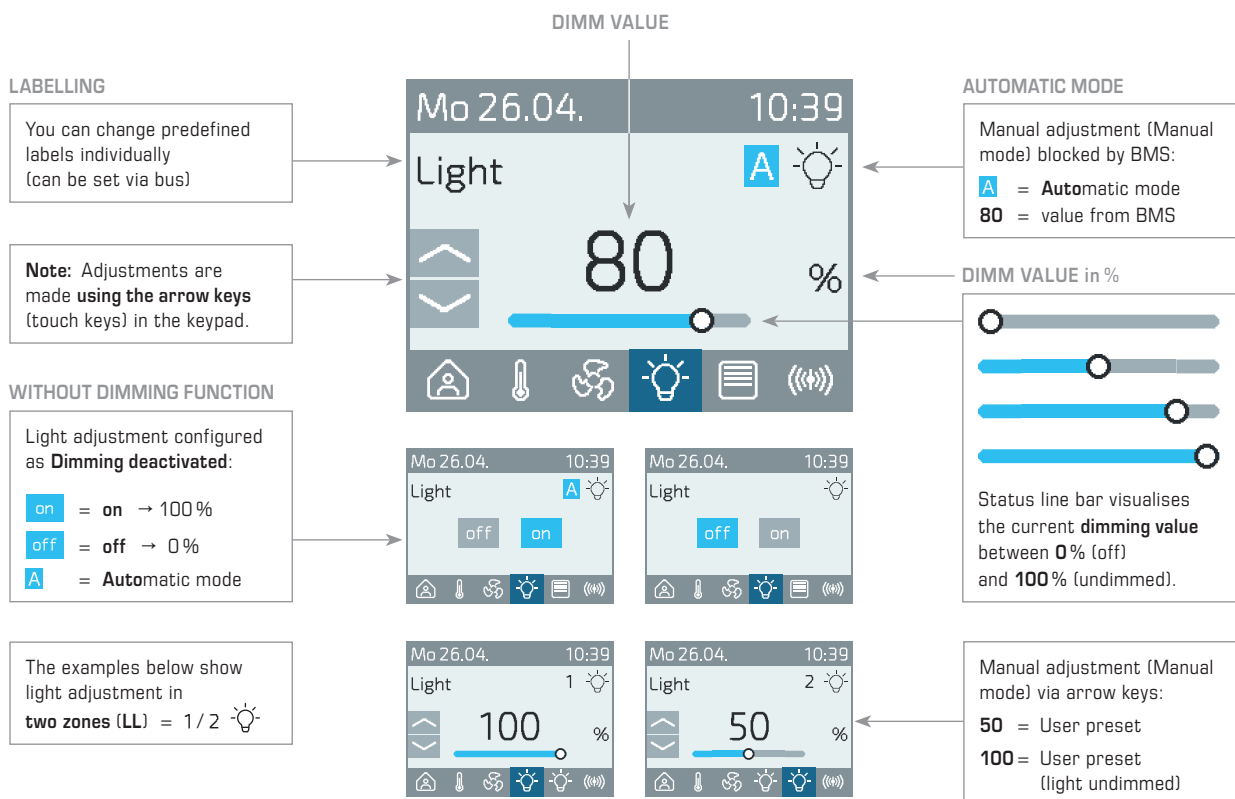


Fig. 041 Elements in the Light menu

LIGHTS CONTROL

Configuration and adjustment

[Configuration register](#)

Light Label

L1_Label_5350-5361
L2_Label_5400-5411

Light Dimmable

L1_Dimmable_5363
L2_Dimmable_5413

Light OpMode

L1_OpMode_5364
L2_OpMode_5414

[Data register](#)

Light Key Status

L1_KeyStatus_1120
L2_KeyStatus_1130

Light Dimm Value

L1_Dimm_Value_1121
L2_Dimm_Value_1131

Light Status

L_LightStatus_1102_bitField

Labelling

Default labels are predefined in each language for the light.

Irrespective of this, each label can be changed individually using the **Light Label** parameter. You can use a maximum of 12 characters for this.

Light types and statuses

The following light types can be selected via the **Light Dimmable** parameter:

- **Light dimming deactivated** (off: 0 % / On: 100 %)
- **Light dimming activated** (Dimming value: 0...100 %) (default)

The dimming value is written via the **Light Dimm Value** parameter.

Writing is performed either by the BMS or by the user in 'Setpoint mode' operating mode (see description for light adjustment in 'Setpoint mode' operating mode).

The **Light Status** parameter is mapped to the bit value and linked with the data register **Light Dimm Value**:

- **Dimm Value = 0 %** (by the user or BMS) → bit in **Light Status** to 0
- **Dimm Value > 0 %** (by the user or BMS) → bit in **Light Status** to 1

The **Light Status** parameter (bit mapping) lets you switch on or off all lights with a bit change (0/1).

The **Dimm Value** is thereby set to 0 % or 100 %.

Note: The unit does not keep the previous value.

Example 1

Light 1 has the dimming value of 50 % (dimmed). This gives the following parameter entries as a result:

Light 1 Dimm Value = 50, **Light Status** bit 0 = 1 (bit mapping)

The BMS now switches to **Light Status** (bit 0) or from 1 to 0 in the corresponding bit value.

The **Light Dimm Value** parameter follows automatically and has the final value of 0.

Example 2

Light 1 has the dimming value of 0 % (light Off). This gives the following parameter entries as a result:

Light 1 Dimm Value = 0, **Light Status** bit 0 = 0 (bit mapping)

The BMS now switches to **Light Status** (bit 0) or from 0 to 1 in the corresponding bit value.

The **Light Dimm Value** parameter follows automatically and has the final value of 100.

Operating mode and key status

The following variants can be configured via the **Light OpMode** parameter:

- **Short-long key** (default)

In the data register **Light Key Status**, a short (< 1 s) or long (> 1 s) key press is recorded. After reading, the BMS writes back the value '**not pressed**'.

The BMS writes the dimming value to the **Light Dimm Value** data register. The GUI is adjusted.

- **Hold key press**

The key press is registered in the data register **Light Key Status** until the user releases the key. After the key is released, the unit resets the value back to '**not pressed**'.

The BMS writes the dimming value to the **Light Dimm Value** data register. The GUI is adjusted.

- **Setpoint mode**

If the user presses one of the two keys, the Dimm value is written directly to the data register **Light Dimm Value**. The GUI is adjusted. The BMS retrieves the values as a default.

For the relationship between pressing the key and adjusting the Dimm value, please refer to the description for sun protection adjustment in 'Setpoint mode' operating mode provided below.

Light adjustment in 'Setpoint mode' operating mode (Manual mode)

The user makes the adjustment using the arrow keys (touch keys) as follows:

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

- Short key press **UP** ⬆ (< 1 s) increases the **Light Dimm Value** by the set **Light Dimm Step Size** (default: 10 %)
- Short key press **DOWN** ⬇ (< 1 s) reduces the **Light Dimm Value** by the set **Light Dimm Step Size** (default: 10 %)
- Long key press **UP** ⬆ (> 1 s) sets the value automatically to 100 %.
- Short key press **DOWN** ⬇ (> 1 s) sets the value automatically to 0 %.

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

Pressing the **UP** ⬆ or **DOWN** ⬇ key (irrespective of the key press duration) sets the value to 0 % (off) or 100 % (on) in the data register **Light Dimm Value**.

[Configuration register](#)

Light Dimm Step Size

L1_DimmStepSize_5368
L2_DimmStepSize_5418

CONTROLLER

General information and
configuration

[Configuration register](#)

[Controller OpMode After Reboot](#)
[ContrOpMode_AfterReboot_8053](#)

[Data register](#)

[Controller OpMode](#)
[ContrOpMode_Setpoint_1607](#)
[Change-Over Status](#)
[ChangeOver_Status_1600](#)

[Configuration register](#)

[2. Control Loop Type](#)
[2.ContrLoopType_8044](#)

[Data register](#)

[Controller OpMode](#)
[ContrOpMode_Setpoint_1607](#)
[Change-Over Status](#)
[ChangeOver_Status_1600](#)

9.0 Controller general information

The RYMASKON® 1000 Controllers are based on the RYMASKON® 1000 Interface.

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

Heating or cooling mode

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

1. Specification via BMS:

Controller OpMode

- 0 = Off
- 1 = Cooling Auto (heating disabled → $Y_H = 0\%$)
- 2 = Heating Auto (cooling disabled → $Y_C = 0\%$)
- 3 = Cooling and Heating Auto (default)

The default value after device restart is configured via the parameter **Controller OpMode After Reboot**.

2. Change-Over:

Change-Over Status

- 0 = Change-Over disabled (default)
- 1 = Cooling mode (heating control loop locked)
- 2 = Heating mode (cooling control loop locked)

An enabled Change-Over (Cooling/Heating) has priority over **Controller OpMode**. The options for changing the **Change-Over Status** are described in Chapter 9.2 'Change-over'.

Important:

In Change-Over mode, the heating and cooling outputs are controlled in parallel, i.e. both outputs receive the same heating or cooling power. The exception is when using the second control loop (refer to Chapter 9.4.2 'Second control loop (temperature controller)').

Control loops

The RYMASKON® 1000 Controller has up to three independent control loops:

1. Control loop (temperature control)

- Main control loop for temperature control
- Specification for heating or cooling mode via the **Controller OpMode** or **Change-Over Status** parameter
- Control of the heating, cooling output or 6-way valve

2. Control loop (temperature control)

- Second control loop for temperature control
- Only works in Change-Over mode (together with the 1st control loop)
- Enabling via parameter **2. Control Loop Type**
- Cooling output control

3. Control loop (fan / RCV control)

- Only for type RYMASKON 143xC / 144xC / 145xC / 146xC (fancoil controller)
- Follows heating/cooling (default)
- Can be configured to control humidity, CO₂ and VOC (RCV control, dehumidification only, CO₂ reduction, VOC reduction)
- 'Fan' output control

Configuration register

Dead Band Comfort
DeadBand_Comfort_8006

Dead Band ECO
DeadBand_ECO_8007

Occupied Override ECO
Occupied_OverrECO_8002

Change-Over_DI-Temp
ChangeOver_DITemp_8054

Data register

Header Icon Status
HeaderIconStatus_ECO_408_bit3

Controller OpMode
ContrOpMode_Setpoint_1607

Change-Over Status
ChangeOver_Status_1600

Comfort mode

Comfort mode is equivalent to the 'present' presence status.

The controller is in default mode. In comfort mode, the dead band between heating and cooling is set to the configured **Dead Band Comfort** (default: 1°C).

The dead band is only enabled if the **Controller OpMode** parameter is set to 'Cooling and Heating Auto' and Change-Over is disabled (**Change-Over Status**).

ECO mode

An enabled ECO mode can be retrieved via the **Header Icons Status** parameter.

The options for enabling/disabling ECO mode are described in chapter 7 'Digital inputs & header icons'.

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

The dead band is only enabled if the **Controller OpMode** parameter is set to 'Cooling and Heating Auto' and Change-Over is disabled (**Change-Over Status**).

If the presence function is used in parallel, the **Occupied Override ECO** parameter can be used to configure whether the 'present' presence status overrides an enabled ECO mode (overtime function).

Note:

If the ECO mode and the Change-Over are to be switched via the DI inputs, the Change-Over has priority. If the **Change-Over_DI-Temp** parameter is used to assign the Change-Over to a DI input, the same input cannot be configured for ECO mode at the same time.

Configuration register

Setpoint Temp Shift Unoccupied
Setpoint_TempShift_Unocc_8000

**Setpoint Temp Offset
Presence Change**
Setpoint_Temp_Offs_PresChange_8001

Change-Over_DI-Temp
ChangeOver_DITemp_8054

Data register

Presence Status
Presence_Status_405

Temp Setpoint
Setpoint_Temp_400

Temp Setpoint Offset
Setpoint_Temp_Offset_401

Controller OpMode
ContrOpMode_Setpoint_1607

Change-Over Status
ChangeOver_Status_1600

Presence

The presence status can be called up 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 (**Temp Setpoint**) is lowered (in heating operation) or raised (in cooling mode) by the **Setpoint Temp Shift Unoccupied** parameter.
2. If the controller is configured for cooling and heating mode, the dead band is changed to twice the value of the **Setpoint Temp Shift Unoccupied** parameter.
3. The setpoint offset set by the user (**Temp Setpoint Offset**) is reset to 0°. The **Setpoint Temp Offset Presence Change** parameter can be used to set whether the original setpoint offset should be restored when 'present'.

Note:

If the presence and the Change-Over are to be switched via the DI inputs, the Change-Over has priority. If the **Change-Over_DI-Temp** parameter is used to assign the Change-Over to a DI input, the same input cannot be configured as a presence contact at the same time.

Standby (Controller Off)

Standby (Off) is configured via the **Controller OpMode** parameter.

The keys, display and building protection are remain enabled.

The controllers maintain the current temperature within the building protection (refer to Chapter 9.1 'Temperature Setpoint (Main control loop)').

[Configuration register](#)

Anti-Jam (Valve Protection)

Anti-Jam_8052

Underfloor Heat Protection Sensor

UnderfloorHeatProtection_Sensor_8050

Underfloor Heat Protection Limit

UnderfloorHeatProtection_Limit_8051

RODO Min. Runtime Heat/Cool

RODO_MinRuntime_HeatCool_8029

Delay Switch Heat/Cool

DelaySwitch_Heat/Cool_8030

Valve Protection (Anti-Jam)

The anti-jam function helps ensure that the valves do not jam if they are not used for a long time. The unit activates the valves briefly for this purpose:

- **Heating and cooling output** is activated for 5 minutes (valve open).
- **6-way valve** is first 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). The value '0' disables this function.

Underfloor Heat Protection Limit

If the limit is exceeded, the unit reduces the heating power to 0%.

The value is specified via the parameter **Underfloor Heat Protection Limit** (default: 34 °C).

Limit value monitoring is enabled automatically when a temperature sensor is selected via the **Underfloor Heat Protection Sensor** parameter.

Minimum runtime, RO / DO output for heating/cooling

(heat pump function, only with 2-point control)

The digital RO / DO heating or cooling output remains in the On state for the configured minimum runtime after switching on, regardless of the heating or cooling power (Y_H / Y_C) of the controller.

The time is specified via the **RODO Min. Runtime Heat/Cool** parameter. The value '0' (default) disables this function.

If a change-over between heating and cooling occurs during active monitoring of the minimum running time, the outputs are changed over directly and the runtime monitoring is restarted.

Delay changing over between heating/cooling

(heat pump function)

The change between the two heating and cooling control sequences takes place with a time delay. The heating or cooling output is only enabled after the configured delay time has elapsed.

The time is specified via the **Delay Switch Heat/Cool** parameter. The value '0' (default) disables this function.

Sensor breakage / sensor short circuit (NTC10K)

In the event of a breakage or short circuit in the passive **external temperature sensor** (NTC10K), the controller is automatically disabled for safety reasons and the icon  (status message icon 'Fault / Alarm') appears in the display header.

[Configuration register](#)

Dead Band Comfort
DeadBand_Comfort_8006

Dead Band ECO
DeadBand_ECO_8007

Frost Protection
Frost_Protection_8041

Heat Protection
Heat_Protection_8042

[Data register](#)

Temp Setpoint Absolut
Setpoint_Temp_Absolut_402

Controller Setpoint Temp
Controller_Setpoint_Temp_1616

Controller OpMode
ContrOpMode_Setpoint_1607

Change-Over Status
ChangeOver_Status_1600

**Header Icons Status
(Window Contact)**
HeaderIconStatus_WindowContact_408_bit1

9.1 Temperature Setpoint (main control loop)

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

Controller Setpoint Temp ($T_{\text{Setpoint Contr}}$)

The reference variable for temperature control (setpoint) is stored in the **Controller Setpoint Temp** ($T_{\text{Setpoint Contr}}$). The setpoint is composed as follows.

In 'Cooling and Heating Auto' operating mode:

$$T_{\text{Setpoint Contr}} = \text{Temp Setpoint Absolute} - \frac{\text{Dead Band}}{2} \quad (\text{Heating mode})$$

$$T_{\text{Setpoint Contr}} = \text{Temp Setpoint Absolute} + \frac{\text{Dead Band}}{2} \quad (\text{Cooling mode})$$

If building protection is enabled:

$$T_{\text{Setpoint Contr}} = \text{Frost Protection} \quad (\text{Heating mode})$$

$$T_{\text{Setpoint Contr}} = \text{Heat Protection} \quad (\text{Cooling mode})$$

Otherwise:

$$T_{\text{Setpoint Contr}} = \text{Temp Setpoint Absolut} \quad (\text{Heating or cooling mode})$$

Dead Band

The dead band is only enabled in 'Cooling and Heating Auto' operating mode.
Within the dead band, the manipulated variable (Y_H / Y_C) remains at the configured minimum value (default: 0%).

Building protection (Frost Protection and Heat Protection)

Building protection is enabled if the Change-Over function is disabled and one of the following two conditions is met:

- **Controller OpMode** is on 'Off'.
 - **Window Contact** is on 'open'.
- For configuration, see chapter 7 'Digital inputs and header icons'.

The building protection sets the **Controller Setpoint Temp** to the configured parameters **Frost Protection** and **Heat Protection**. In this case, the dead band is disabled.

The controllers remain switched off until the temperatures of the protective functions are reached.
If the current 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 enabled, the icon  appears in the display header (refer to Chapter 'Icons').

[Configuration register](#)

[Change-Over_DI-Temp](#)
[ChangeOver_DI-Temp_8054](#)

[Change-Over Temp Cooling](#)
[ChangeOver_TempCooling_8055](#)

[Change-Over Temp Heating](#)
[ChangeOver_TempHeating_8056](#)

[Data register](#)

[Controller OpMode Setpoint](#)
[ContrOpMode_Setpoint_1607](#)

[Change-Over Modbus](#)
[ChangeOver_Modbus_1602](#)

[Change-Over Status](#)
[ChangeOver_Status_1600](#)

9.2 Change-Over

As an alternative to the bus specification, the heating or cooling mode can be controlled via the Change-Over. In Change-Over mode, the heating and cooling outputs are controlled in parallel, i.e. both outputs receive the same heating or cooling power.

The exception is when using the second control loop (refer to Chapter 9.4.2 'Second control loop (temperature controller)').

The Change-Over is used in heating and cooling systems in which the heat exchanger (FBH, cooling ceiling, radiator, etc.) is operated in a 2-pipe system. A control valve is connected upstream of the heat exchanger to adjust the flow rate of the medium. The control valve does not differentiate between heating and cooling operation.

The change-over 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 unit depending on the season (cooling only in summer, heating only in winter).

Any change-over of the medium must be communicated to the RYMASKON controller via the Change-Over signal (bus or DI). The following parameters are available for configuration/specification:

- **Change-Over DI-Temp** (default: Change-Over disabled)
- **Change-Over Modbus** (higher priority)

The unit alternatively recognises the Change-Over automatically based on the supply temperature of the medium. To do this, the external temperature sensor can be connected to the flow pipe, or else the flow temperature can be transmitted to the unit via bus (temperature bus). 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 Temp Cooling** and **Change-Over Temp Heating** parameters.

The following example (Fig. 901) shows an air conditioning system with seasonal change-over. The control valve on the heat exchanger is connected to the heating output AO1 (terminal 7) of the RYMASKON 132xC unit type. Only the heating controller is enabled in winter (heating mode). When you switch to cooling mode in summer, the Change-Over signal of the chiller changes over and only the cooling controller is enabled.

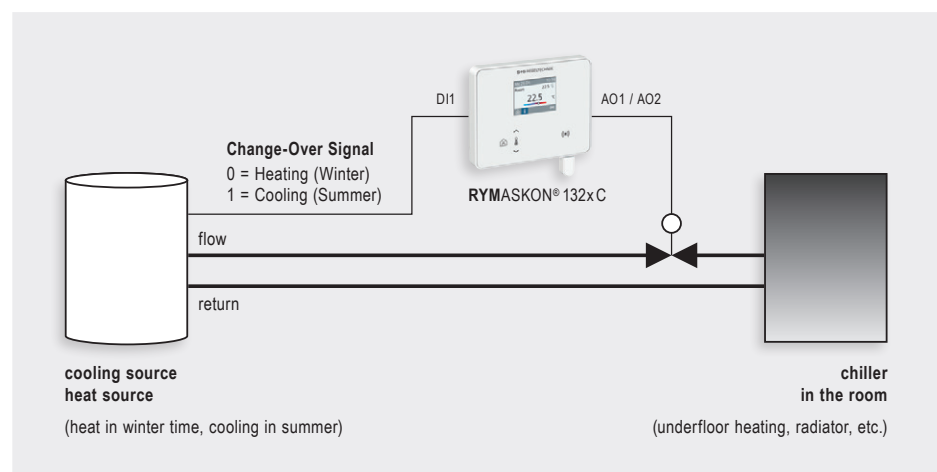


Fig. 901 Change-Over | 2-wire system

An **enabled** Change-Over (Cooling/Heating) has priority over **Controller OpMode Setpoint**. The status can be retrieved via the **Change-Over Status** parameter.

Note: If Change-Over is configured to a switching contact or external temperature sensor at the input via the **Change-Over_DI-Temp** parameter, the corresponding input cannot assume any other function. Value changes via bus are reset.

Configuration register

Change-Over_DI-Temp
ChangeOver_DI-Temp_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 Temp
Controller_Setpoint_Temp_1616

9.3 Dew point and window contact

An enabled dew point or window contact can be retrieved 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 Change-Over are to be switched via the DI inputs, the change-over has priority. If the **Change-Over_DI-Temp** parameter is used to assign the Change-Over to a DI input, the same input cannot be configured as dew point or window contact at the same time.

Dew point

An enabled dew point (condensation present) locks the cooling controller ($Y_C = 0\%$). Condensation is detected via the **Header Icon Status** parameter. An external dew point monitor must be used, the unit does not detect dew points.

Window contact

The building protection is enabled when a window contact (open window) is triggered (refer to Chapter 9.1 'Temperature Setpoint (main control loop)'). Open windows are detected via the **Header Icon Status** parameter.

9.4 Temperature control

RYMASKON Controllers have a PI and 2-point controller for heating and cooling. The parameters of the control sequences for heating and cooling can be separately set.

In addition to the main control loop (1st control loop), a second control loop (2nd control loop) can be enabled, for example to control an adjacent room using the RYMASKON Controller.

Configuration register

Controller Typ Heating
ContrTyp_Heating_8003

Controller Typ Cooling
ContrTyp_Cooling_8004

9.4.1 Main control loop (temperature controller)

PI controller (main control loop)

The controller types for heating and cooling the main control loop can be configured via the **Controller Typ Heating** and **Controller Typ Cooling** parameters. The following parameters have an influence on the PI controller of the main control loop.

Parameter	Holding address	Range
Controller Typ Heating = PI controller		
Proportional Band X_p Heating	8013	0.1...27.0 °C/°F (default: 2 °C/4 °F)
Reset Time T_i Heating	8014	0...1200 minutes (default: 20 minutes)
Manipulated Variable Min. Heating	8015	0...100 % (default: 0 %)
Manipulated Variable Max. Heating	8016	0...100 % (default: 100 %)
Controller Typ Cooling = PI controller		
Proportional Band X_p Cooling	8009	0.1...27.0 °C/°F (default: 2 °C/4 °F)
Reset Time T_i Cooling	8010	0...1200 minutes (default: 20 minutes)
Manipulated Variable Min. Cooling	8011	0...100 % (default: 0 %)
Manipulated Variable Max. Cooling	8012	0...100 % (default: 100 %)
Heating and Cooling		
Y Min Deviation PI Temp Control Loop	8018	0...10 % (default: 0.2 %)
Manipulated Variable Min. Behavior	8019	0 / 1 (default: 0) 0 = At least the set minimum value is present at the output as heating/cooling power (default) 1 = Heating/cooling power is only applied to the output from the set min. value.
PWM Cycle Time (for outputs DO/RO)	8005	5...60 minutes (default: 30 minutes)

Tab. 001 Configuring the PI controller for main control loop (temperature controller)

PI controller (main control loop) continued

With the PI controller, the temporal behaviour is determined via the two parameters **Proportional Band X_P** and **Reset Time T_N** .

Due to the proportional part (P), the manipulated variable reacts immediately to any temperature difference. The integral part (I) acts with time. The control difference ($dT_{\text{Setpoint Contr}}$) is calculated as follows:

$$dT_{\text{Contr}} = T_{\text{Setpoint Contr}} - T_{\text{Current}}$$

The value for $T_{\text{Setpoint Contr}}$ and T_{Current} depends on the operating mode and configuration (refer to Chapter 9.1 'Temperature Setpoint (Main control loop)' and 3.1 'Current temperature').

The resulting manipulated variable (Y_H / Y_C) is applied as a PWM signal to an RO/DO output or as a continuous signal to an AO output.

The calculation of the manipulated variable is illustrated in simplified form in the following diagram (Fig. 902). The diagram for the control variable can be derived from it as a function of the setpoint/current temperature. (Fig. 903)

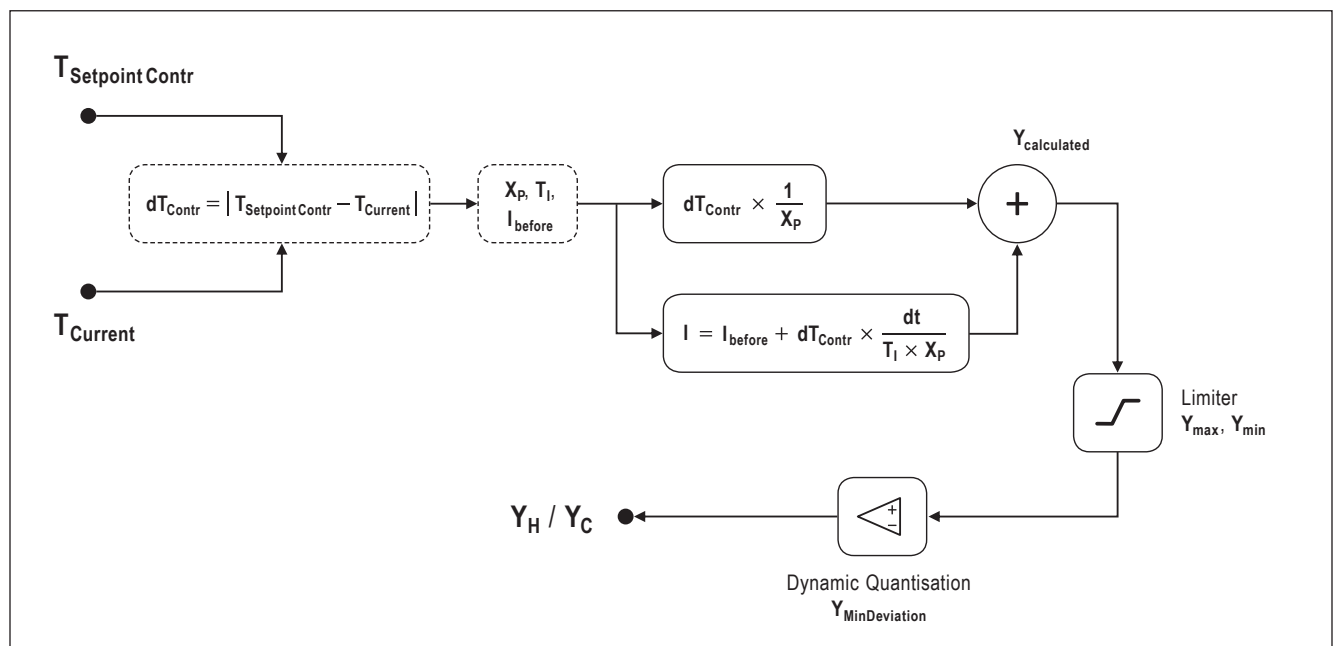


Fig. 902 PI controller (main control loop) | Calculation of manipulated variables (Y_H / Y_C)

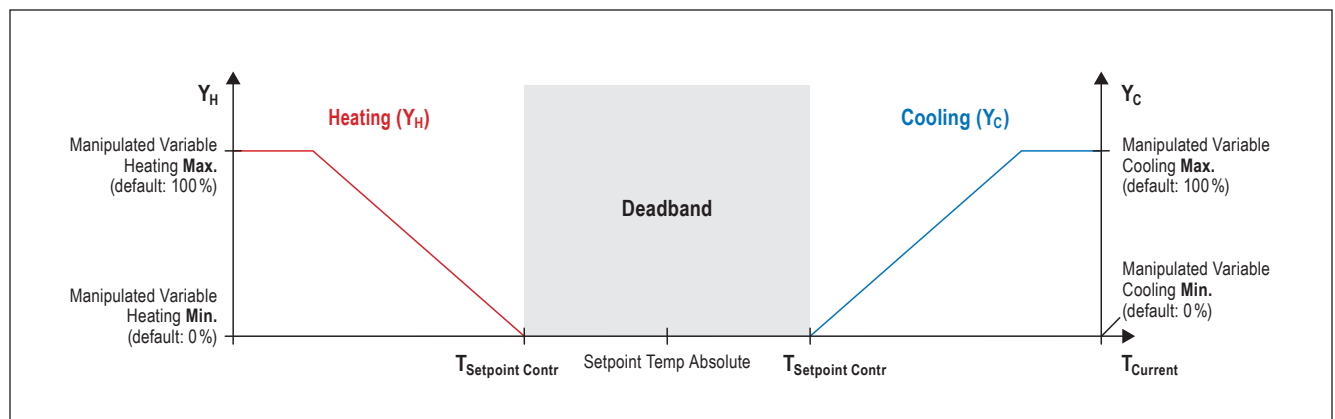


Fig. 903 PI controller (main control loop) | Manipulated variables (Y_H / Y_C) as a function of the setpoint/current temperature

PI controller (main control loop)
continued

The Limiter is configured via the parameter **Manipulated Variable Max...** and **Manipulated Variable Min...** (refer to Fig. 903 and Tab. 001).

The **Manipulated Variable Min. Behavior** parameter can also be used to configure whether at least the set min. value is applied to the output (Fig. 904) or whether the calculated manipulated variable $Y_{\text{calculated}}$ is only applied to the output from the set min. value (Fig. 905).

The following diagrams show examples with 'Manipulated Variable Min. Heating = 20%'.
The following diagrams show examples with 'Manipulated Variable Min. Heating = 20%'.

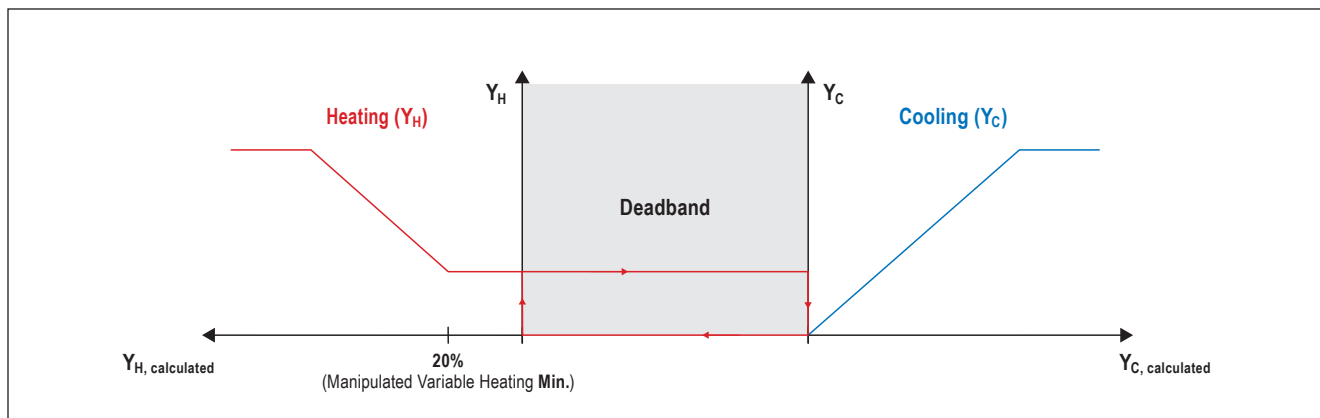


Fig. 904 PI controller (main control loop) | Manipulated Variable Min. Behavior = 0

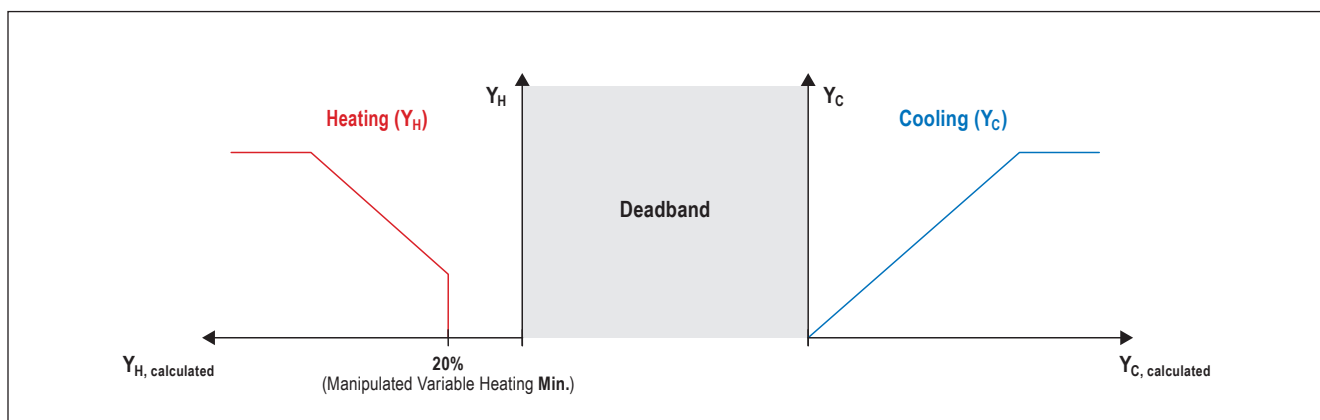


Fig. 905 PI controller (main control loop) | Manipulated Variable Min. Behavior = 1

The **Y Min Deviation PI Temp Contol Loop** parameter can be used to quantise the output linearly (stepped output change).

The **Y Min Deviation PI Temp Contol Loop** parameter sets the step amount (refer to 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 via the **PWM Cycle Time** parameter.

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

Configuration register

Controller Typ Heating
ContrTyp_Heating_8003

Controller Typ Cooling
ContrTyp_Cooling_8004

2-point controller (main control loop)

The controller types for heating and cooling the main control loop can be configured via the **Controller Typ Heating** and **Controller Typ Cooling** parameters.

The following parameters have an influence on the 2-point controller of the main control loop.

Parameter	Holding address	Range
Controller Typ Heating = 2-Point controller		
Manipulated Variable Min. Heating	*1 8015	0...100 % (default: 0 %)
Manipulated Variable Max. Heating	*1 8016	0...100 % (default: 100 %)
Controller Typ Cooling = 2-Point controller		
Manipulated Variable Min. Cooling	*1 8011	0...100 % (default: 0 %)
Manipulated Variable Max. Cooling	*1 8012	0...100 % (default: 100 %)
Heating and Cooling		
Hysteresis Temp Control	8008	0...27.0 °C/°F (default: 1 °C/2 °F)
Manipulated Variable Min. Behavior	*1 8019	0 / 1 (default: 0) 0 = At least the set minimum value is present at the output as heating/cooling power (default) 1 = no effect for the 2-point controller
*1 Parameter is only relevant for units with AO outputs for heating/cooling/6-way valve. The effects of the parameters on the 2-point controller are the same as for the PI controller.		

Tab. 002 Configuring the 2-point controller for main control loop (temperature controller)

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

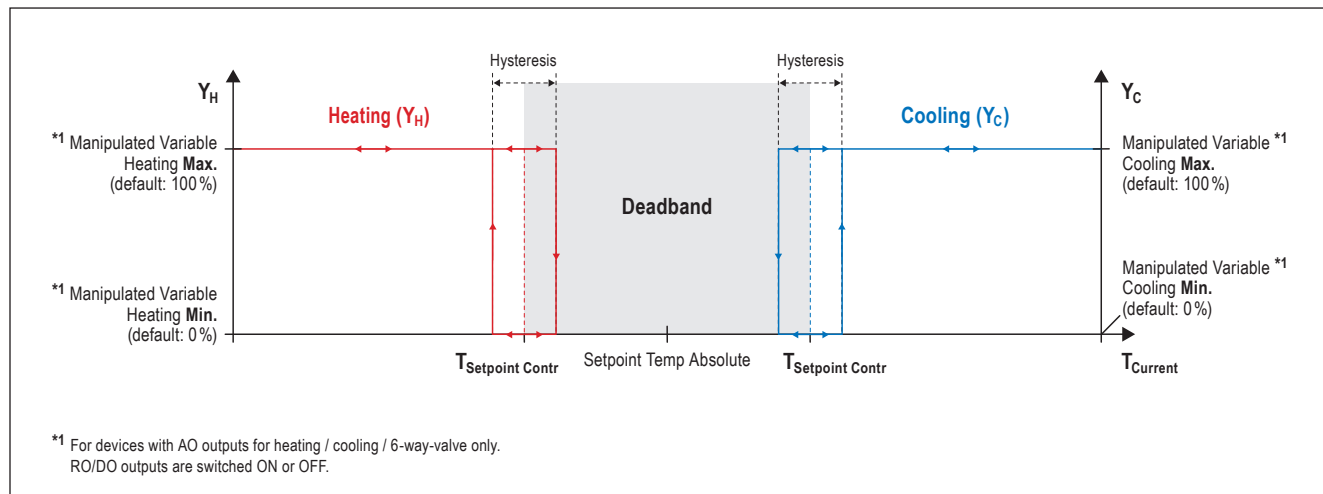


Fig. 906 2-point controller (main control loop) | Manipulated variables (Y_H/Y_C) as a function of the setpoint/current temperature

2-point controller (main control loop)
continued

Note:

To ensure trouble-free operation, the controller performs a plausibility check of the two parameters **Dead Band** and **Hysteresis**. The dead band has priority. If a configuration of the two parameters causes the heating/cooling hysteresis ranges to overlap, the hysteresis is automatically adjusted by the unit.

The parameters **Manipulated Variable Max...** and **Manipulated Variable Min...** (refer to **Tab. 002**) can be used to set limit values for units 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 'Manipulated Variable Min. Heating = 20 %' (**Fig. 907**).

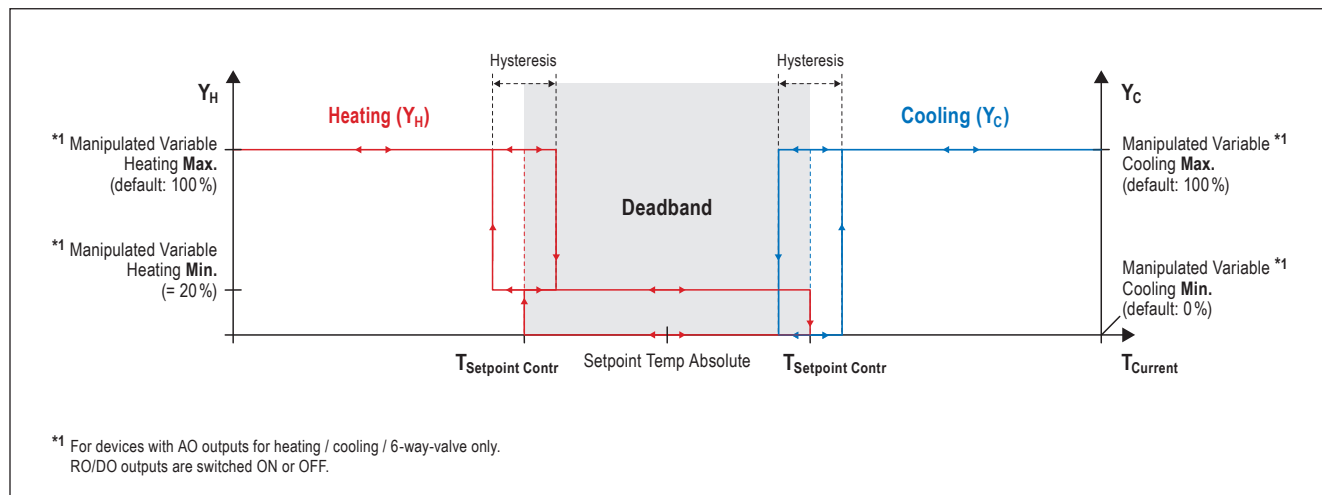


Fig. 907 2-point controller (main control loop) | Manipulated Variable Min. Behavior = 0

Important for fancoil controllers with AO output for fans
(RYMASKON 143xC / 145xC / 146xC)

If the main control loop (temperature) is set as a 2-point controller and, for example, the configuration is carried out as analogue **Fig. 007** ('Manipulated Variable Min. Heating = 20 %' and 'Manipulated Variable Min. Behavior = 0'), the fan switches off at $T_{\text{Setpoint Contr}} + \frac{1}{2} \text{Hysteresis}$, whereas a signal can still be present at the output for heating.

[Configuration register](#)

2. Control Loop Type
2.ContrLoopType_8044

2. Control Loop Setpoint Temp Offset
2.ContrLoop_SetTempOffset_8049

Frost Protection
Frost_Protection_8041

Heat Protection
Heat_Protection_8042

2. Control Loop Sensor Mapping
2.ContrLoop_SensMapping_8043

[Data register](#)

Change-Over Status
ChangeOver_Status_1600

Temp Setpoint Absolut
Setpoint_Temp_Absolut_402

9.4.2 Second control loop (temperature controller)

The second control loop is only possible in Change-Over mode (together with the main control loop). Enabling the Change-Over mode is described in Chapter 9.2 'Change-Over'. In addition, the parameter **2. Control Loop Type** must be used to activate the second control loop (PI controller or 2-point controller).

The second 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 second control loop is paired to the setpoint of the main control loop, but can be shifted with a constant value via the parameter **2. Control Loop Setpoint Temp Offset**.

Since the second control loop is operated exclusively in Change-Over mode (heating or cooling), the dead band is disabled (refer to Chapter 9.1 'Temperature Setpoint (Main control loop)'). An enabled window contact activates the building protection.

This allows the setpoint of the second control loop ($T_{2, \text{Setpoint}}$) to be calculated as follows.

If building protection is enabled:

$$T_{2, \text{Setpoint}} = \text{Frost Protection} \quad (\text{Heating mode})$$

$$T_{2, \text{Setpoint}} = \text{Heat Protection} \quad (\text{Cooling mode})$$

Otherwise:

$$T_{2, \text{Setpoint}} = \text{Temp Setpoint Absolut} + \text{2. Control Loop Setpoint Temp Offset} \quad (\text{Heating or cooling mode})$$

The control difference (dT_2) is calculated as follows:

$$dT_2 = T_{2, \text{Setpoint}} - T_{2, \text{Current}}$$

The current temperature ($T_{2, \text{Current}}$) for the second control loop is specified via the external temperature sensor or via bus value.

The assignment is made via the parameter **2. Control Loop Sensor Mapping**.

[Configuration register](#)

[2. Control Loop Type](#)
[2.ContrLoopType_8044](#)

PI controller (second control loop)

The controller types of the second control loop can be configured via the parameter **2. Control Loop Type**.

The following parameters have an influence on the PI controller of the second control loop.

Parameter	Holding address	Range
Second control loop is enabled as PI controller if: Change-Over Status = Cooling/Heating 2. Control Loop Type = PI controller		
2. Control Loop Sensor Mapping	8043	1 / 2 (default: 1) 1 = external temperature sensor (default) 2 = Bus temperature sensor
2. Control Loop Proportional Band X_p	8045	0.1...27.0 °C/°F (default: 2 °C/4 °F)
2. Control Loop Reset Time T_i	8046	0...1200 minutes (default: 20 minutes)
2. Control Loop Manipulated Variable Min	8047	0...100 % (default: 0 %)
2. Control Loop Manipulated Variable Max	8048	0...100 % (default: 100 %)
2. Control Loop Setpoint Temp Offset	8049	-25.0...25.0 °C/°F (default: 0 °C)
together with main control loop		
Y Min Deviation PI Temp Control Loop	8018	0...10 % (default: 0.2 %)
Manipulated Variable Min. Behavior	8019	0 / 1 (default: 0) 0 = At least the set minimum value is present at the output as heating/cooling power (default) 1 = Heating/cooling power is only applied to the output from the set min. value.
PWM Cycle Time	8005	5...60 minutes (default: 30 minutes)

Tab. 003 Configuring the PI controller for second control loop (temperature controller)

With the PI controller, the two parameters **2. Control Loop Proportional Band X_p** and **2. Control Loop Reset Time T_i** are used to determine the temporal behaviour. Due to the proportional part (P), the manipulated variable reacts immediately to any temperature difference. The integral part (I) acts with time.

PI controller (second control loop) continued

The operating principle of the 'Limiter', 'Dynamic Quantisation' and PWM is the same as for the main control loop.

The calculation of the manipulated variable is illustrated in simplified form in the following diagram (**Fig. 908**). The diagram for the control variable can be derived from it as a function of the setpoint/current temperature. (**Fig. 909**)

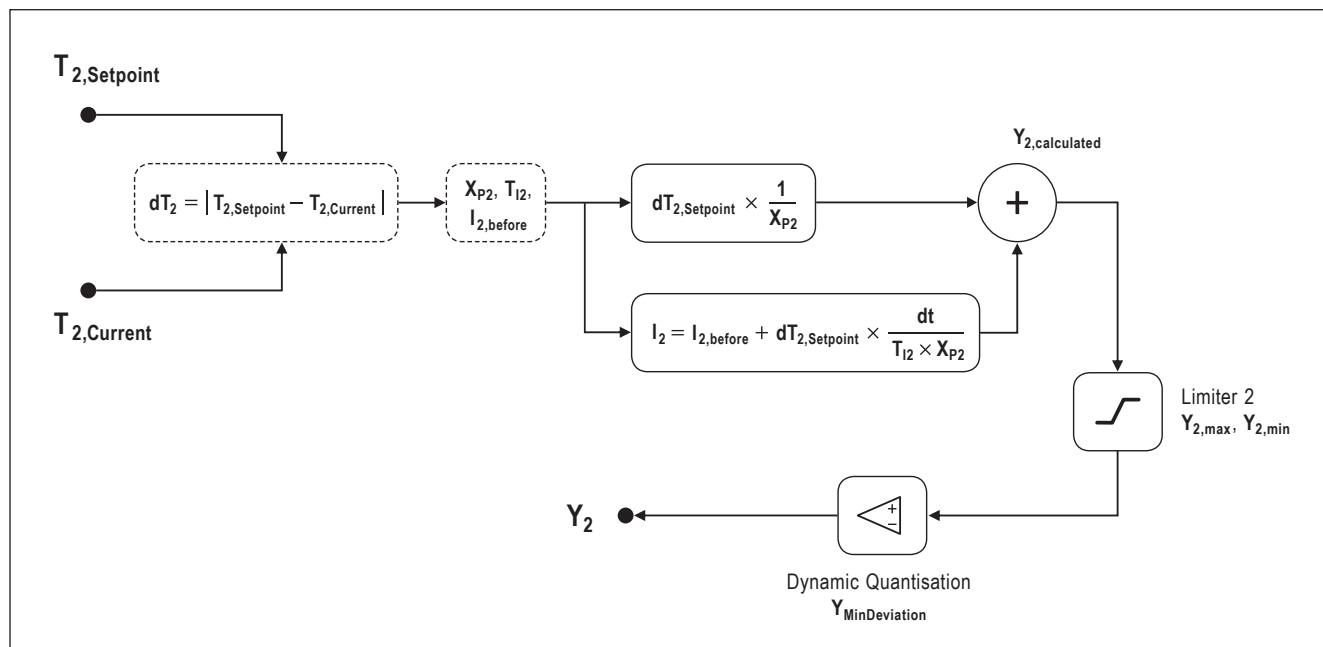


Fig. 908 PI controller (second control loop) | Calculation of the manipulated variable (Y_2)

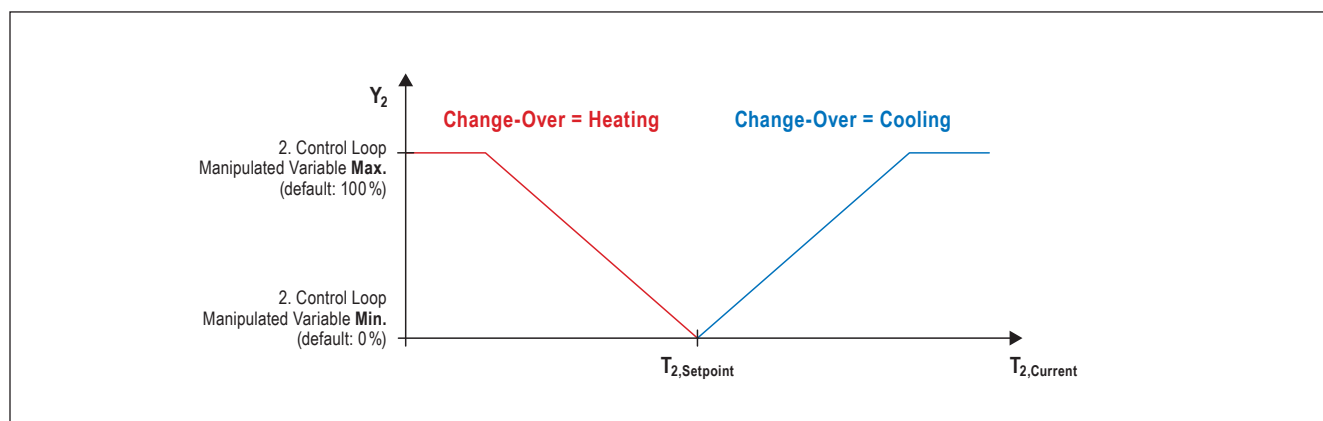


Fig. 909 PI controller (second control loop) | Manipulated variable (Y_2) as a function of the setpoint/current temperature

[Configuration register](#)

2. Control Loop Type
2.ContrLoopType_8044

2-point controller (second control loop)

The following parameters have an influence on the 2-point controller of the second control loop.

Parameter	Holding address	Range
Second control loop is enabled as 2-point controller if: Change-Over Status = Cooling/Heating 2. Control Loop Type = 2-Point controller		
2. Control Loop Sensor Mapping	8043	1 / 2 (default: 1) 1 = external temperature sensor (default) 2 = Bus temperature sensor
2. Control Loop Manipulated Variable Min *1	8047	0...100 % (default: 0 %)
2. Control Loop Manipulated Variable Max *1	8048	0...100 % (default: 100 %)
2. Control Loop Setpoint Temp Offset	8049	-25.0...25.0 °C / °F (default: 0 °C)
together with main control loop		
Hysteresis Temp Control	8008	0...27.0 °C / °F (default: 1 °C)
Manipulated Variable Min. Behavior *1	8019	0 / 1 (default: 0) 0 = At least the set minimum value is present at the output as heating/cooling power (default) 1 = no effect for the 2-point controller
*1 Parameter is only relevant for units with AO outputs for heating/cooling. The effects of the parameters on the 2-point controller are the same as for the PI controller.		

Tab. 004 Configuring the 2-point controller for second control loop (temperature controller)

The behaviour of the 2-point controller (second control loop) can be illustrated schematically as follows (**Fig. 910**).

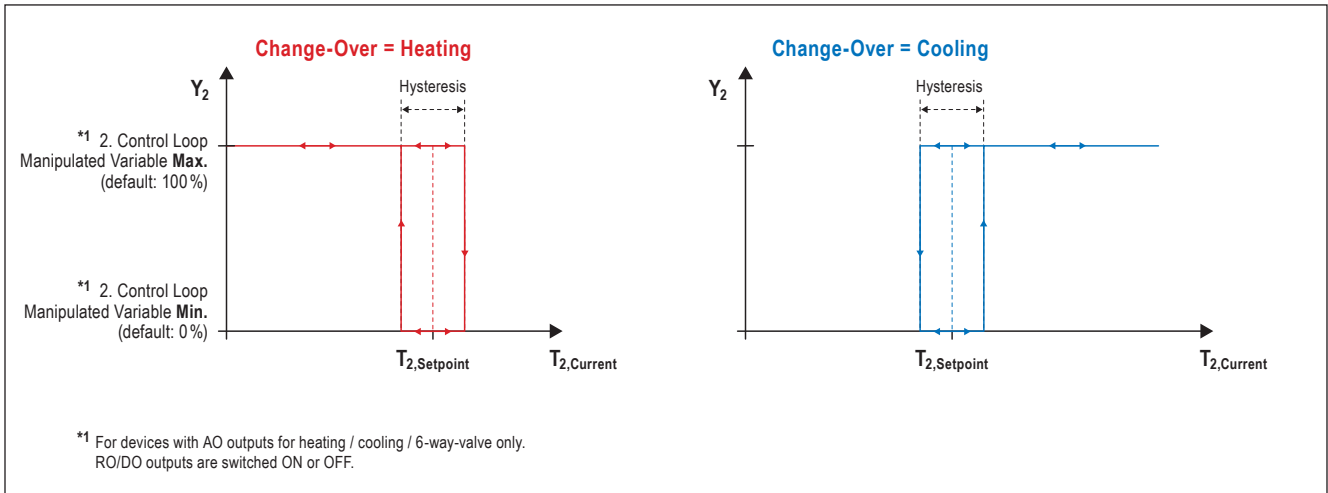


Fig. 910 2-point controller (second control loop) | Manipulated variable (Y_2) as a function of the setpoint/current temperature

The parameters **2. Control Loop Manipulated Variable Max** and **2. Control Loop Manipulated Variable Min** (refer to **Tab. 004**) can be used to set the limits for the AO output of the 2nd control loop. This allows the voltage at the output to be limited.

[Configuration register](#)

[Fan Mapping](#)

[FanMapping_8031](#)

[AO Fan Min.](#)

[AO_FanMin_8032](#)

[AO Fan Max.](#)

[AO_FanMax_8033](#)

[Number of Fan Steps](#)

[Fan_NumberOfSteps_3762](#)

[Data register](#)

[Fan Level](#)

[Setpoint_Fan_Level_407](#)

9.5 Fan control

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

The parameter **Fan Mapping** can be used to configure the fan operating mode.

By default, the fan responds to the heating or cooling power (refer to Chapter 9.5.1 'Heating/cooling fan control (Fancoil, Auto)').

Alternatively, it can be configured to control RH, CO2 or VOC concentration (refer to Chapter 9.5.2 'Fan control RCV (Auto)').

Fan Mapping

The parameter **Fan Mapping** can be used to configure the fan operating mode.

The general function of the configuration options can be divided into two groups:

- **Fan Mapping = 1...3**
In automatic mode, the fan responds to the control deviation of the current temperature
- **Fan Mapping = 4...9**
The RCV controller is enabled
(refer to Chapter 9.5.2 'Fan control RCV (Auto)')

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

- 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 fan, running in parallel)
- RO outputs (3 relays)**
for controlling a **3-level fan**
RYMASKON 144xC (3x RO for fan, 230 V, max. 3 A)

Manual fan control (Manual mode)

The user interface of the fan control and the configuration options of the Controller for Manual mode are described in Chapter 4.X 'Fan'.

In Auto mode, the Controller controls the fan outputs depending on the heating/cooling or RCV controller. Manually adjusting the fan levels to OFF or to fan level 1...5 results in the controller being 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 level.

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

$$AO_{FM} = AO \text{ Fan Min.} + \frac{\text{Fan Level}}{\text{Number of Fan Steps}} \times (AO \text{ Fan Max.} - AO \text{ Fan Min.})$$

Configuration register

Number of Fan Steps
Fan_NumberOfSteps_3762

Fan Mapping
FanMapping_8031

Fan StartUp Time
Fan_StartUpTime_8035

Fan FollowUp Time
Fan_FollowUpTime_8036

Hysteresis Temp Control
Hyst_TempContr_8008

Fan Gradient AO
FanGradient_AO_8037

AO Fan Min.
AO_FanMin_8032

AO Fan Max.
AO_FanMax_8033

Fan Manipulated Variable Start
Fan_ManipVar_Start_8034

Data register

Fan Level
Setpoint_Fan_Level_407

9.5.1 Heating/cooling fan control (Fancoil, Auto)

This section provides a description of the fan control when the fan responds to the heating or cooling power in automatic mode. The configuration options via the **Fan Mapping** parameter are as follows:

- **Fan Mapping = 1** → Fan responds to cooling and heating
- **Fan Mapping = 2** → Fan responds to cooling
- **Fan Mapping = 3** → Fan responds to heating

Basic functions of fan control

(valid for all types of Controllers)

- In automatic mode (406 = 1), the fan control is paired with the main control loop (temperature controller).
- If no heating or cooling power is required in the fan's automatic mode (Y_H and $Y_C = 0\%$), the fan level $Y_F = 0\%$ (default: if $Y_F = 0\%$, the fan is turned off).
- The fan can be configured to start up more reliably using the **Fan StartUp Time** parameter. During this time, the fan runs from standstill to maximum speed.
- The fan shut down can be delayed using the **Fan FollowUp Time** parameter.

Behaviour of controller with AO output for fans (0...10 V)

(RYMASKON 143xC / 145xC / 146xC)

If the controller type for heating/cooling is configured to PI controller, the manipulated variable of the fan (Y_F) changes according to the manipulated variables for heating/cooling (Y_H / Y_C).

$$Y_F = Y_H \quad \text{or} \quad Y_F = Y_C$$

if the heating/cooling controller type is configured to 2-point controller, the manipulated variable of the fan (Y_F) is calculated from the control deviation and the proportional range **Fan Gradient AO** as follows:

$$Y_F = \left| \frac{T_{\text{Setpoint Contr}} - T_{\text{Current}} + \frac{\text{Hysteresis Temp Control}}{2}}{\text{Fan Gradient AO}} \right| \times 100\%$$

The value for $T_{\text{Setpoint Contr}}$ and T_{Current} depends on the operating mode and configuration (refer to Chapter 9.1 'Temperature Setpoint (Main control loop)' and 3.1 'Current temperature').

Additional configuration options:

- The min/max value of the fan output can be configured via the **AO Fan Min.** [V] and **AO Fan Max.** [V] parameters (e.g. $Y_F = 0...100\% \hat{=} 2.0...8.0\text{ V}$).
If, for example, **AO Output Min.** > 0 V is set, the fan also runs at $Y_F = 0\%$.
- The manipulated variable at which the fan should start can be configured via the **Fan Manipulated Variable Start** parameter.
If, for example, **Fan Manipulated Variable Start** = 20% is set, the fan only starts at $Y_F \geq 20\%$.

Fan Auto Mode (406=1)		Number of Fan Steps (3762)				
		1	2	3	4	5
Display Fan Level (407)	0 (off)	$Y_F = 0\%$	$Y_F = 0\%$	$Y_F = 0\%$	$Y_F = 0\%$	$Y_F = 0\%$
	1	$Y_F > 0\%$	$Y_F > 0\%$	$Y_F > 0\%$	$Y_F > 0\%$	$Y_F > 0\%$
	2		$Y_F > 50\%$	$Y_F > 33\%$	$Y_F > 25\%$	$Y_F > 20\%$
	3			$Y_F > 66\%$	$Y_F > 50\%$	$Y_F > 40\%$
	4				$Y_F > 75\%$	$Y_F > 60\%$
	5					$Y_F > 80\%$

Tab. 005 Fan level (Y_F) and fan level display for controllers that have an AO output for fans

Configuration register

Number of Fan Steps

Fan_NumberOfSteps_3762

Fan Manipulated Variable Start

Fan_ManipVar_Start_8034

Delta T Fan Level 1 RO

DeltaT_FanLevel1RO_8038

Delta T Fan Level 2 RO

DeltaT_FanLevel2RO_8039

Delta T Fan Level 3 RO

DeltaT_FanLevel3RO_8040

Behaviour of Controller with RO output for fans (3 relays)

(RYMASKON 144xC)

If the controller type for heating/cooling is configured to PI controller, the manipulated variable of the fan (Y_F) changes according to the manipulated variables for heating/cooling (Y_H / Y_C).

$$Y_F = Y_H \quad \text{or} \quad Y_F = Y_C$$

The fan levels are switched via a fixed threshold of the manipulated variable Y_F .

The thresholds depend on the number of fan levels (refer to **Tab. 006**).

The number is configured via the **Number of Fan Steps** parameter.

PI control (main control loop)		Number of Fan Steps (3762)		
		1	2	3
Display Fan Level (407)	1	$Y_F > 0 \%$	$Y_F > 0 \%$	$Y_F > 0 \%$
	2		$Y_F > 50 \%$	$Y_F > 33 \%$
	3			$Y_F > 66 \%$

Tab. 006 Fan level (Y_F) and fan level display for controllers that have an RO output for 3-level fans (RYMASKON 144xC)

The manipulated variable at which the fan should start can be configured via the

Fan Manipulated Variable Start parameter.

If, for example, **Fan Manipulated Variable Start** = 30 % is set, the fan only starts at $Y_F \geq 30 \%$.

If the heating/cooling controller type is configured as a 2-point controller, the fan levels are switched via the temperature difference between the setpoint temperature and the current temperature.

The configuration of the switching thresholds (dTL_{F1} , dTL_{F2} , dTL_{F3}) takes place via the parameters

Delta T Fan Level 1 RO, **Delta T Fan Level 2 RO** and **Delta T Fan Level 3 RO**.

The internal hysteresis (permanently programmed to $\pm 0.3 \text{ } ^\circ\text{C} / ^\circ\text{F}$) prevents the outputs from jittering when the fan levels are switched (**Fig. 911**).

If 0 (default) is set for **Delta T Fan Level 1 RO** (dTL_{F1}),

the fan starts immediately when a heating or cooling request occurs (Y_H or $Y_C > 0 \%$).

The internal hysteresis has no influence on the switching threshold dTL_{F1} .

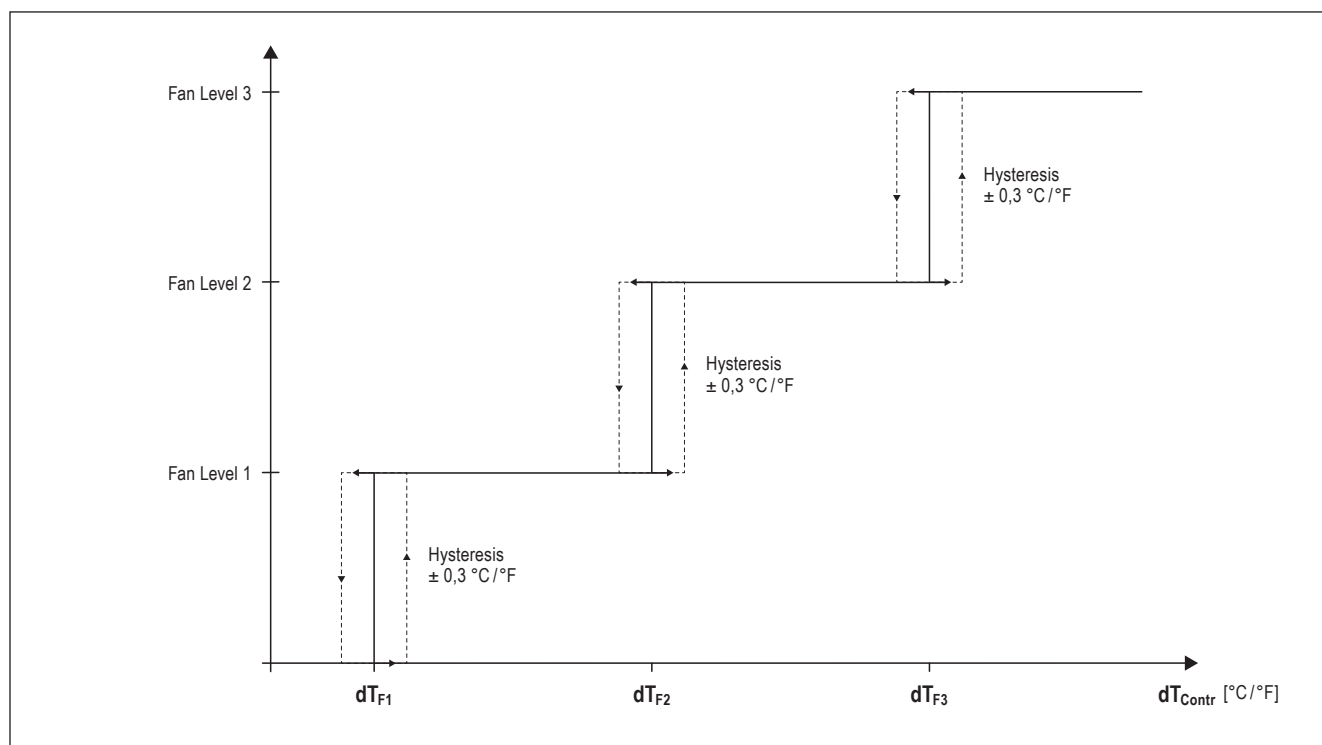


Fig. 911 RYMASKON 144xC (3-level fan) when connected to a 2-point temperature control

Configuration register

Fan Mapping

FanMapping_8031

Control Type RCV

ContrTyp_RCV_8201

Setpoint RCV

Setpoint_RCV_8200

Fan StartUp Time

Fan_StartUpTime_8035

Fan FollowUp Time

Fan_FollowUpTime_8036

Data register

Humidity Sensor 1 Int.

HumS1Int_Value_101

CO2 Sensor 1 Int.

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 **Fan Mapping** parameter is used to assign the desired measurand to the 3rd control loop (fan RCV control).

The RCV controller is enabled when an RH, CO2 or VOC sensor is assigned.

The controller type is configured via the **Control Type RCV** parameter.

The setpoint is permanently configured via the **Setpoint RCV** parameter and cannot be changed on the unit during operation.

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

$$\text{dRCV} = \text{Setpoint RCV} - \text{RCV}_{\text{Current}}$$

The value for $\text{RCV}_{\text{Current}}$ depends on the assigned sensor via the **Fan Mapping** parameter.

Important!

The control sequence of the RCV is unidirectional.

RH: Dehumidification

CO2 / VOC: Fresh air supply

It is not possible to humidify or enrich the air with CO2/VOC!

Example 1:

Fan Mapping	=	humidity (internal sensor)
$\text{RCV}_{\text{Current}}$	=	Humidity Sensor 1 Int. = 800 (80 %RH)
$\text{RCV}_{\text{Setpoint}}$	=	Setpoint RCV = 500 (50 %RH)
→ $\text{RCV}_{\text{Setpoint}} < \text{RCV}_{\text{Current}}$ → fan is activated		

Example 2:

Fan Mapping	=	humidity (internal sensor)
$\text{RCV}_{\text{Current}}$	=	Humidity Sensor 1 Int. = 500 (50 %RH)
$\text{RCV}_{\text{Setpoint}}$	=	Setpoint RCV = 800 (80 %RH)
→ $\text{RCV}_{\text{Setpoint}} > \text{RCV}_{\text{Current}}$ → fan is <u>not</u> activated		

Example 3:

Fan Mapping	=	CO2 (internal sensor)
$\text{RCV}_{\text{Current}}$	=	CO2 Sensor 1 Int. = 1500 (1500 ppm)
$\text{RCV}_{\text{Setpoint}}$	=	Setpoint RCV = 800 (800 ppm)
→ $\text{RCV}_{\text{Setpoint}} < \text{RCV}_{\text{Current}}$ → fan is activated		

Fan StartUp Time / FollowUp Time

To ensure that the fan starts up safely, a start-up time can be configured via the **Fan StartUp Time** parameter (default: 1s). During this time, the fan runs from standstill to maximum speed.

The **Fan FollowUp Time** parameter (default: 1s) can be used to delay the fan shut down.

PI controller (RCV control loop)

The RCV controller type can be configured via the **Control Type RCV** parameter.

The following parameters have an influence on the PI controller of the RCV control loop.

Configuration register

Fan Mapping

FanMapping_8031

Control Type RCV

ContrTyp_RCV_8201

Setpoint RCV

Setpoint_RCV_8200

Data register

Humidity Sensor 1 Int.

HumS1Int_Value_101

CO2 Sensor 1 Int.

CO2S1Int_Value_102

Parameter	Holding address	Range
Control Type RCV = PI controller		
Setpoint RCV	8200	0...30 000 (default: 1000)
Proportional Band X_p RCV	8202	0...10 000 (default: 100)
Reset Time T_i RCV	8203	0...60 000 s (default: 420 s)
Fan Manipulated Variable Start	8034	0...30 % (default: 0 %)
RCV Min Deviation PI Control Loop	8209	0...50 % (default: 5 %)

Tab. 007 Configuring the PI controller for RCV control loop (fan)

With the PI controller, the temporal behaviour is determined via the two parameters

Proportional Band X_p RCV and **Reset Time T_i RCV**.

Due to the proportional part (P), the manipulated variable reacts immediately to any RCV difference.

The integral part (I) acts with time.

The resulting manipulated variable (Y_{RCV}) is applied as a continuous signal to an AO fan output.

The calculation of the manipulated variable is illustrated in simplified form in the following diagram (Fig. 912). The diagrams for the manipulated variable can be derived from this as a function of the Setpoint/Current RCV (see Fig. 913 / Fig. 914).

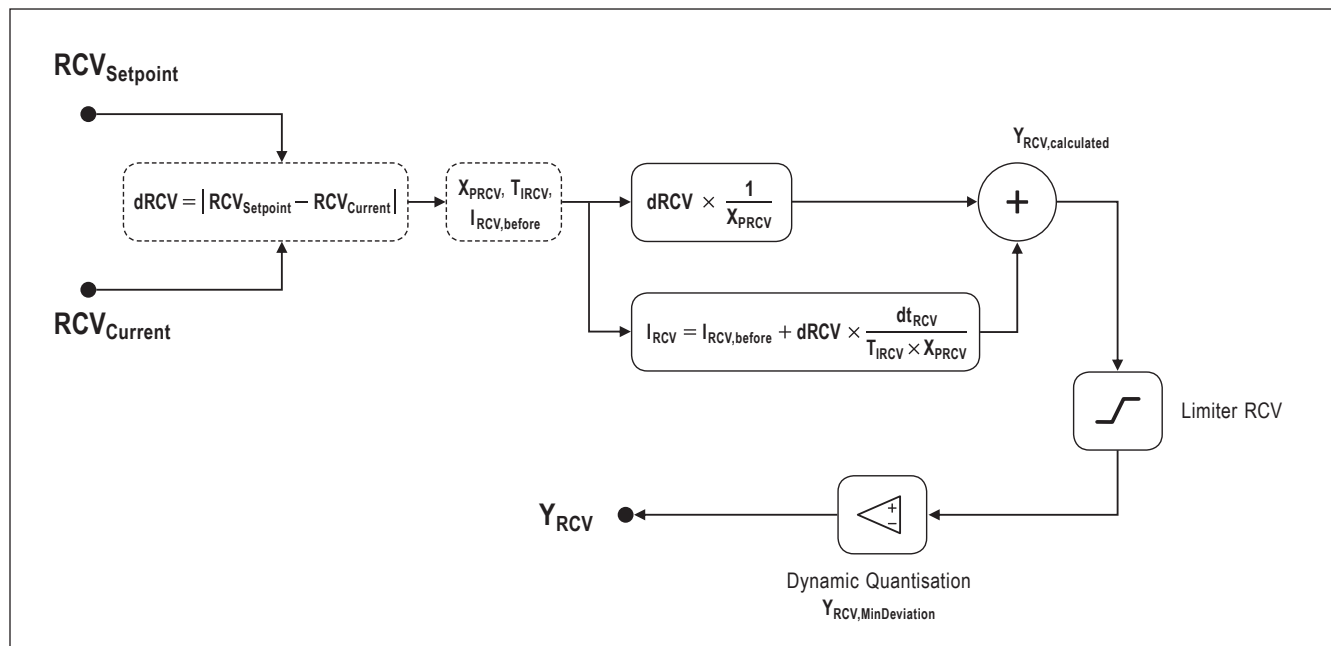


Fig. 912 PI controller (RCV control loop) | Calculation of the manipulated variable (Y_{RCV})

The 'Limiter RCV' is configured via the **Fan Manipulated Variable Start** parameter (refer to Fig. 912 and Tab. 007).

The 'Dynamic Quantisation' is configured via the **Y_{RCV} Min Deviation PI Control Loop** parameter (refer to Fig. 912 and Tab. 007).

In this process, the calculated manipulated variable is compared with the previous manipulated variable. If the deviation is less than the value from the **Y_{RCV} Min Deviation PI Control Loop** parameter, the manipulated variable does not change.

PI controller (RCV control loop)
continued

The following diagrams for the manipulated variable as a function of the Setpoint/Current RCV illustrate examples with 'Fan Manipulated Variable Start = 0% (default)' (**Fig. 913**) as well as 'Fan Manipulated Variable Start = 20%' (**Fig. 914**).

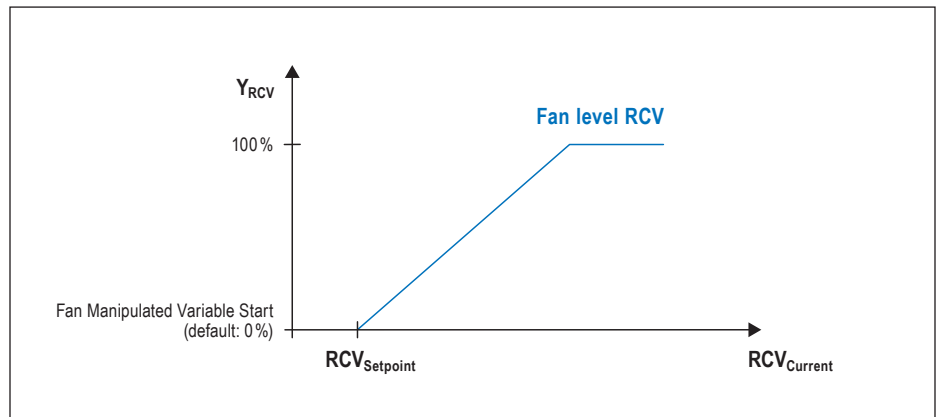


Fig. 913 PI controller (RCV control loop) | Manipulated variable (Y_{RCV}) as a function of the Setpoint/Current RCV

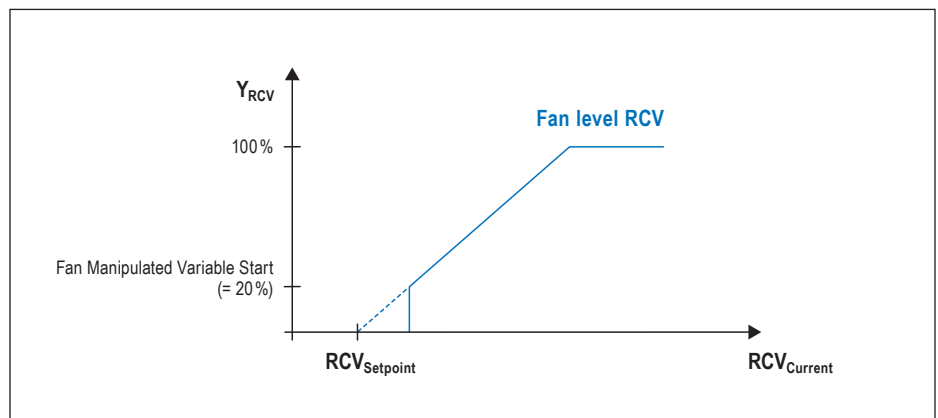


Fig. 914 PI controller (RCV control loop) | Fan Manipulated Variable Start = 20%

2-point controller (RCV control loop)

The RCV controller type can be configured via the **Control Type RCV** parameter.

The following parameters have an influence on the 2-point controller of the RCV control loop (Tab. 008).

Configuration register

Number of Fan Steps

Fan_NumberOfSteps_3762

Control Type RCV

ContrTyp_RCV_8201

AO Fan Min.

AO_FanMin_8032

AO Fan Max.

AO_FanMax_8033

Data register

Fan Level

Setpoint_Fan_Level_407

Parameter	Holding address	Range
Control Type RCV = 2-Point controller		
Setpoint RCV	8200	0...30 000 (default: 1000)
Hysteresis RCV	8204	0...30 000 (default: 50)

Tab. 008 Configuring the 2-point controller for RCV control loop (fan)

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

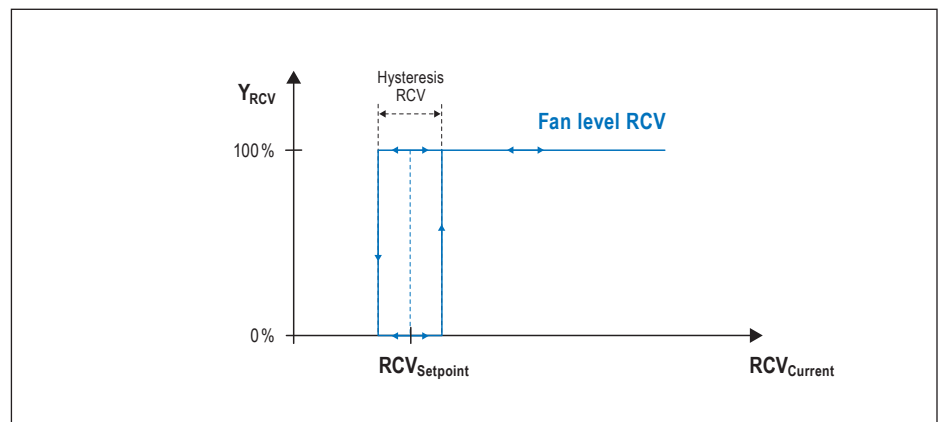


Fig. 915 2-point controller (RCV control loop) | Manipulated variable (Y_{RCV}) as a function of the Setpoint/Current RCV

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

The min/max value of the fan output can be configured via the

AO Fan Min. [V] and **AO Fan Max.** [V] parameters

(e.g. $Y_{RCV} = 0...100\% \hat{=} 2.0...8.0V$).

If, for example, **AO Output Min.** > 0 V is set, the fan also runs at $Y_{RCV} = 0\%$.

Fan Auto Mode (406=1)		Number of Fan Steps (3762)				
		1	2	3	4	5
Display Fan Level (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					$Y_{RCV} > 80\%$

Tab. 009 Fan level (Y_{RCV}) and fan level display for controllers that have an AO output for fans

2-point controller (RCV control loop)
continued

[Configuration register](#)

[Setpoint RCV](#)

[Setpoint_RCV_8200](#)

[Fan Mapping](#)

[FanMapping_8031](#)

[Delta RCV Fan Level 1 RO](#)

[DeltaRCV_FanLevel1RO_8205](#)

[Delta RCV Fan Level 2 RO](#)

[DeltaRCV_FanLevel2RO_8206](#)

[Delta RCV Fan Level 3 RO](#)

[DeltaRCV_FanLevel3RO_8207](#)

Behaviour of controller with RO output for fans (3 relays) for RCV control
(RYMASKON 144xC)

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

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

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

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

RCV_{Current} depends on the sensor assigned via the **Fan Mapping** parameter.

The configuration of the switching thresholds (**dRCV_{F1}**, **dRCV_{F2}**, **dRCV_{F3}**) takes place via the parameters **Delta RCV Fan Level 1 RO**, **Delta RCV Fan Level 2 RO** and **Delta RCV Fan Level 3 RO**.

The hysteresis can be configured via the **Hysteresis RCV Control** parameter to prevent the outputs from jittering when the fan levels are changed (**Fig. 916**).

When 0 (default) is set for **Delta RCV Fan Level 1 RO** (**dRCV_{F1}**), the fan starts directly at **dRCV > 0**.

The internal hysteresis has no influence on the switching threshold **dRCV_{F1}**.

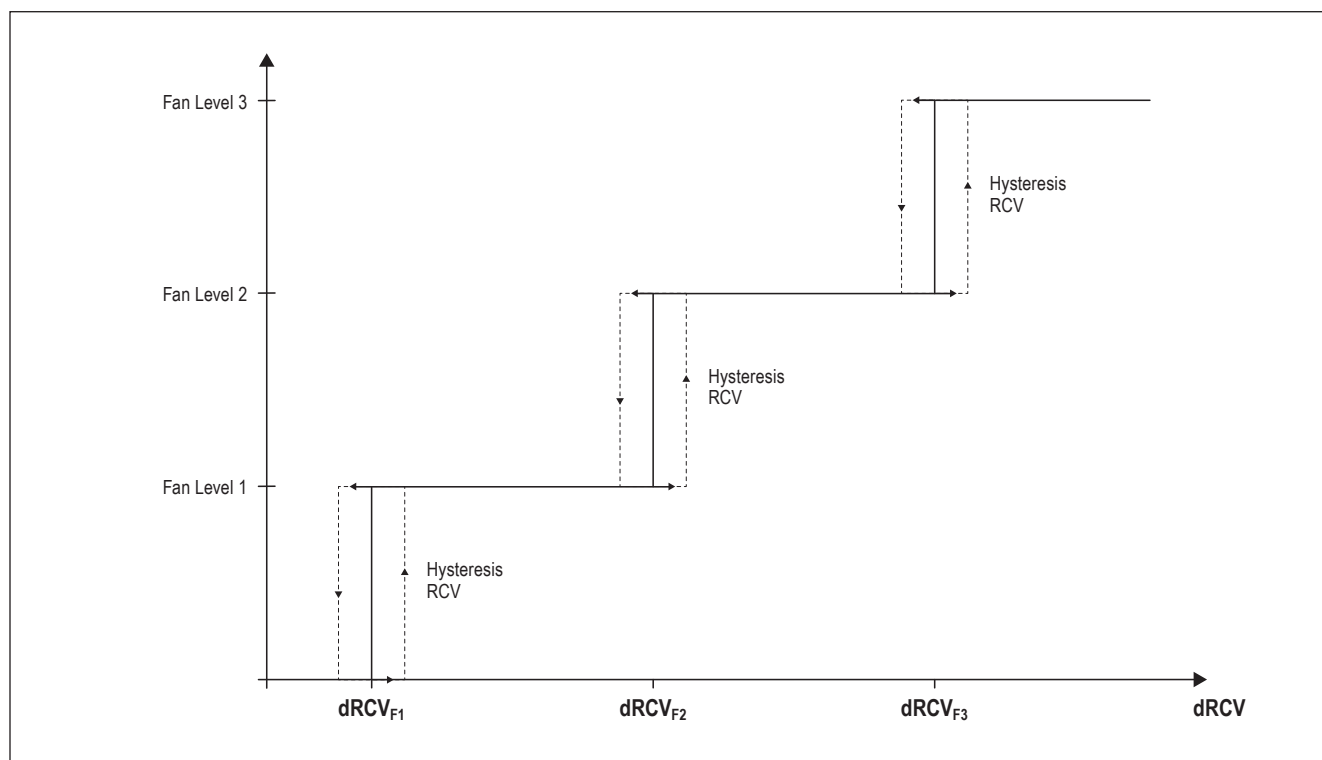


Fig. 916 RYMASKON 144xC (3-level fan) when connected to a 2-point RCV control

Configuration register

AO Direction Heating
AODirection_Heating_8025

AO Direction Cooling
AODirection_Cooling_8026

RODO Direction Heating
RODODirection_Heating_8027

RODO Direction Cooling
RODODirection_Cooling_8028

Output 6-Way-Valve
Out6WayValve_8020

6-Way-Valve Generic...
6WayValveGen..._8021 bis
6WayValveGen..._8024

Data register

AO Output Heating BMS Contr.
AO_OutHeat_BMSContr_1608

AO Output Cooling BMS Contr.
AO_OutCool_BMSContr_1609

AO Output 6-Way-Valve BMS Contr.
AO_Out6WayValve_BMSContr_1610

RO/DO Output Heating BMS Contr.
RODO_OutHeat_BMSContr_1611

RO/DO Output Cooling BMS Contr.
RODO_OutCool_BMSContr_1612

AO Output Fan BMS Contr.
AO_OutFan_BMSContr_1613

RO/DO Output Fan BMS Contr.
RODO_OutFan_BMSContr_1615

Fan Auto Mode
Fan_AutoMode_406

Fan Level
Setpoint_Fan_Level_407

9.6 Outputs

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

The output designations are as follows:

- **Heating** (AO/DO/RO)
- **Cooling** (AO/DO/RO)
- **6-Way Valve** (AO)
- **Fan** (AO/RO)

The BMS can override every individual output.

The **Output...BMS Contr.** parameters are available for this purpose.

If an output is overridden by the BMS, the outputs are decoupled from the controller.

Note for RYMASKON 136xC / 146xC:

The DO outputs are designed for max. 24 V!

The fan outputs are a special case when the BMS overrides the outputs.

If the **AO Output Fan BMS Contr.** (AO fan outputs)

or **RO/DO Output Fan BMS Contr.** (RO fan outputs) parameters are used to override the outputs via the BMS, the display must also be adjusted via the **Fan Auto Mode** and **Fan Level** parameters.

The unit's fan keys remain enabled. Pressing the keys leads to a change on the display and in the parameters, but it does not alter the fan outputs.

Automatic calibration

To make sure the voltage is accurate, the outputs perform an automatic calibration each time the unit is switched on.

During calibration (takes approx. 0.5 s), the outputs switch to 10 V for 0.1 s and then to 0 V again.

The respective output value is then set.

Heating and cooling direction

The direction for all heating and cooling outputs can be adjusted.

This allows the control of valves that are normally closed or normally open (NC/NO actuators).

Configuration register

AO Direction Heating
AODirection_Heating_8025

AO Direction Cooling
AODirection_Cooling_8026

RODO Direction Heating
RODDirection_Heating_8027

RODO Direction Cooling
RODDirection_Cooling_8028

Output 6-Way-Valve
Out6WayValve_8020

6-Way-Valve Generic...
6WayValveGen..._8021 bis
6WayValveGen..._8024

Data register

AO Output Heating BMS Contr.
AO_OutHeat_BMSContr_1608

AO Output Cooling BMS Contr.
AO_OutCool_BMSContr_1609

AO Output 6-Way-Valve BMS Contr.
AO_Out6WayValve_BMSContr_1610

RO/DO Output Heating BMS Contr.
RODO_OutHeat_BMSContr_1611

RO/DO Output Cooling BMS Contr.
RODO_OutCool_BMSContr_1612

AO Output Fan BMS Contr.
AO_OutFan_BMSContr_1613

RO/DO Output Fan BMS Contr.
RODO_OutFan_BMSContr_1615

Fan Auto Mode
Fan_AutoMode_406

Fan Level
Setpoint_Fan_Level_407

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

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

The relationships between manipulated variable and AO/DO/RO output heating and cooling, as well as the influence of the **Manipulated Variable Min**, **Manipulated Variable Min. Behavior** and **Manipulated Variable Max** parameters are illustrated in Fig. 917.

The Output 6-way valve is described separately (see chapter 9.6.3).

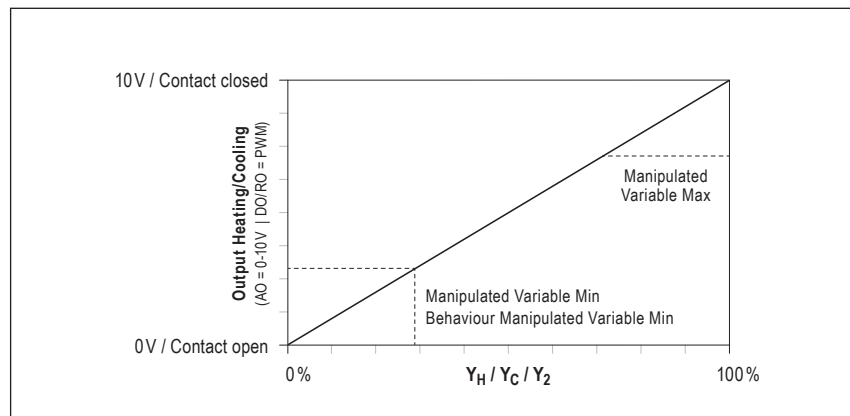


Fig. 917 AO/DO output | Temp controller ($Y_H/Y_C/Y_2$) manipulated variable (default: non-inverted)

9.6.2 Fan output (AO)

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

The relationships between the manipulated variable and the fan AO output, as well as the influence of the **Fan Manipulated Variable Start** parameter, are illustrated in Fig. 918.

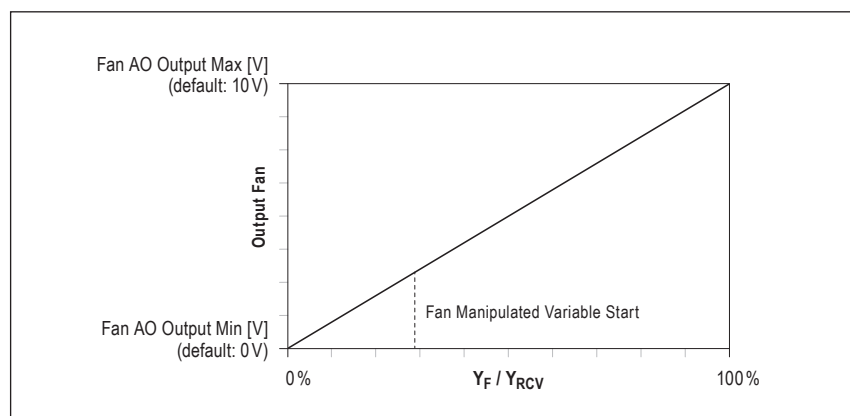


Fig. 918 AO output | Fan control (Y_F/Y_{RCV}) manipulated variable (default: non-inverted)

Configuration register

Output 6-Way-Valve
Out6WayValve_8020

6-Way-Valve Generic...
6WayValveGen..._8021 bis
6WayValveGen..._8024

Data register

AO Output Heating BMS Contr.
AO_OutHeat_BMSContr_1608

AO Output Cooling BMS Contr.
AO_OutCool_BMSContr_1609

AO Output 6-Way-Valve BMS Contr.
AO_Out6WayValve_BMSContr_1610

RO/DO Output Heating BMS Contr.
RODO_OutHeat_BMSContr_1611

RO/DO Output Cooling BMS Contr.
RODO_OutCool_BMSContr_1612

AO Output Fan BMS Contr.
AO_OutFan_BMSContr_1613

RO/DO Output Fan BMS Contr.
RODO_OutFan_BMSContr_1615

9.6.3 Output 6-way valve (AO)

The **Output 6-way valve** parameter can be used to select various preconfigured 6-way valve types.

It is also possible to configure a generic 6-way valve using the **6-Way Valve Generic...** parameter.

The 6-way valve is disabled on delivery.

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

These outputs continue to be overridden via the **AO Output Heating BMS Contr.** or **AO Output Cooling BMS Contr.** parameters, even if these outputs are configured as a 6-way valve.

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

The following graphical representations were created in line with the data sheet issued by the manufacturer of the respective 6-way valve (Fig. 919 - 924).

Output 6-way valve addresse 8020	Cooling mode	Heating mode
0 (default)	Output 6-Way Valve responds to the heating or cooling output (in both cases) as a steady signal 0...10 V .	
1 (generic)	100%...0% $\hat{=}$ values from 8021...8022 [V]	0%...100% $\hat{=}$ values from 8023...8024 [V]
2 (Belimo)	100%...0% $\hat{=}$ 2.0...4.7 V	0%...100% $\hat{=}$ 7.3...10 V
3 (Belimo inverted)	0%...100% $\hat{=}$ 7.3...10 V	100%...0% $\hat{=}$ 2.0...4.7 V
4 (Sauter DN15)	100%...0% $\hat{=}$ 1.1...3.7 V	0%...100% $\hat{=}$ 6.3...8.9 V
5 (Sauter DN15 inverted)	0%...100% $\hat{=}$ 6.3...8.9 V	100%...0% $\hat{=}$ 1.1...3.7 V
6 (Sauter DN20)	100%...0% $\hat{=}$ 1.6...4.5 V	0%...100% $\hat{=}$ 5.5...8.4 V
7 (Sauter DN20 inverted)	0%...100% $\hat{=}$ 5.5...8.4 V	100%...0% $\hat{=}$ 1.6...4.5 V
8	Output 6-Way-Valve responds to heating power	100%...0% $\hat{=}$ 0...10 V
9	100%...0% $\hat{=}$ 0...10 V	Output 6-Way-Valve responds to cooling power
10	Output 6-Way-Valve responds to heating power	100%...0% $\hat{=}$ 10...0 V
11	100%...0% $\hat{=}$ 10...0 V	Output 6-Way-Valve responds to cooling power

Tab. 011 Configuring the output 6-way valve

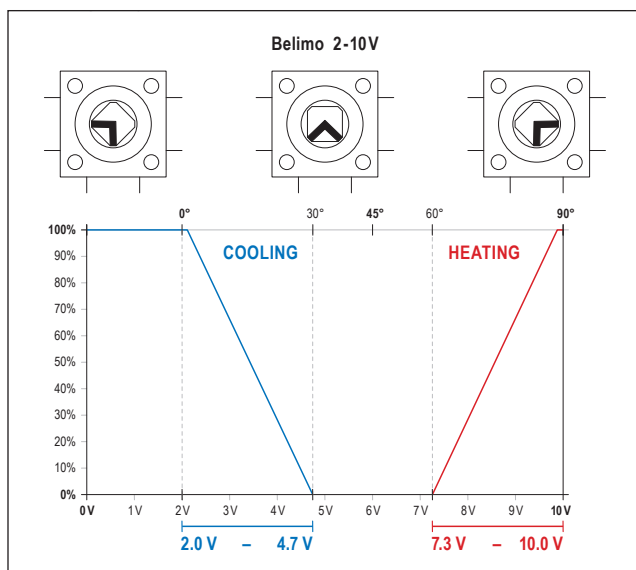


Fig. 919 6-way valve | Belimo (address 8020 = 2)

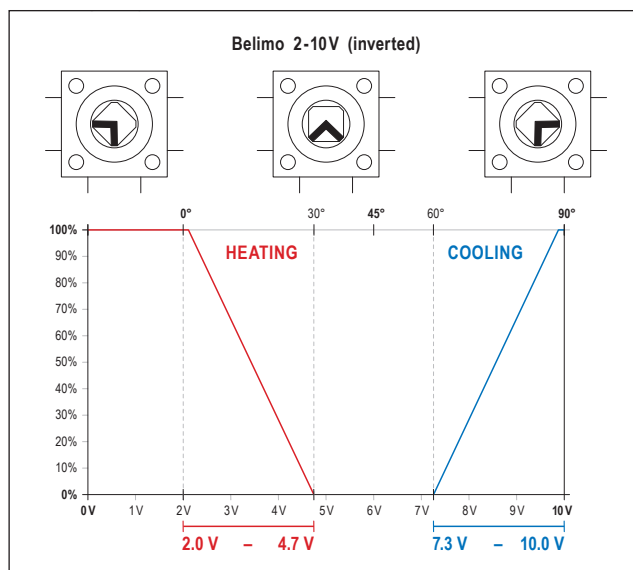


Fig. 920 6-way valve | Belimo inverted (address 8020 = 3)

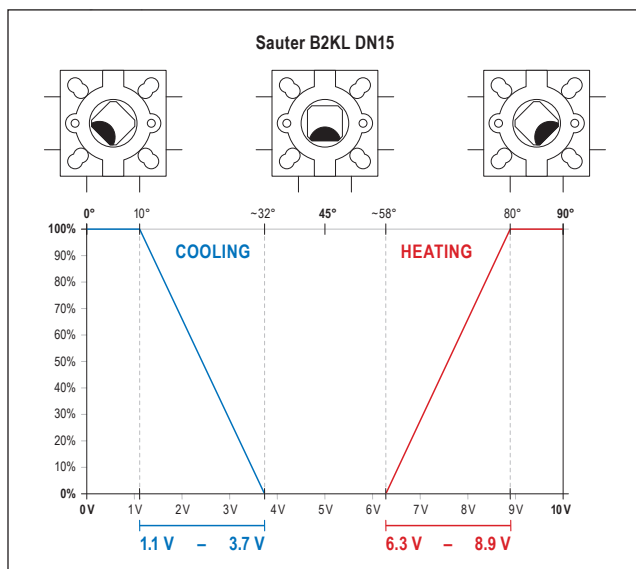


Fig. 921 6-way valve | Sauter DN15 (address 8020 = 4)

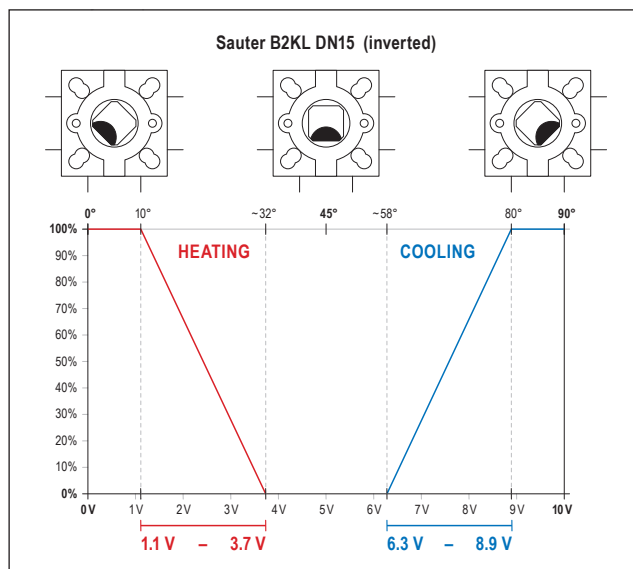


Fig. 922 6-way valve | Sauter DN15 inverted (address 8020 = 5)

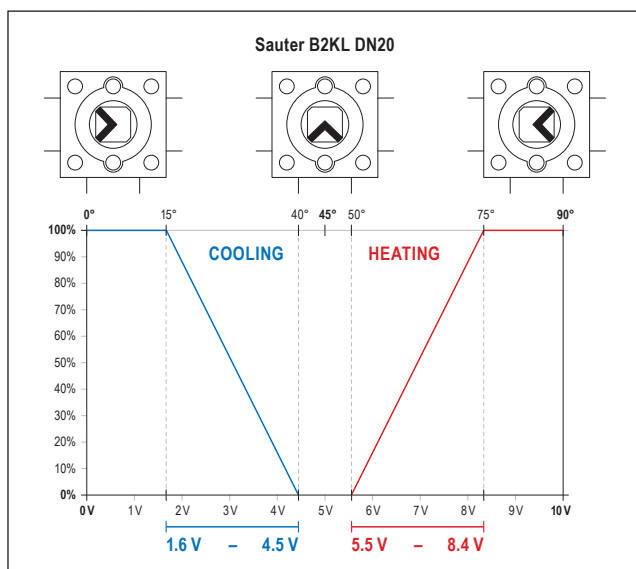


Fig. 923 6-way valve | Sauter DN20 (address 8020 = 5)

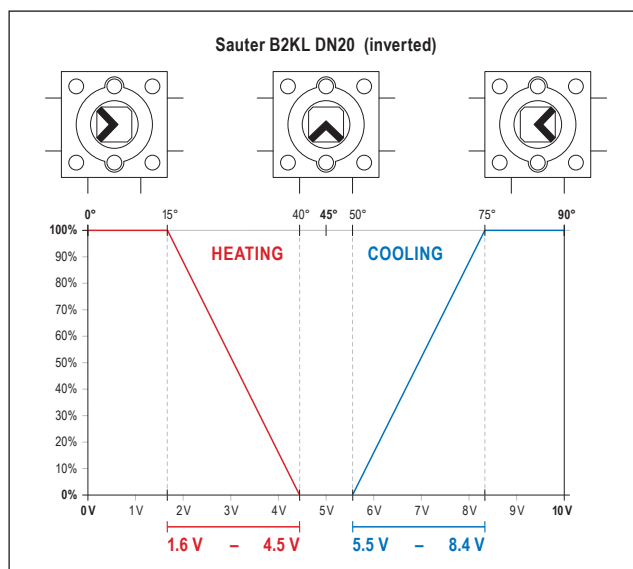


Fig. 924 6-way valve | Sauter DN20 inverted (address 8020 = 6)

Configuration register

Time Program 1...48 (ZP)
address 7040...7515

For example TP1 and TP2:

TP1_Activate_7040
TP1_EventDay_7041
TP1_EventHour_7042
TP1_EventMinute_7043
TP1_RegisterAddress_7044
TP1_Register_NewValue_7045

TP2_Activate_7050
TP2_EventDay_7051
TP2_EventHour_7052
TP2_EventMinute_7053
TP2_RegisterAddress_7054
TP2_Register_NewValue_7055

9.7 Time Program

There are 48 freely programmable time channels available.
Every time channel changes an entry in a Modbus register / BACnet object.

The register address, the new register value and the weekdays and time of the change are specified via bus or via the PC configuration software (Fig. 925).

Furthermore, every time channel can be enabled or disabled individually.
The last change has priority (manual, bus, Time Program).

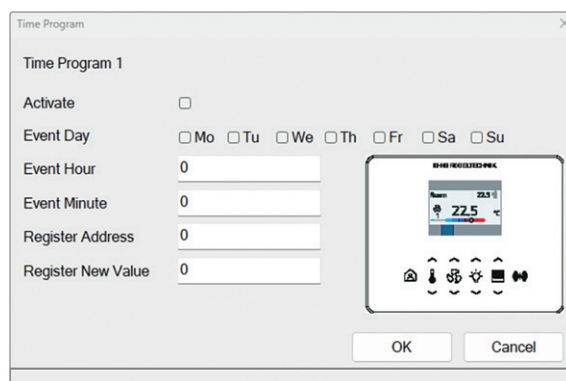


Fig. 925 Time Program | Configuration software (PC)

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