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USER GUIDE

CU

Produal

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PRODUAL

PART OF BEMSIQ GROUP

CU multifunctional control unit

USER GUIDE

This user guide is for control unit software version 1.7.0.1 or newer.

Made in Finland

5 years warranty

MANAGEMENT SYSTEM CERTIFICATION DNV ISO 9001 · ISO 14001 Finland

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1 Introduction

The CU control unit is designed for advanced room and zone control applications that demand more functionality than traditional controllers can provide. With this control unit you can control, for example, heating, cooling and ventilation using a wide range of actuators.

The control unit has two separate controllers and a cascade controller for controlling up to two zones with one control unit. With multiple inputs and outputs, you can use several different devices for measurement and control.

You can connect up to two room units to one control unit for controlling up to two rooms with the same unit. The control unit supports the following devices as room units:

- RU
- RT-CO2-MOD
- RTX-CO2-MOD and RTX-RH-MOD
- TRI
- ROU-S

The control unit supports the following communication protocols: Modbus RTU, Modbus TCP, BACnet MS/TP and BACnet IP.

1.1 About this user guide

This user guide contains important information about the installation, wiring, configuration and use of the product. Read this guide carefully before you install the product, connect the wires, or operate the product. Make sure that you fully understand all instructions before you start work. If you are not sure what the instructions mean, contact the seller or the manufacturer.

Follow all instructions in this user guide carefully. Always obey the applicable local rules and regulations.

The original instructions were written in English. If there are differences between the English instructions and the translations, refer to the English instructions.

If you find a mistake in the English instructions or in the translations, please send the details to the manufacturer.

1.2 Intended use

The CU control unit is intended to be used for controlling heating, cooling and ventilation in up to two rooms or zones. This control unit can be mounted in the empty space above a false ceiling, if the local installation regulations permit middle roof installation.

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2 Safety precautions

The product is developed, manufactured and tested according to high quality standards. However, instructions for safe use must be followed when installing, using or disposing the product or parts of product.

Read this user guide carefully before you commission, use or service this device. To avoid any kind of damage to people or property, follow the instructions carefully. Produal is not liable for any hazards, injury to people, or damage to property caused by incorrect installation or misuse of the device.

To avoid electrical shock or damage to equipment, disconnect power before you install or service the product. Use only proper wiring that is rated for the full operating voltage and maximum current in the system. The wiring must also withstand fault conditions.

To avoid fire and/or explosion, do not use the product in potentially flammable or explosive atmosphere.

Make sure that the product is not damaged before installation. Do not drop the product or use excessive force during installation. Do not use the product if you can see any damages.

After installation, the product will be part of a system whose specifications and performance characteristics are not designed or controlled by Produal. Refer to national and local authorities to ensure that the installation is functional and safe.

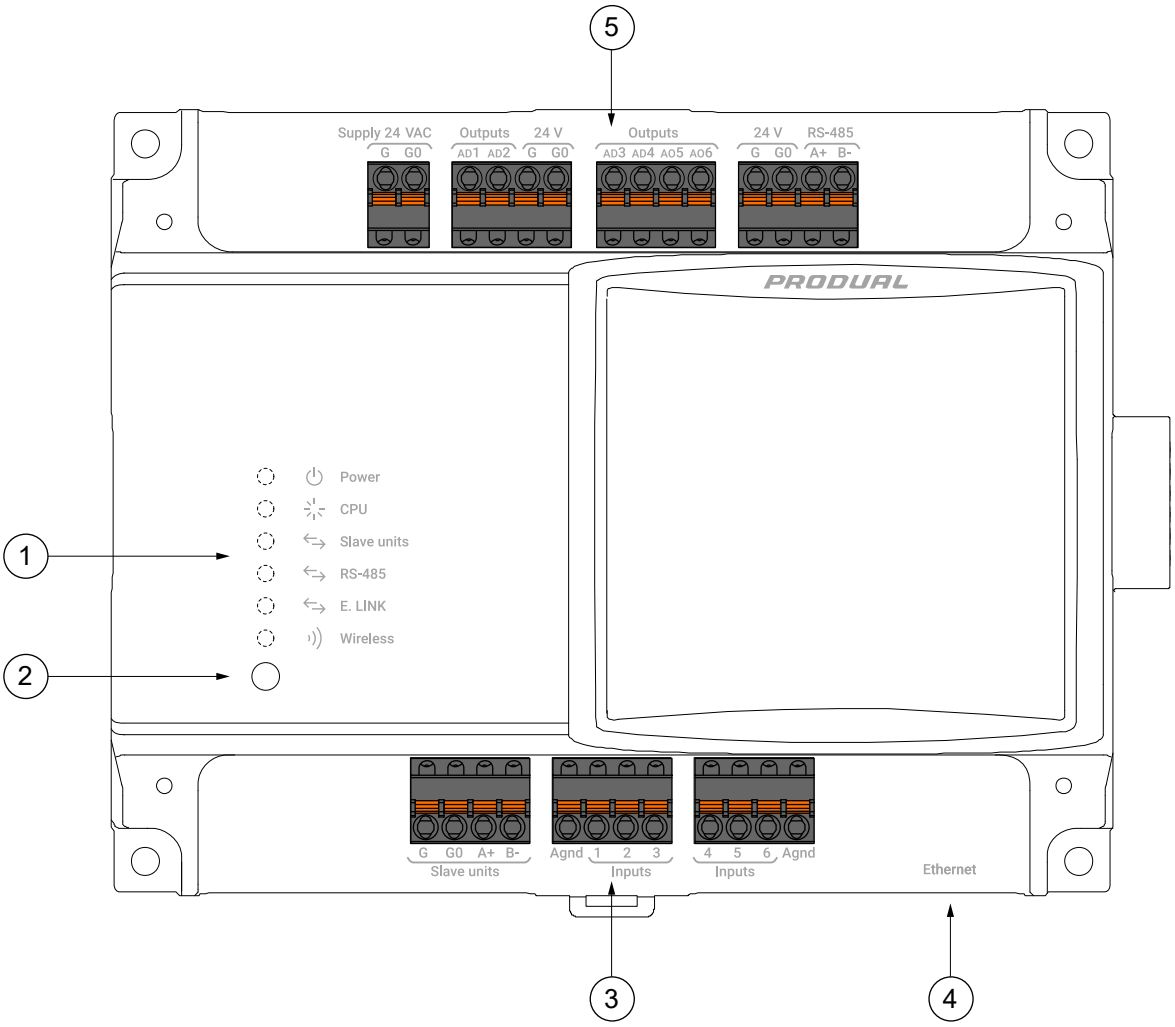
The product should only be used in professionally designed applications. Unauthorised modifications are not allowed. The product must not be used in relation with any equipment that in case of a failure may threaten, directly or indirectly, human health or life or result in danger to human beings, animals or property.

In this document, there are different warnings and notes. The warning and note types are defined in the following table.

Sign	Description
WARNING:	The warning symbol indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
CAUTION:	The caution symbol indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.
Important:	The important symbol indicates a potentially hazardous situation which, if not avoided, could result in damage to the device or property.
Note:	The note symbol indicates a useful tip or a recommended way to complete a task. These notes also provide information that is useful but not critical to the user.

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3 Main components



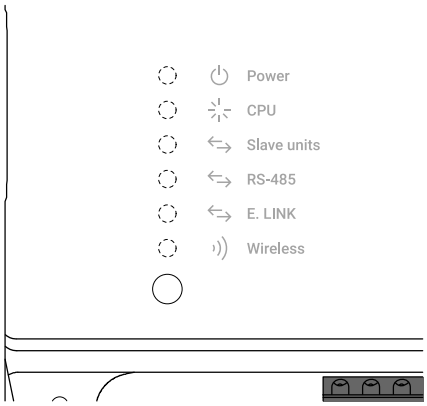
1	Indicator lights	2	Connection button
3	Bottom connectors	4	RJ-45 connector for Modbus TCP and BACnet IP
5	Top connectors		

4 Functional description

This chapter introduces the main functions of the device.

4.1 Indicator lights

Note: The cover texts are different on the devices that are manufactured before June 2020.



Power		The indicator light is ON when the supply voltage is connected.
CPU		The indicator light is ON while the device is connected to the MyProdual smartphone application.
		The indicator light flashes when Bluetooth is enabled but the device is not connected to the MyProdual application.
Slave units		The light indicates that the control unit communicates with the room units connected to the control unit.
RS-485		The light indicates communication in the RS-485 port.
E.LINK		The light indicates that expansion modules are connected to the control unit.
Wireless		The indicator light flashes while the connection button is pressed down.

4.2 Operation modes

The control unit has three operation modes. These operation modes are called day mode (mode 1), night mode (mode 2) and eco mode (mode 3). Each operation mode can have separate settings for setpoint, setpoint source and dead zone.

You can control the operation modes using:

- information the control unit receives through its inputs
- the room unit's functions (occupancy button, occupancy detection)
- bus communication

4.2.1 Changing temperature and fan speed setpoint sources when the operation mode changes

The controller has a function that changes the temperature and fan speed setpoint sources when a room unit shifts between operation modes. You can select the setpoint source for the function in the controller settings. The function also resets the fan speed to the default fan speed defined in the *Default fan speed after power failure* parameter.

In the MyProdual application, you can configure the following settings in *Configuration* > *Component setup* > *Controllers*.

MyProdual parameter	Holding register	Default	Range	Description
Reset setpoint and fan speed when entering operation mode 1	*2X30*	*Disabled*	*Disabled / Input 1...6 / Room-Unit 1 / Room-Unit 2 / Active operation mode*	Source for temperature and fan speed setpoints when entering day mode. The control unit resets the fan speed source to the source defined in the *Default fan speed after power failure* parameter.
Reset setpoint and fan speed when entering operation mode 2	*2X31*	*Disabled*	*Disabled / Input 1...6 / Room-Unit 1 / Room-Unit 2 / Active operation mode*	Source for setpoint when entering night mode. The control unit resets the fan speed source to the source defined in the *Default fan speed after power failure* parameter.
Reset setpoint and fan speed when entering operation mode 3	*2X32*	*Disabled*	*Disabled / Input 1...6 / Room-Unit 1 / Room-Unit 2 / Active operation mode*	Source for setpoint when entering eco mode. The control unit resets the fan speed source to the source defined in the *Default fan speed after power failure* parameter.
Default fan speed after power failure	*2X29*	*4-Step auto*	*Disabled / Fan speed 1 / Fan speed 2 / Fan speed 3 / 4-Step auto / EC auto / Room-Unit 1 / Room-Unit 2 / EC auto*	Fan speed source after power failure or operation mode shift.

4.3 Inputs

The control unit has six inputs and all the inputs are multifunctional. You can configure each multifunctional input for a different input signal and the controller will change its behaviour according to the selected configuration.

The following input types are available:

- Voltage input (0...10 Vdc)
- Temperature transmitter input (0...10 Vdc)
- Humidity transmitter input (0...10 Vdc)
- CO_2 transmitter input (0...10 Vdc)
- NTC 10K temperature sensor input
- Pt1000 temperature sensor input
- Resistance input for continuous resistance measurement or for a contact. For example, you can use this input for a condensation switch (e.g. KA 10).
- Potentiometer input
- Occupancy sensor input

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4.3.1 Selectable input reaction time

The input reaction time is set to *Normal* by default. If the input type is resistance input, you can use the default setting. If the input type is digital input, change this setting to *Fast*. Otherwise the input reacts too slowly, for example, to a button press or a signal from an occupancy sensor.

In the MyProdual application, you can select the input reaction time in *Configuration* > *Component setup* > *Inputs* > *1/2/...* > *Input responsiveness* > *Filtering Mode*.

MyProdual parameter	Holding register	Default	Range	Description
Filtering Mode	*X35*	*Normal*	*Normal / Fast*	Input responsiveness. The *Fast* mode reduces filtering, and the control unit reacts faster to changes in the input signal.

4.3.2 Software contacts

The software contact function for inputs can provide ON and OFF signals to the control unit's controllers or outputs. You can configure trigger levels for the input signal. The trigger can be a button press or an input value that reaches a certain level. For VAV applications, the trigger can be a button that forces the VAV damper open for a configured time. In addition, if the CO_2 level is too high, the software contact function can open the VAV damper to decrease the CO_2 level.

To enable the software contact function for an output, first configure the contact settings for an input. Then select the input as the source that overrides the output.

You can use the software contact function with the following inputs:

- 0...10 Vdc signal input
- 0...10 Vdc temperature transmitter input
- 0...10 Vdc humidity transmitter input
- 0...10 Vdc CO_2 transmitter input
- NTC 10K temperature sensor input
- Pt1000 temperature sensor input
- Resistance input
- PIR input

The control unit also has a timer function for software contacts. See chapters Contact timers on page 10 and Contact timers for external PIR sensors on page 10 for more information on contact timers.

MyProdual parameter	Holding register	Default	Range	Description
Contact-On Level	*X14*	*90.00 %*	*0.00...100.00 %*	Contact on level. Set the input value that is interpreted as the contact ON value.
Contact-Off Level	*X15*	*10.00 %*	*0.00...100 %*	Contact off level. Set the input value that is interpreted as the contact OFF on value.
Contact-On Level	*X16*	*100*	*0...30000 Ω*	Contact on level. Set the input value that is interpreted as the contact ON value.
Contact-Off Level	*X17*	*50*	*0...30000 Ω*	Contact off level. Set the input value that is interpreted as the contact OFF on value.
Forcing Input Source	*1X07*	*Off*	*Off / Input 1...6 / Room unit 1...2*	Select the input that overrides the output as the input source in the output settings.

4.3.3 Contact timers

The control unit has a timer function for software contacts. You can define delays for turning the contact on and off in the input settings.

In the MyProdual application, you can configure the contact timer settings in *Configuration* > *Component setup* > *Inputs* > *1/2/...* > *Contact settings*.

MyProdual parameter	Holding register	Default	Range	Description
Contact hold on time	*X18...X20*	*0 h 0 min 0 s*	*0 h 0 min 0 s...18 h 12 min 15 s*	The contact stays on for the duration defined in this parameter. The contact stays on even if the control unit receives a contact OFF signal during this time.
Contact hold off time	*X21...X23*	*0 h 0 min 0 s*	*0 h 0 min 0 s...18 h 12 min 15 s*	The contact stays off for the duration defined in this parameter. The contact stays off even if the control unit receives a contact ON signal during this time.
Contact turn on delay	*X36...X38*	*0 h 0 min 0 s*	*0 h 0 min 0 s...18 h 12 min 15 s*	This is the time the control unit waits before it turns on the contact after it receives a contact ON signal.
Contact turn off delay	*X39...X41*	*0 h 0 min 0 s*	*0 h 0 min 0 s...18 h 12 min 15 s*	This is the time the control unit waits before it turns off the contact after it receives a contact OFF signal.

4.3.4 Contact timers for external PIR sensors

You can set contact timers to prevent unnecessary shifts between operation modes. For example, if the room is unoccupied and the eco mode is active, you can set a timer to prevent day mode activation when someone enters the room temporarily. Similarly, you can prevent eco mode activation when everyone has left for lunch, for example. The day mode stays active during this short unoccupied time.

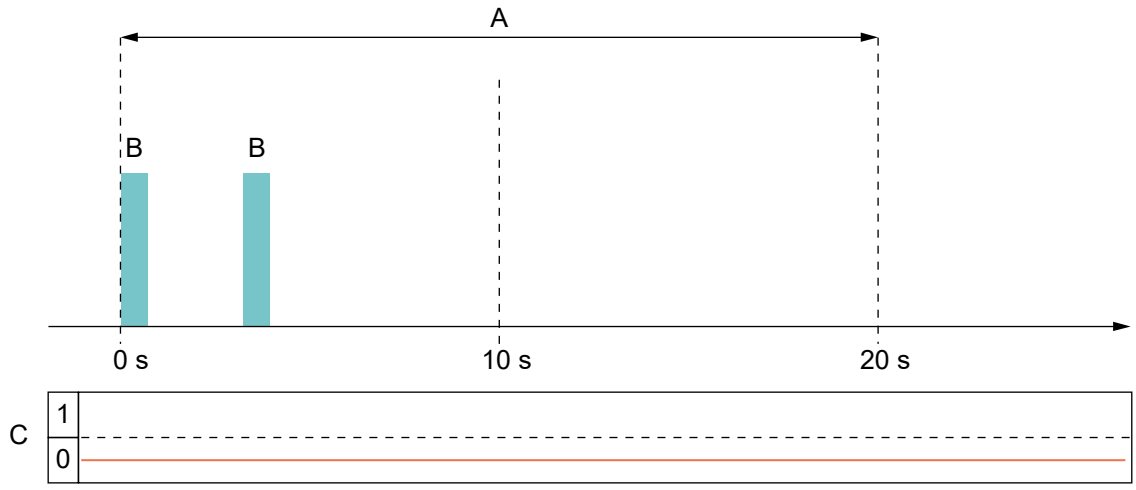
You can connect an external PIR sensor to a control unit input for occupancy detection if you select *PIR* as the input type. The external PIR sensor must provide contact input signal to the control unit. The control unit supports both normally open (NO) and normally closed (NC) sensor types. You can adjust the contact resistance threshold in the input settings according to sensor type.

If you connect an external PIR sensor to an input, set the input reaction time to *Fast* in the input settings. See section Selectable input reaction time on page 9 for more information.

The contact timer function for the external PIR sensor allows you to define delays for turning a contact on and off. The PIR contact timers operate on the basis of a detection window that tracks software contact events. The detection window duration is two times the delay defined in the or *Contact turn on delay* parameter. A new detection window starts when the PIR sensor detects movement after the previous detection window has ended.

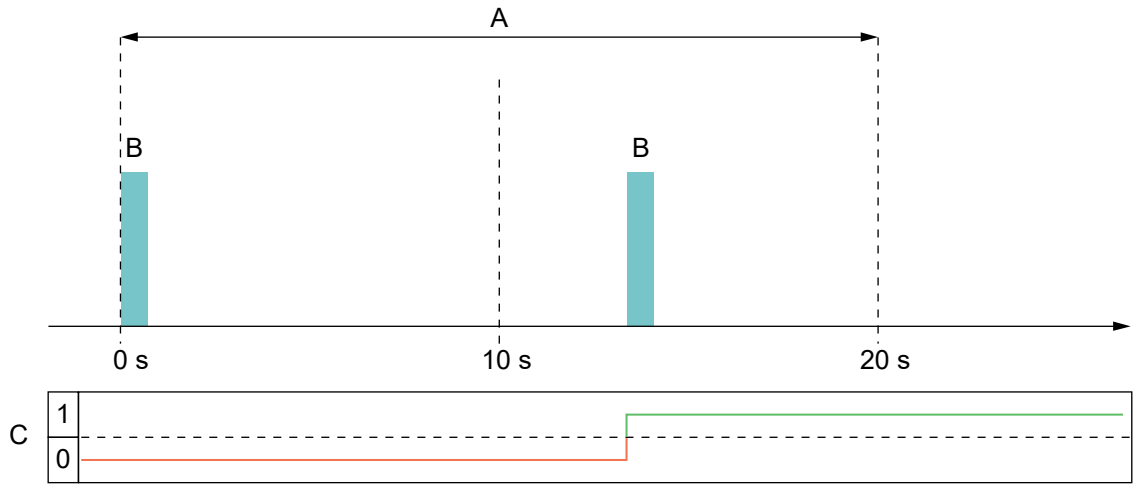
For example, in the following figures the delay defined in the *Contact turn on delay* parameter is 10 seconds, and the detection window is 20 seconds. If the PIR sensor detects movement twice within the first 10 seconds but then nothing for the next 10 seconds, the contact stays off.

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A. Detection window
B. PIR sensor event
C. Contact status (0 = OFF, 1= ON)

If the PIR sensor detects movement at the beginning of the detection window and again during the second half of the detection window, the second PIR sensor event turns on the contact.



A. Detection window
B. PIR sensor event
C. Contact status (0 = OFF, 1= ON)

You can also set a delay for turning the contact off, for example, to prevent operation mode shift from day mode to eco mode when everyone has left the room for a short period of time during office hours. For example, if you set the delay in the *Contact turn off delay* parameter to 30 minutes, the operation mode changes after 1 hour if the external PIR sensor does not detect movement again during that time.

In the MyProdual application, you can configure the contact timer settings in *Configuration* > *Component setup* > *Inputs* > *1/2/...* > *Contact settings*.

MyProdual parameter	Holding register	Default	Range	Description
Contact-On Level	*X16*	*1000 Ω*	0...300000 Ω	Contact resistance threshold for turning the contact on. Set this parameter above the *Contact off level* if the sensor type is normally closed.

MyProdual parameter	Holding register	Default	Range	Description
Contact-Off Level	*X17*	*500 Ω*	0...300000 Ω	Contact resistance threshold for turning the contact off. Set this parameter below the *Contact on level* if the sensor type is normally closed.
Contact hold on time	*X18...X20*	*0 h 0 min 0 s*	0 h 0 min 0 s...60 h 59 min 59 s	The contact stays on for the duration defined in this parameter. The contact stays on even if the control unit receives a contact OFF signal during this time.
Contact hold off time	*X21...X23*	*0 h 0 min 0 s*	0 h 0 min 0 s...60 h 59 min 59 s	The contact stays off for the duration defined in this parameter. The contact stays off even if the control unit receives a contact ON signal during this time.
Contact turn on delay	*X36...X38*	*0 h 0 min 0 s*	0 h 0 min 0 s...18 h 12 min 15 s	This is the duration the control unit waits after the external PIR sensor detects movement. After this delay, the control unit waits the same duration for the next PIR sensor event. If the PIR sensor detects movement again during this time, the control unit turns on the contact.
Contact turn off delay	*X39...X41*	*0 h 0 min 0 s*	0 h 0 min 0 s...18 h 12 min 15 s	This is the duration the control unit waits after the last PIR sensor event. After this delay, the control unit waits the same duration for the next PIR sensor event. If the PIR sensor does not detect movement again during this time, the control unit turns off the contact.
Filtering Mode	*X35*	*Normal*	*Normal / Fast*	Input response time. Select *Fast* mode for the PIR input.
Control Source	*1X01*	*Controller 1*	*BMS / Controller 1...2 / Cascade-Controller / Room-Unit 1 / Input 1...6 / Room-Unit 1 / Room-Unit 2*	Select the input as the *Control Source* in the output settings to connect the input to an output.

4.4 Outputs

The control unit has six outputs and all the outputs are multifunctional. You can configure each multifunctional output for different output signals and functions.

The following output types are available:

- Voltage output (0...10 Vdc).
- 6-way valve output (0...10 Vdc).
- Fan output (0...10 Vdc).
- PWM output (24 Vac). Only in outputs 1...4.
- 3-point actuator output (24 Vac). Only in outputs 1...4.
- Current output (0...20 mA). Only in outputs 5 and 6.

The controller also has two supply outputs (24 Vac, <8 A total) for external devices.

4.4.1 Thermostat function

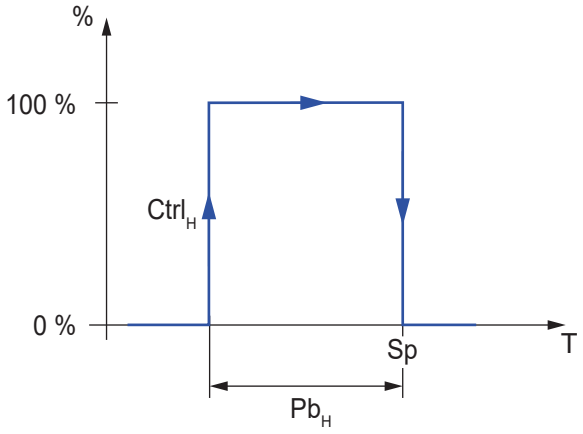
You can set the thermostat function separately for each output. This function works for heating and cooling control signals.

The control unit sends a 100 % output signal when the control signal is 100 %. When the control signal is 0 %, the control unit sends a 0 % output signal. For example, if you use a 24 V PWM output to control a thermal actuator, the control unit sends a 24 V signal when the control signal is 100 %, and a 0 V signal when the control signal is 0 %.

The proportional band set in the controller settings defines the hysteresis for the thermostat function.

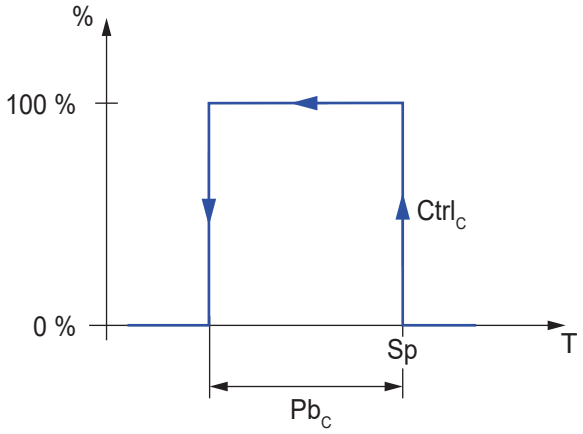
The thermostat function operates in heating and cooling mode as follows:

- When the thermostat function operates in the heating mode, the heating valve opens fully when the temperature falls below the lower limit of the proportional band. The heating valve closes when the temperature reaches the setpoint.



Ctrl$_H$	Control signal for heating
Sp	Setpoint
Pb$_H$	Proportional band for heating

- When the thermostat function operates in the cooling mode, the cooling valve opens fully when the temperature rises over the higher limit of the proportional band. The cooling valve closes when the temperature reaches the setpoint.



Ctrl$_C$	Control signal for cooling
Sp	Setpoint
Pb$_C$	Proportional band for cooling

Note the following parameters:

MyProdual parameter	Holding register	Default	Range	Description
Output control type	*1X02*	*Heating*	*Heating / Heating thermostat / Cooling / Cooling thermostat / Heating and Cooling / Changeover / RH / CO2 / Maximum control*	Output control method. Set the parameter value to *Heating thermostat* or *Cooling thermostat*. Output settings.
P-band, Heating	*2X20*	*1.5 °C*	*0.0...16.0 °C*	Control range for heating. Set the proportional band for heating in this parameter. This value defines the lower and the higher limit of the proportional band. It also defines the hysteresis for the thermostat function. Controller settings.
P-band, Cooling	*2x21*	*1.5 °C*	*0.0...16.0 °C*	Control range for cooling. Set the proportional band for cooling in this parameter. This value defines the lower and the higher limit of the proportional band. It also defines the hysteresis for the thermostat function. Controller settings.

4.5 Control functions

The control unit controls the temperature in a room using a fan coil unit, heating radiators and/or chilled beams. The control unit compares the temperature setpoint with the measured temperature and controls room heating and/or cooling via its outputs.

The control unit has two separate controllers that can have different control settings. With these two controllers, the control unit can control two rooms or zones simultaneously.

You can configure the setpoint, integration time and proportional band for the controllers. Proportional band is the range of values within which the control output signal goes between 0 % and 100 % in proportion to the measured input value.

You can set the controller's temperature setpoint by:

- a device connected to an input on the control unit
- a room unit connected to the control unit as a slave unit
- the BMS via bus communication
- a fixed setpoint (active operation mode controls the setpoint).

4.5.1 Temperature control

Temperature control can have one or two stages (heating or cooling / heating and cooling). The control unit can also automatically change over from heating to cooling by using a digital input, temperature measurement or network value.

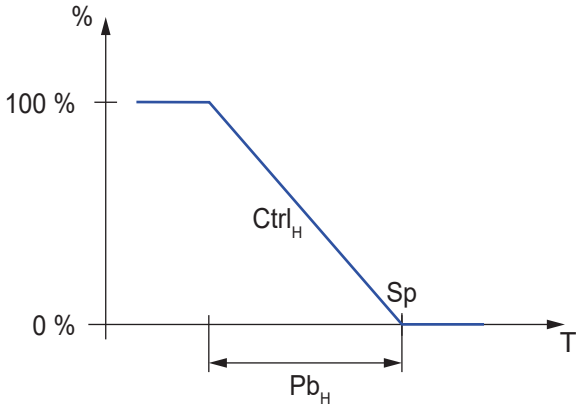
There are various control configurations available:

- One stage heating control
- One stage cooling control
- One stage heating and one stage cooling control
- One stage changeover heating and cooling control

The controller modulates the heating and cooling signals according to the setpoint (*Sp*) and the measured temperature. The control can be P or PI control.

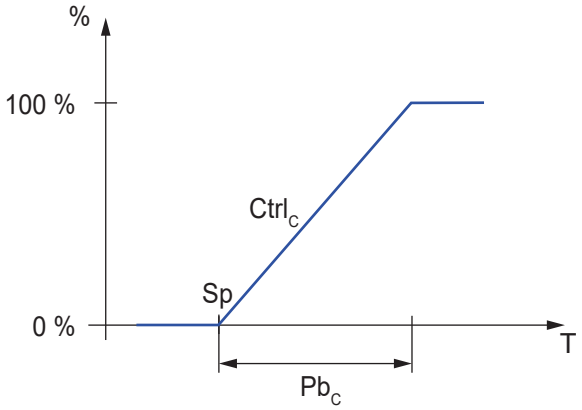
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Heating control



%	Control signal level
Ctrl$_H$	Control signal for heating
Sp	Setpoint
Pb$_H$	Proportional band for heating control
T	Temperature

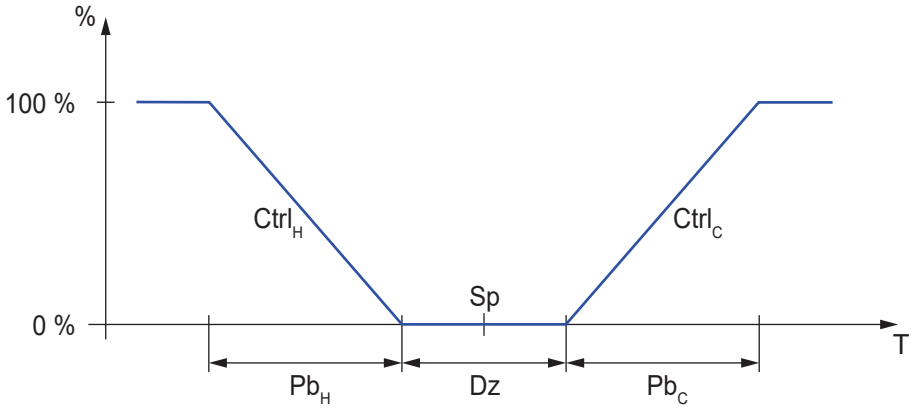
Cooling control



%	Control signal level
Ctrl$_C$	Control signal for cooling
Sp	Setpoint
Pb$_C$	Proportional band for cooling control
T	Temperature

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Heating and cooling control



%	Control signal level
Ctrl$_H$	Control signal for heating
Ctrl$_C$	Control signal for cooling
Sp	Setpoint
Pb$_H$	Proportional band for heating control
Pb$_C$	Proportional band for cooling control
Dz	Dead zone
T	Temperature

There is a dead zone between the heating and cooling stages. In the dead zone, the cooling and heating control signals are at 0 %. If you use PI control, temperature must remain in the dead zone for a prolonged period before the heating and cooling signals are controlled to 0 %. The controller has a function that prevents cooling and heating control from operating simultaneously.

You can set control output direction to direct or reversed. The reversed control output changes the actuator running direction to opposite direction (e.g. valve drives from 100 % to 0 %). You can configure the output direction individually for each control output.

4.5.2 Cascade control

In addition to the two controllers described above, the control unit also has a cascade controller that broadens the possibilities to control the room temperature. Cascade control provides an additional control process to control devices that require different reaction times and control properties than the normal room control. With the cascade controller, the control unit can control the room temperature using, for example, shunt valves, floor heating, exhaust air, or intake air.

You can use cascade control, for example, to control the water temperature of a floor heating supply line. Cascade control requires an additional temperature sensor because normal room sensors are not fast or accurate enough for this purpose. In addition, the placement of normal room sensors is not optimal for cascade control, as they are usually installed in the middle of the room or integrated into a room unit. When you use an additional temperature sensor, you can mount it, for example, on the floor heating supply pipe, inside the floor, or in the ventilation exhaust duct.

You can adjust the cascade controller settings to the requirements of different applications. The preset settings are suitable for floor heating. However, you may need to adjust the controller settings to get stable control results. It is common practice to set the floor temperature, intake air temperature or other secondary temperature setpoint to a value between the minimum and maximum temperatures defined for the cascade controller.

You can activate the cascade controller on one of the control unit outputs. Connect the additional temperature sensor to an input and configure the input settings. Then configure the cascade controller settings and output settings.

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In the MyProdual application, you can configure the cascade controller settings in *Configuration* > *Component setup* > *Controllers* > *Cascade*.

MyProdual parameter	Holding register	Default	Range	Description
Temperature Input (additional for average)	*2302*	*Off*	*Off / Input 1...6 / Room-Unit 1 / Room-Unit 2*	Secondary temperature input for average calculation. Select the input the external temperature sensor is connected to.
Setpoint Source	*2304*	*Controller 1*	*Controller 1 / Controller 2*	Select the source for the setpoint.
Setpoint Source Mode	*2305*	*Heating*	*Heating / Cooling / Heating and Cooling*	Select the setpoint source mode.
Setpoint Min	*2306*	*22.0 °C*	*2.0...32.0 °C*	Define the minimum temperature for the setpoint range.
Setpoint Max	*2307*	*22.0 °C*	*2.0...32.0 °C*	Define the maximum temperature for the setpoint range.
Control Source	*1X01*	*Controller 1*	*BMS / Controller 1 /Cascade-Controller / Input 1...6 / Room-Unit 1 / Room-Unit 2*	Select *Cascade-Controller* as the control source in output settings.

4.5.3 Separate integral times for heating and cooling control

As a default, both heating and cooling controllers use the same integral time. You can also set separate integral times for heating and cooling control.

In the MyProdual application, you can configure these settings in *Configuration* > *Component setup* > *Controllers* > *Controller 1 / Controller 2 / Cascade* > *PI controller*.

MyProdual parameter	Holding register	Default	Range	Description
I-time (integral time)	*2122 / 2222 / 2311*	*720 s*	*0...1200 s*	Controller integral time. If the *Separate I-time for cooling* parameter value is *Off*, the integral time is common for both heating and cooling. If the parameter value is not *Off*, this value is the integral time for heating.
Separate I-time for cooling	*2132 / 2232 / 2312*	*Off*	*Off, 0...1200 s*	Enable this parameter to use a separate integral time for cooling.

4.5.4 Changeover function

In the changeover mode, the controller can switch an output between the heating mode and the cooling mode according to the status of an input. You can use the changeover function for 2-pipe control systems, where the water temperature changes according to seasons. For example, in winter, the water is used for heating (water is hot), and in summer, the water is used for cooling (water is cold).

You can select the input that controls the changeover function in the controller settings. The input can control the changeover function according to temperature, contact switch or resistance input (digital on/off). The BMS system can also control the input directly and override the input value that switches the changeover state between cooling or heating.

Note the following parameters:

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MyProdual parameter	Holding register	Default	Range	Description
Output control type	*1X02*	*Heating*	*Heating / Heating thermostat / Cooling /Cooling thermostat / Heating and Cooling / Changeover / RH / CO2 / Maximum control*	Output control method. Set the parameter value to *Changeover*. Output settings.
Changeover Input Source	*2X13*	*Off*	*Off / Input 1...6*	Input source for the changeover function. If the parameter value is *Off*, the function state can be controlled from BMS. Controller settings.
-	*2x34*	*0 / 1*	0. *Heating* 1. *Cooling*	State of the changeover function. The BMS can control the function if the value in the *Changeover Input Source* parameter is *Off*.

4.5.5 Fan control

Select *Fan* in the *Output Type* parameter in the output settings to access the fan settings in the MyProdual application.

4.5.5.1 Fan starting boost

Some EC fan motors have difficulties to start with low voltages. The fan boost function increases the control voltage to a higher value when the fan starts. You can enable the fan boost function in the output settings.

When this function is active, the fan output is set to a fixed value (parameter *Fan boost voltage*) for the defined time (parameter *Fan boost time*), while the fan speed is controlled from stop position to speed 1. The fan output returns to speed 1 voltage after the timer runs out.

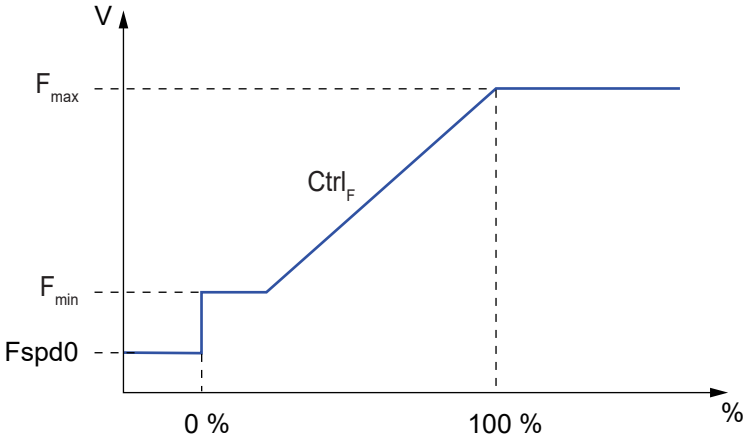
MyProdual parameter	Holding register	Default	Range	Description
Fan boost time	*1X48*	*Off*	*Off, 1...10 s*	Fan starting boost timer. Select the boost duration in this parameter to enable the timer.
Fan boost voltage	*1X49*	*0.000 V*	*0...10.000 V*	Fan starting boost voltage. This setting is available when the *Fan boost time* parameter value is not *Off*.

4.5.5.2 Minimum fan control voltage

Some EC fan motors have difficulties to run with low voltages. You can define the minimum control voltage for the fan. When the control unit starts the fan, it sets the output signal immediately at the voltage configured for the *Fan on voltage minimum* parameter in the output settings.

The figure below shows the operating principle of the minimum fan control voltage function. In the beginning, the fan speed is 0 and the fan power is at 0 %. Then the control unit sets the output signal at the minimum control voltage, and the fan starts at speed 1. The control unit keeps the output signal at the minimum fan control voltage until it is time to increase the fan speed.

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V	Fan control output voltage
Ctrl$_F$	Control signal for fan
F$_{min}$	Minimum fan control voltage
F$_{max}$	Maximum fan control voltage
Fspd0	Fan speed 0
%	Fan control power

MyProdual parameter	Holding register	Default	Range	Description
Fan on voltage minimum	*1x52*	*0*	*0...10.000 V*	Minimum fan control voltage. This setting is available in the MyProdual application, if you selected *EC auto*, *Room-Unit 1 EC* or *Room-Unit 2 EC* in the *Fan speed mode* parameter in the output settings.

4.5.5.3 Fan speed limit in automatic mode

You can set the maximum speed for the fan when the fan control is in automatic mode. You can enable this limitation by selecting the maximum speed in the *Max fan step in auto mode* parameter in the output settings. Even if the limit is set, the user can increase the fan speed manually.

MyProdual parameter	Holding register	Default	Range	Description
Max fan step in auto mode	*1X50*	*No limit*	*No limit / Fan speed 1...3*	Fan speed limit in automatic mode.

4.5.5.4 Fan speed changing delay

With the fan speed changing delay (parameter *Fan speed step delay*), you can prevent the fan going directly from off position to full speed, for example. The delay is used in all step changes. You can set this parameter in the output settings.

MyProdual parameter	Holding register	Default	Range	Description
Fan speed step delay	*1X37*	*0 s*	*0...3600 s*	Fan speed changing delay.

4.5.5.5 Fan speed after power failure or operation mode shift

You can select the fan speed that becomes effective after a power failure or an operation mode shift in the *Default fan speed after power failure* parameter in the controller settings.

MyProdual parameter	Holding register	Default	Range	Description
Default fan speed after power failure	*2X29*	*4-Step auto*	*Disabled / Fan speed 1...3 / 4-Step auto / EC auto / Room-Unit 1 / Room-Unit 2 / Room-Unit 1 EC auto / Room-Unit 2 EC auto*	Fan speed after a power failure or operation mode shift.

4.5.5.6 Fan turn off delay

You can configure the fan to operate for a certain time after the fan speed is controlled to stop. This gives the actuator time to stop heating or cooling, and it also gives the fan time to ventilate the remaining hot or cold air. The fan turn off delay prevents problems caused by condensation. If the fan stops immediately, moisture can condensate to the fan element.

The control unit sets the fan output to fan speed 1 for the time defined in the *Fan turn off delay* parameter. You can define the fan speed voltage for step 1 and the fan turn off delay in the output settings.

Note the following parameters:

MyProdual parameter	Holding register	Default	Range	Description
Fan turn off delay	*1X51*	*Off*	*Off, 0...300 s*	Delay for turning the fan off.
Fan speed 1, Volt output	*1X30*	*0*	*0...10.000 V*	Voltage for fan speed 1.

4.6 Room units

You can connect up to two room units to the control unit. If you use two room units, you can control two rooms with one control unit. The control unit has dedicated slave unit connectors for connecting the room units. Configure room unit 1 to use Modbus address 1 and room unit 2 to use Modbus address 2 in the device menu of the room unit before you connect them to the slave unit connectors.

The control unit's slave unit connectors support the following Produal devices:

- RU room units
- ROU-S room units
- TRI touchscreen room interfaces
- RT-CO2-MOD room CO_2 transmitters
- RTX-CO2-MOD room CO_2 transmitters
- RTX-RH-MOD room humidity transmitters

The control unit communicates with the room units using the internal Modbus bus between the control unit and the room unit. Therefore, the room units connected to the slave unit connectors must use the Modbus RTU protocol to communicate with the control unit. Many BACnet devices also have a Modbus mode. If you plan to connect BACnet devices to the slave unit connectors, always make sure that they support Modbus communication.

The communication sequence varies depending on the room unit. The control unit initialises the room unit by reading the device type and firmware version from the room unit. If the room unit is ROU-S or TRI, the control unit proceeds to read the input registers. After reading the necessary registers, the control unit starts to poll the input values at regular intervals. If the control unit loses the connection with the room unit, it resets all information it has read from the room unit and starts to initialise the room unit

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again. The control unit loses the connection if it cannot read the room unit input values for 30 seconds or if the identity of the room unit changes.

If an RT-CO2 or RTX transmitter is connected to the control unit, the control unit reads all input registers. Then the control unit writes the control values to the Modbus holding registers of the transmitter. The control unit reads and writes the registers every second.

RT-CO2 and RTX series transmitters as room units

The control unit supports the following measurements for the RT-CO2 and RTX series transmitters: temperature, humidity and carbon dioxide. It also supports occupancy detection (PIR).

RT-CO2 and RTX transmitter settings cannot be configured through the control unit. Configure their settings first using the MyProdual smartphone application. Configure the bus as the control source for the transmitter features which the control unit controls. Then select some other control source than bus for the remaining transmitter features.

Other compatible transmitters and sensors

The dedicated slave unit connectors only support the devices listed above. However, you can connect output signals from other sensors and transmitters to the control unit inputs.

You can connect the following Produal devices to the control unit inputs:

- HDH room CO_2 transmitters
- TEHR NTC 10-P room temperature sensor
- TEHR PT 1000-P room temperature sensor
- TEHR LL-P room temperature transmitter
- TEHR LU-P room temperature transmitter
- TEHR LU-PU room temperature transmitter

If the room temperature sensor or transmitter has a passive potentiometer, configure the minimum resistance and the maximum resistance of the control unit input to match the resistance range of the passive potentiometer.

4.6.1 External measurement value on room unit display

An external measurement value can be shown on room unit's display. This function is available for RU room units.

The available value types (measurement units) are the plain value without unit, temperature (°C) and CO_2 (ppm).

Note the following parameters:

MyProdual parameter	Holding register	Default	Range	Description
External Display Value Type	*739 / 839*	*Disabled*	*Disabled / None / Temperature / CO2*	External measurement shown on the room unit's display. *Disabled* – Functionality disabled. *None* – No unit. *Temperature* – Temperature value. *CO2* – CO_2 value.

MyProdual parameter	Holding register	Default	Range	Description
External Display Value Source	*737 / 837*	*Internal sensor*	*Internal sensor / Input 1...6 / Value from Modbus register*	Source of the external measurement shown on the room unit's display. *Internal sensor* — Functionality is disabled. Room unit's internal measurement is shown on the display. *Input 1...6* — The control unit reads the value from the selected input. *Value from Modbus register* — The control unit reads the value from the Modbus register *738 / 838*.
-	*738 / 838*	*0*	*-32768...32767*	External display value. **Note:** The control unit sets this value to 0 after a power failure.

4.6.2 Software contacts

The software contact function for room units provides ON and OFF signals to the control unit's controllers or outputs. You can configure trigger levels for the ON and OFF signals. You can use temperature, relative humidity or carbon dioxide level as a trigger.

To enable the software contact function for an output, first configure the contact settings for the room unit. Then select the room unit as the source that overrides the output.

MyProdual parameter	Holding register	Default	Range	Description
Contact Mode	*X04*	*Not Used*	*Not Used / Temperature / RH / CO2*	Select the contact mode for the room unit to use the input signal from the room unit as a contact input.
Contact-On Level	*X11*	*0.00 %*	*0.00...100.00 %*	Contact on level. Set the value that is interpreted as contact ON value.
Contact-Off Level	*X12*	*0.00 %*	*0.00...100 %*	Contact off level. Set the value that is interpreted as contact OFF on value.
Contact hold-on time	*X13...X15*	*0 h 0 min 0 s*	*0 h 0 min 0 s...18 h 12 min 15 s*	The contact stays on for the duration defined in this parameter. The contact stays on even if the control reads a contact OFF value from the room unit during this time.
Contact hold-off time	*X17*	*50*	*0 h 0 min 0 s...18 h 12 min 15 s*	The contact stays off for the duration defined in this parameter. The contact stays off even if the control unit reads a contact ON value from the room unit during this time.
Forcing Input Source	*1X07*	*Off*	*Off / Input 1...6 / Room-Unit 1 / Room-Unit 2*	Select the room unit that overrides the output as the input source. Output settings.
Forcing Input Type	*1X08*	*PIR-Detection*	*PIR-Detection / "Man in House" -Button /Occupancy (PIR or MIH) / Contact*	Select *Contact* as the input type to override the output. Output settings.

4.6.3 Occupancy sensor timers for room units

The control unit has a contact timer function for room units that have a PIR sensor for detecting room occupancy The contact timer function allows you to define delays for turning a contact on and off. The contact timers operate on the basis of a detection window that tracks PIR sensor events. The room unit contact timers operate in the same way as the external PIR sensors. See Contact timers for external PIR sensors on page 10 for more information about their operating principle.

You can set contact timers to prevent unnecessary shifts between operation modes. For example, if the room is unoccupied and the eco mode is active, you can set a timer to prevent day mode activation when someone enters the room temporarily. Similarly, you can prevent eco mode activation when everyone has left for lunch, for example. The day mode stays active during this short unoccupied time.

You can define delays for turning the contact on and off in the room unit settings of the control unit. In the MyProdual application, you can find the PIR settings in *Component setup* > *Room units* > *1/2* > *PIR settings*.

MyProdual parameter	Holding register	Default	Range	Description
PIR contact-on delay	*X19...X20*	*0 min 0 s*	*min 0 s...59 min 59 s*	This is the time the controller waits before it turns on the contact after it reads a PIR sensor event from the room unit. The room unit saves a PIR sensor event to the holding register when the PIR sensor detects movement. If the PIR sensor detects movement after this delay, the controller turns the contact on.
PIR hold-on delay	*X21...X23*	*0 h 0 min 0 s*	*0 h 0 min 0 s...18 h 12 min 15 s*	This setting defines how long the contact stays on if the PIR sensor does not detect movement again.
PIR turn-off delay	*X40...X42*	*0 h 0 min 0 s*	*0 h 0 min 0 s...18 h 12 min 15 s*	This is the time the controller waits before it turns off the contact after movement stops.
PIR hold-off delay	*X43...X45*	*0 h 0 min 0 s*	*0 h 0 min 0 s...18 h 12 min 15 s*	This delay defines how long the contact stays off after the control unit turns it off. The contact stays off even if the PIR sensor detects movement during this time.

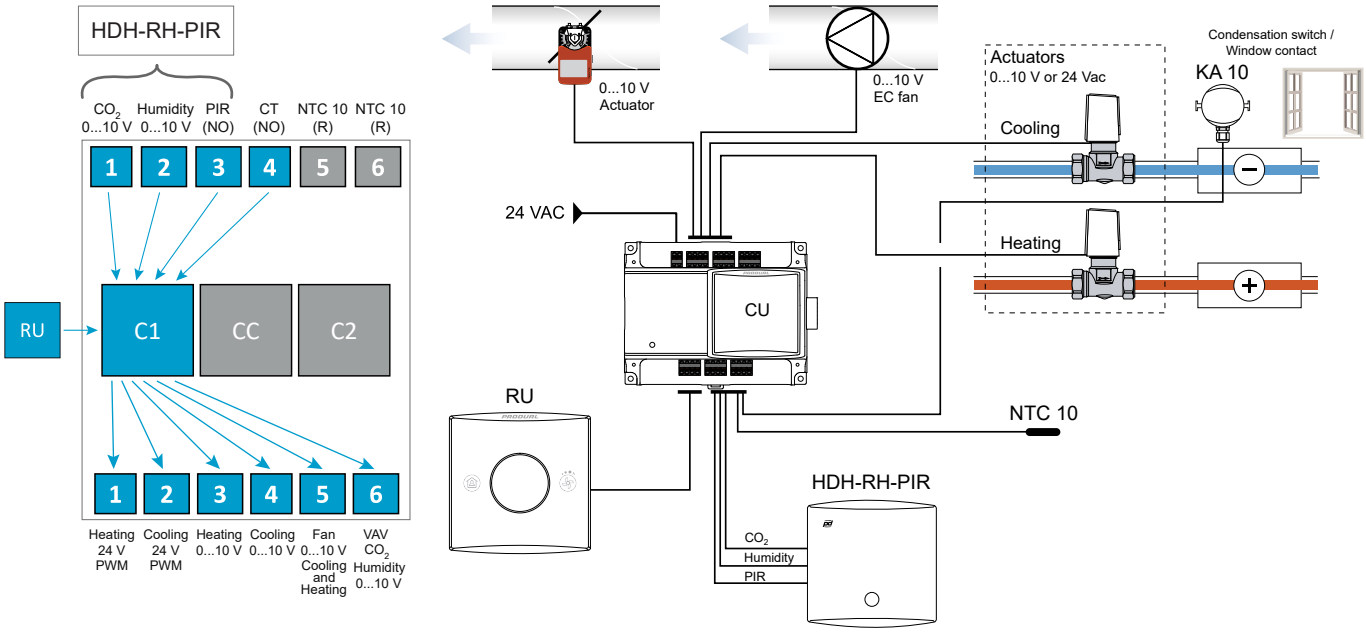
4.7 Application examples for available configuration files

Produal has created configuration files for some application examples of the control unit. You can use these configuration files as a starting point for a similar real-life application.

You can download configuration files for the following application examples from this product's page at www.produal.com.

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4.7.1 Application example AN001: Default application



You can implement this application using the controller's factory settings. The following tables describe some of the basic settings for the application.

Output settings		
1	Heating	PWM, 24 Vac
2	Cooling	PWM, 24 Vac
3	Heating	0...10 V
4	Cooling	0...10 V
5	Fan	3-speed control with 2.5 / 5.0 / 7.5 V steps, both heating and cooling
6	VAV	Combined output for cooling, CO_2 and humidity

Controller settings	
Setpoint	18...24 °C (center 21 °C, ±3 °C)
Dead zone	±0.5 °C
Proportional band	1.5 °C for heating, 1.5 °C for cooling

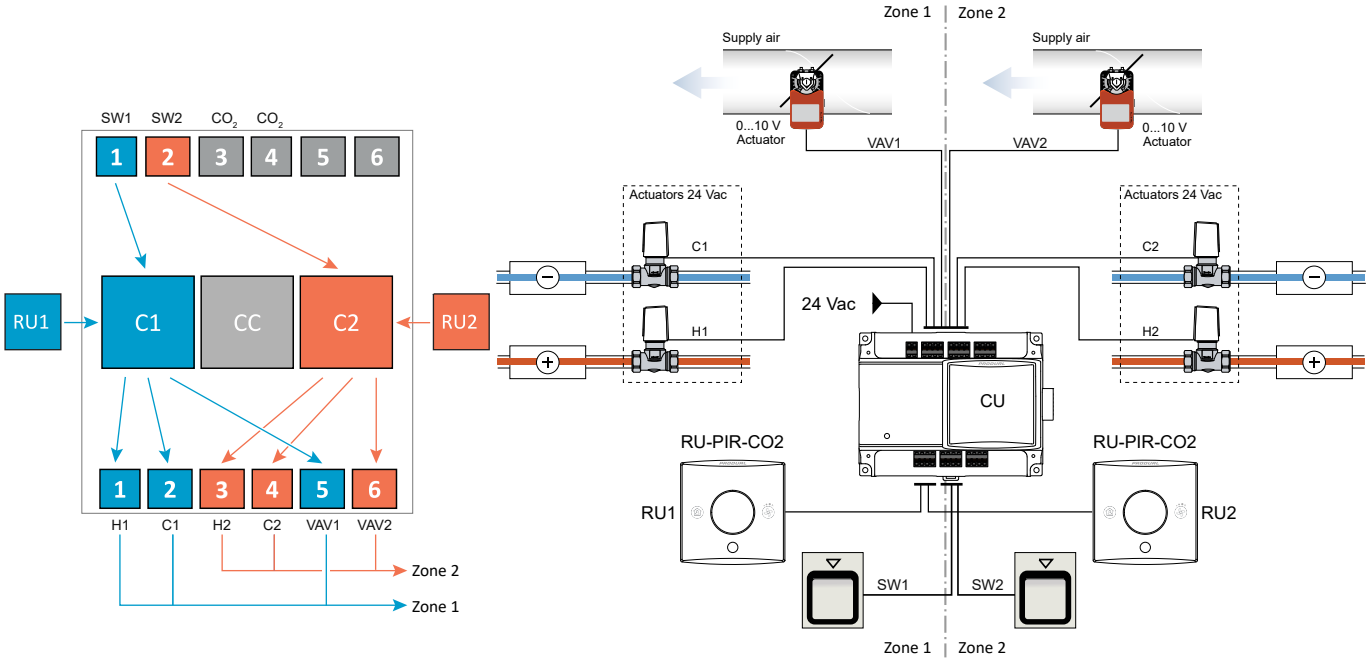
Fan settings	
Heating and cooling	3-speed control, 0 / 2.5 / 5.0 / 7.5 V

VAV settings	
Cooling	VAV cooling enabled
CO_2	0...10 V / 750...1250 ppm
Humidity	0...10 V / 50...100 %

Input settings		
1	CO_2	0...10 V (0...2000 ppm), from external device

Input settings		
2	Humidity	0...10 V (0...100 %), from external device
3	PIR	Night mode is active when the contact is closed, day mode is active when the contact is open
4	CT	Window/condensation contact, blocks cooling when the contact is closed
5	NTC 10	External sensor for temperature measuring, no control, just information for BMS
6	NTC 10	

4.7.2 Application example AN002: Controlling two rooms with control unit and two room units



In this application, the control unit controls heating, cooling and ventilation of two rooms. Room units measure the room conditions (temperature, occupancy and CO_2 level). You can set the room temperature setpoint with the room unit or via bus. Cooling beams and heating radiators regulate the room temperature. The demand-based ventilation uses VAV with fresh air boost according to the CO_2 level.

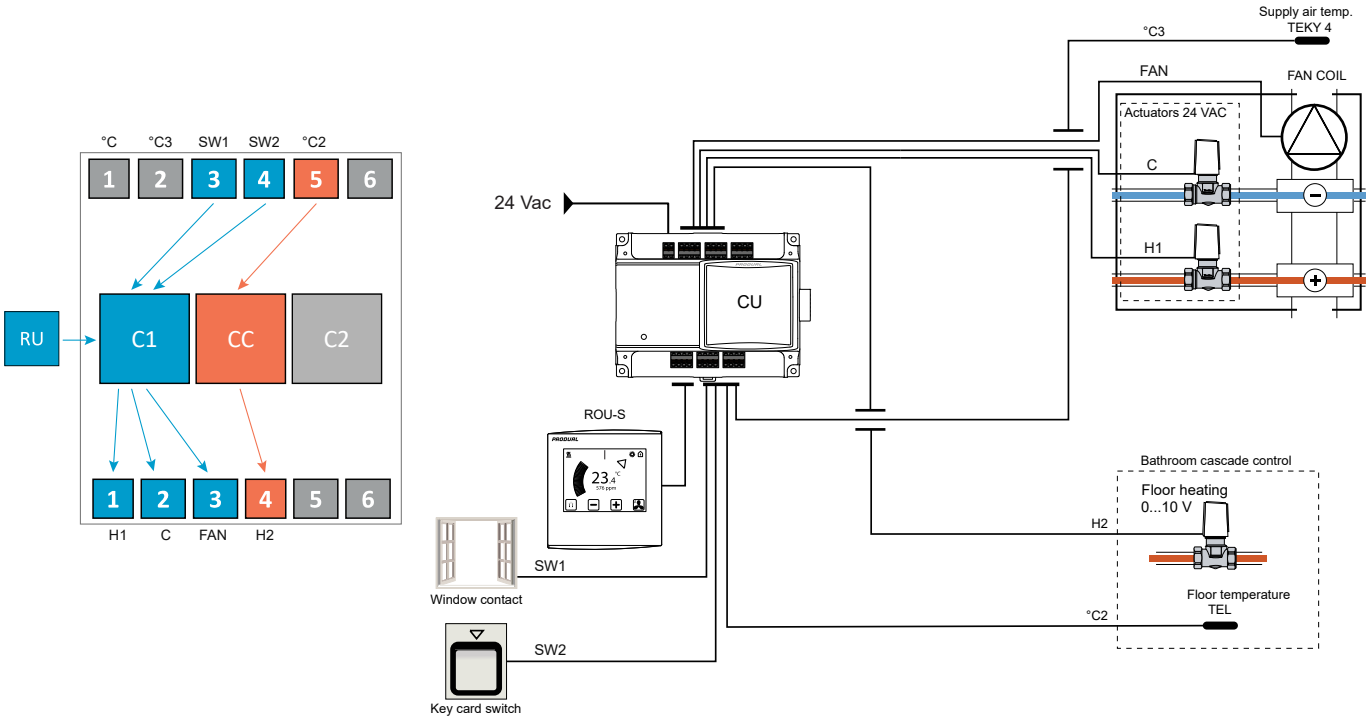
Input settings		
1	Resistance contact	Contact on level is 1000 Ω and contact off level is 300000 Ω.
2	Resistance contact	Contact on level is 1000 Ω and contact off level is 300000 Ω.
3	0...10 V	CO_2 measurement signal, range 0...2000 ppm
4	0...10 V	CO_2 measurement signal, range 0...2000 ppm

Room unit 1 and 2 settings	
Setpoint	21 °C, ±1.5 °C
CO_2 measurement	0...2000 ppm
Humidity measurement	0...100 %rH

Controller 1 and 2 settings	
Temperature	Measured with room unit
CO_2	
Humidity	
Setpoint	Supplied from room unit
Dead zone	±0.5 °C
Proportional band	2 °C for heating, 2 °C for cooling
Integration time	600 s

Output settings		
1	Heating 1	Room 1 heating, PWM, 24 Vac
2	Cooling 1	Room 1 cooling, PWM, 24 Vac
3	Heating 2	Room 2 heating, PWM, 24 Vac
4	Cooling 2	Room 2 cooling, PWM, 24 Vac
5	VAV 1	Output is controlled to 100 % according to occupancy detection.
6	VAV 2	Output is controlled to 100 % according to occupancy detection.

4.7.3 Application example AN003: Hotel room



In this application, the control unit controls heating, cooling and ventilation of a hotel room. The room unit measures the room conditions (temperature and CO_2 level). You can set the room temperature setpoint with the room unit or via bus. A fan coil unit regulates the room temperature. The demand-based ventilation uses VAV with fresh air boost according to the CO_2 level. The control unit reads the damper positions. You can set the room occupancy with the card switch. If you open a window, heating and cooling stops.

A cascade control loop controls the bathroom floor heating. The cascade control loop has different control parameters than the main control loop (for example, floor temperature instead of room temperature).

Input settings		
1	NTC 10	Temperature sensor, range 0...50 °C.
2	NTC 10	Temperature sensor, range 0...50 °C
3	Resistance contact	Contact on level is 300000 Ω and contact off level is 1000 Ω. Contact hold on time is one hour.
4	Resistance contact	Contact on level is 1000 Ω and contact off level is 300000 Ω.
5	NTC 10	Temperature sensor, range 0...50 °C.

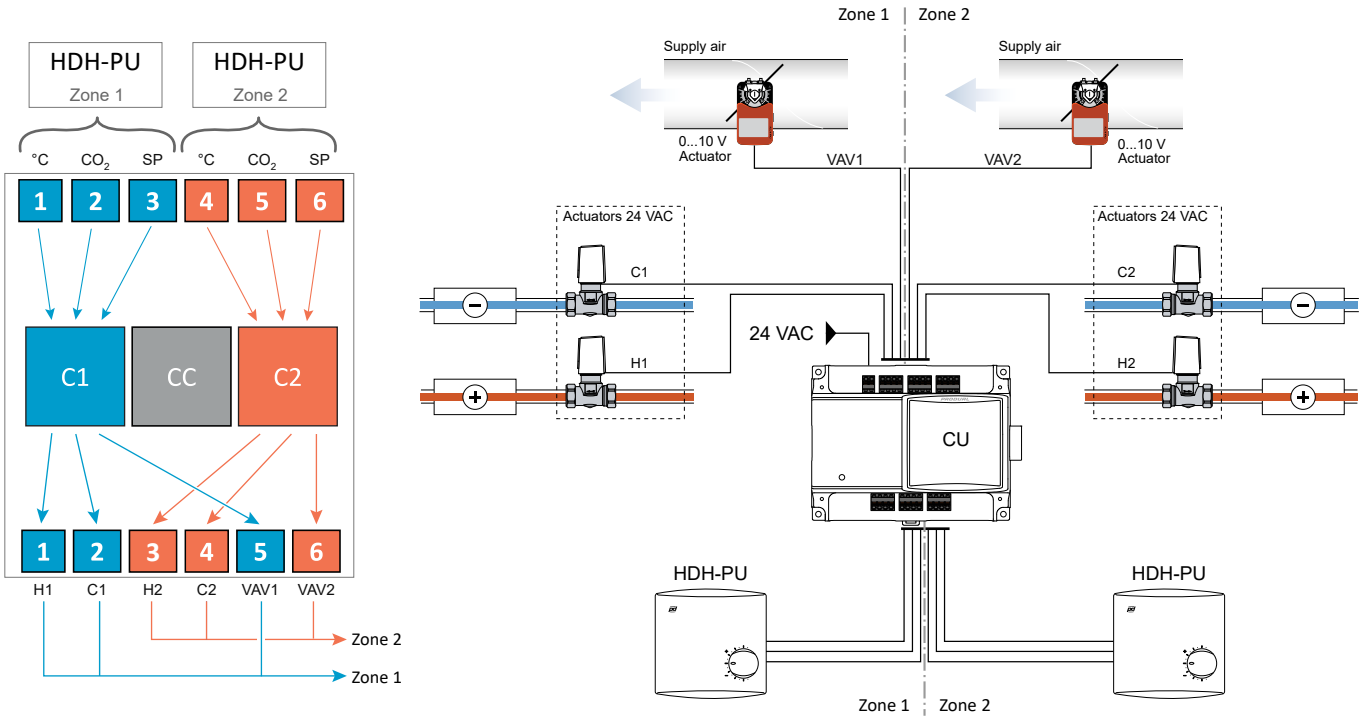
Room unit settings	
Setpoint	21 °C, ±1.5 °C
CO_2 measurement	0...2000 ppm
Humidity measurement	0...100 %rH

Controller 1 settings	
Temperature	Measured with room unit
CO_2	
Humidity	
Setpoint	Supplied from room unit
Dead zone	±0.5 °C
Proportional band	2 °C for heating, 2 °C for cooling
Integration time	600 s

Output settings		
1	Heating 1	Heating, PWM, 24 Vac
2	Cooling 1	Cooling, PWM, 24 Vac
3	Fan	Fan speed, 0...10 Vdc
4	Heating 2	Bathroom heating, PWM, 24 Vac

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4.7.4 Application example AN008: Controlling two rooms with control unit and two CO_2 transmitters



In this application, the control unit controls heating, cooling and ventilation of two rooms. The CO_2 transmitter measures the room conditions (temperature and CO_2 level). You can set the room temperature setpoint with the CO_2 transmitter. Cooling beams and heating radiators regulate the room temperature. The demand-based ventilation uses VAV with fresh air boost according to the CO_2 level.

Input settings		
1	0...10 V	Temperature measurement signal from zone 1, range 0...50 °C.
2	0...10 V	CO_2 measurement signal from zone 1, range 0...2000 ppm
3	0...10 V	Temperature setpoint signal from zone 1, range 19...23 °C
4	0...10 V	Temperature measurement signal from zone 2, range 0...50 °C.
5	0...10 V	CO_2 measurement signal from zone 2, range 0...2000 ppm
6	0...10 V	Temperature setpoint signal from zone 2, range 19...23 °C

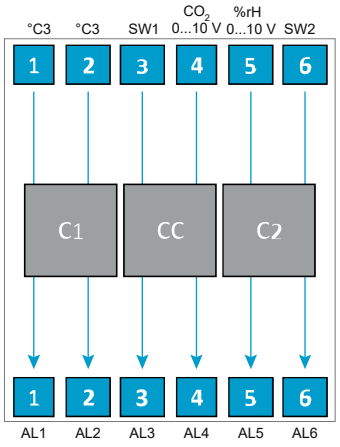
Controller 1 and 2 settings	
Temperature	Measured with room transmitter (HDH-PU)
CO_2	
Setpoint	Supplied from room transmitter (HDH-PU)
Dead zone	±0.5 °C
Proportional band	2 °C for heating, 2 °C for cooling
Integration time	600 s

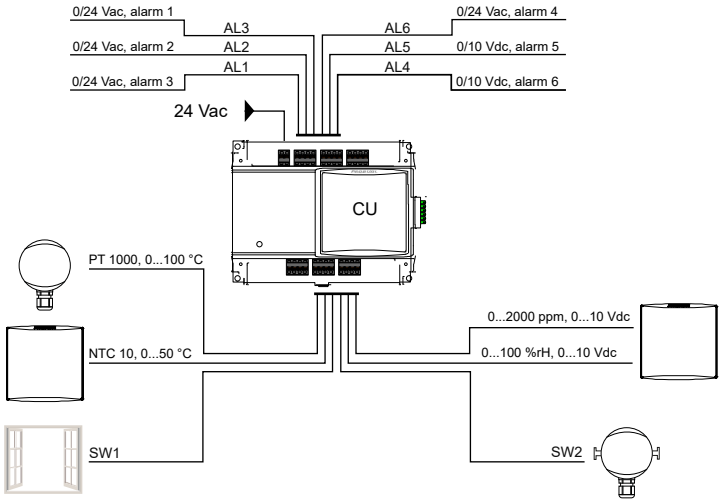
VAV settings	
CO_2	Ventilation control according to CO_2 value, 700...1200 ppm

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Output settings		
1	Heating 1	Zone 1 heating, PWM, 24 Vac
2	Cooling 1	Zone 1 cooling, PWM, 24 Vac
3	Heating 2	Zone 2 heating, PWM, 24 Vac
4	Cooling 2	Zone 2 cooling, PWM, 24 Vac
5	VAV 1	Zone 1 ventilation control according to VAV settings, 0...10 Vdc
6	VAV 2	Zone 2 ventilation control according to VAV settings, 0...10 Vdc

4.7.5 Application example AN009: I/O device





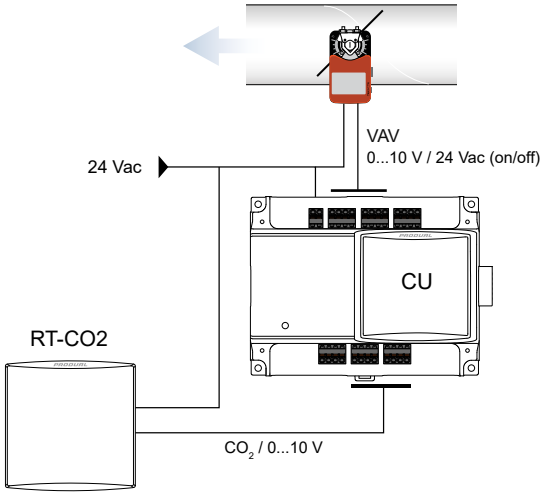
In this application, the control unit is an I/O module that you can use for alarm purposes, for example. You can read the values via bus, and configured input levels trigger the 100 % signal in the outputs.

Input settings		
1	PT1000	Temperature sensor, range 0...100 °C
2	NTC 10	Temperature sensor, range 0...50 °C
3	Contact	Contact-On level is 1000 Ω and contact-off level is 300000 Ω
4	CO_2	0...10 Vdc = 0...2000 ppm
5	Humidity	0...10 Vdc = 0...100 %rH
6	Contact	Contact-On level is 150000 Ω and contact-off level is 300000 Ω

Output settings		
1	PWM, 24 Vac	Input 1 controls the output (0 / 100 %).
2	PWM, 24 Vac	Input 2 controls the output (0 / 100 %).
3	PWM, 24 Vac	Input 3 controls the output (0 / 100 %).
4	PWM, 24 Vac	Input 4 controls the output (0 / 100 %).
5	0...10 V	Input 5 controls the output (0 / 100 %).
6	0...10 V	Input 6 controls the output (0 / 100 %).

4.7.6 Detailed application examples

4.7.6.1 Application example AN004: CO_2 and VAV control application



In this application, the CO_2 transmitter measures the air quality based on the CO_2 level. You can connect the CO_2 transmitter to the control unit's input and control the fresh air supply according to the measured CO_2 level. For example, you can use one output to open a damper at a given CO_2 level to supply fresh air to the room.

The control unit can control the damper with either 24 Vac or 0...10 Vdc output signal. A 24 Vac damper works only using the on/off functionality. You can control the air supply more accurately with a 0...10 Vdc damper.

Connecting CO_2 transmitter

CO_2 transmitters normally use 24 Vac power supply. Make sure that the supply voltage potential is the same in the transmitter and in the control unit. Otherwise, the control unit cannot interpret the measurement signal correctly. You can connect the CO_2 transmitter to the supply voltage outputs on the control unit to make sure that all devices are at the same voltage potential.

If you use a separate power supply for the CO_2 transmitter, connect the transmitter's G0 to control unit's G0. This ensures that both devices are at the same voltage potential.

The CO_2 transmitter output signal is usually 0...10 Vdc, and the control unit converts the signal to a CO_2 level. You can connect the transmitter output signal to any of the inputs in the control unit. However, you must configure the input to a CO_2 input using the MyProdual application or via Modbus.

Configuring input for CO_2 transmitter

1. Connect the MyProdual application to the control unit. See chapter Configuring control unit settings on page 37 for instructions.
2. Tap the *Configuration* button.
3. Tap the *Component setup* button on the *Configuration* page to open the *Component setup* page.
4. Tap a number button in the *Inputs* column to select the input you are going to configure.
5. Tap the *Input Type* field to select the input type.
6. Select *CO2 Transmitter* as the input type and tap the *Ok* button.
7. Configure the settings for the input.

   Configure the settings to match the transmitter properties. See chapter CO2 transmitter input parameters on page 31 for more information about the settings.
8. Tap the *Confirm* button at the top of the page to save the changes to the application.

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9. Tap the *Apply these settings to device* button at the bottom of the *Component setup* page to write the changes to the device.

CO_2 transmitter input parameters

CO_2 transmitters can have different CO_2 measurement ranges. In the control unit input settings, you can trim the transmitter's CO_2 measurement range with parameters *CO2 @ 0%* and *CO2 @ 100%*. For example, if the CO_2measurement range is 0...5000 ppm, set the *CO2 @ 100%* parameter value to 5000 ppm. 5000 ppm is the maximum value for the CO_2 measurement range setting.

You can tune the CO_2 measurement with the*CO2 Offset* parameter. The adjustment range is ±200 ppm.

Some transmitters can have different output voltage ranges, for example 2...10 V. You can set how the control unit reads the CO_2 value from the input signal with parameters *Voltage @ 0%* and *Voltage @ 100%*. These parameter values are the percentages of the 0...10 V range (0 % = 0 V and 100 % = 10 V). For example, a setting of 10 % (*Voltage @ 0%*) and 90 % (*Voltage @ 100%*) means 1...9 V input signal.

You can test the CO_2 function and how the controller works with different CO_2 levels with parameters *Override Enabled* and *Override Value*. In the *Override Value* parameter, you can set a percentage value that corresponds to the full CO_2 range. For example, if the CO_2 range is 0...2000 ppm, then 50 % is 1000 ppm, and 100 % is 2000 ppm. Remember to turn off the override function to return the system to normal operation.

You can control if the CO_2 level has an effect on an output with parameters *Contact-On Level* and *Contact-Off Level*. You can think of this as a software contact. Set the limits as a percentage value of the full CO_2 range. If you want to open a ventilation damper when the CO_2 value rises over 1000 ppm and close it when the value drops below 700 ppm, set the parameter values as follows:

- *Contact-On Level* = 50 % (1000 ppm)
- *Contact-Off Level* = 35 % (700 ppm)

With the *Contact hold-on time* parameter, you can set the duration the contact stays on even if the *Contact-Off Level* condition is fulfilled. You can set this time in seconds, minutes and hours.

With the *Contact hold-off time* parameter, you can set the duration the contact stays off even if the *Contact-On Level* condition is fulfilled. You can set this time in seconds, minutes and hours.

If you control, for example, an output directly with an input, you can define the input range that controls the output from 0 % to 100 %. Set the input range with parameters *Efficient Control Range Min* and *Efficient Control Range Max*. For example, if you want a damper to start to open at 700 ppm and to be fully open at 1000 ppm, set the parameters as follows:

- *Efficient Control Range Min* = 35 % / 700 ppm (maximum range is 2000 ppm)
- *Efficient Control Range Max* = 50 % / 1000 ppm (maximum range is 2000 ppm)

Configuring output for 0...10 V on/off damper

1. Connect the MyProdual application to the control unit. See chapter Configuring control unit settings on page 37 for instructions.
2. Tap the *Configuration* button.
3. Tap the *Component setup* button on the *Configuration* page to open the *Component setup* page.
4. Tap a number button in the *Outputs* column to select the output you are going to configure.
5. Tap the *Output Type* field to select the output type.
6. Select *Voltage* as the output type and tap the *Ok* button.
7. Select the CO_2 transmitter input from the list in the *Control Source* parameter.

   If you want to invert the 0...10 V signal into a 10...0 V signal, select the CO_2 transmitter input from the list in the *Forcing Input Source* parameter. Then select *Enabled* in the *Force invert output signal* parameter.

8. In the *Force-Value* parameter, set the damper output value that activates the software contact when the CO_2 transmitter detects too high CO_2 concentration.
9. Tap the *Confirm* button at the top of the page to save the changes to the application.
10. Tap the *Apply these settings to device* button at the bottom of the *Component setup* page to write the changes to the device.

CO_2 control output parameters

You can define where the output receives the control signal with the *Control Source* parameter in the output settings. The source can be:

- BMS system, if the control unit is used as an I/O unit.
- One of the controllers (1 or 2).
- A room unit, if the room unit has the CO_2 measurement option.
- Direct output from an input. For example, if the CO_2 transmitter is configured to input 1, select *Input 1* as the *Control Source* parameter value.

The *Output control type* parameter defines the output type. The available output types are heating, cooling, heating and cooling, humidity, CO_2, and maximum control.

You can override the output with an external signal from any input or room unit with the *Forcing Input Source* parameter. You can set the signal trigger levels manually in the settings. The trigger can be a button or an input value that reaches a certain level. When the contact activates, the control unit controls the output to the set signal level. For VAV applications, the trigger can be a button that forces the VAV damper open with a given delay. Also, if the CO_2 level is too high, this function can open the VAV damper until the CO_2 concentration decreases enough.

You can force the output to a certain value with parameters *Output override* and *Output override value*. You can use this function to test the control system functions, for example. You can also use this function when the control unit is used as an I/O unit and its control functions are not used to control the output.

Parameters *Efficient Control Range Min* and *Efficient Control Range Max* allow you to configure a sequence of different outputs, for example. You can configure one output to open at a 0...50 % demand and a second output to open at a 50...100 % demand.

You can set different minimum and maximum output levels for day, night and eco modes with the *Operating Mode Source* parameter. For example, you can set a minimum VAV output level to let some fresh air into the room in the day mode. If there is no need for VAV ventilation at night, you can set the damper to close completely in the night mode. The output operating mode source is usually the controller. If you do not need this function, set this parameter value to *Not Used*.

If necessary, you can limit the output voltage range (0...10 V) with parameters *Voltage @ 0%* and *Voltage @ 100%*. For example, a setting of 3 V (*Voltage @ 0%*) and 7 V (*Voltage @ 100%*) limits the output to 3...7 V.

With the *Jam-Prevention Interval* parameter, you can prevent a 2 Vac PWM actuator from clogging up. You can set this interval to off or 1...7 days. For example, if the setting is 1 day, the output is controlled to 100 % and 0 % once a day.

Configuring output for linear 0…10 V damper

1. Connect the MyProdual application to the control unit. See chapter Configuring control unit settings on page 37 for instructions.
2. Tap the *Configuration* button.
3. Tap the *Component setup* button on the *Configuration* page to open the *Component setup* page.
4. Tap a number button in the *Outputs* column to select the output you are going to configure.
5. Tap the *Output Type* field to select the output type.
6. Select *Voltage* as the output type and tap the *Ok* button.

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7. Select the CO_2 transmitter input from the list in the *Control Source* parameter.

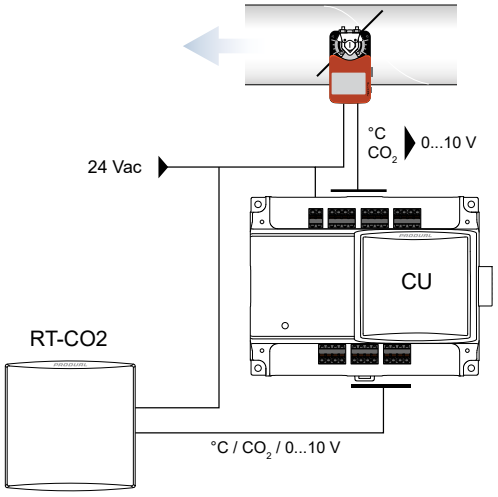
   If you want to invert the 0...10 V signal into a 10...0 V signal, select the CO_2 transmitter input from the list in the *Forcing Input Source* parameter. Then select *Enabled* in the *Force invert output signal* parameter.
8. Tap the *Confirm* button at the top of the page to save the changes to the application.
9. Tap the *Apply these settings to device* button at the bottom of the *Component setup* page to write the changes to the device.

Configuring output for 24 Vac on/off damper

1. Connect the MyProdual application to the control unit. See chapter Configuring control unit settings on page 37 for instructions.
2. Tap the *Configuration* button.
3. Tap the *Component setup* button on the *Configuration* page to open the *Component setup* page.
4. Tap a number button in the *Outputs* column to select the output you are going to configure.
5. Tap the *Output Type* field to select the output type.
6. Select *24V AC PWM* as the output type and tap the *Ok* button.
7. Select the CO_2 transmitter input from the list in the *Control Source* parameter.

   You can use the parameter *Invert 24VAC Control* to invert the 0/24 Vac signal to 24/0 Vac signal.
8. In the *Force-Value* parameter, set the damper output value that activates the software contact when the CO_2 transmitter detects too high CO_2 concentration.
9. Tap the *Confirm* button at the top of the page to save the changes to the application.
10. Tap the *Apply these settings to device* button at the bottom of the *Component setup* page to write the changes to the device.

4.7.6.2 Maximum control application for cooling and CO_2 control



If you want to control both cooling and air quality with the same damper, use the maximum selection control function. This function selects the highest control signal to control the output. For example, if the cooling control signal is higher than the CO_2 control signal, the cooling control signal controls the output.

Configuring maximum selection control

1. Connect the MyProdual application to the control unit. See chapter Configuring control unit settings on page 37 for instructions.
2. Tap the *Configuration* button.

3. Tap the *Component setup* button on the *Configuration* page to open the *Component setup* page.
4. Tap a number button in the *Controllers* column to select controller 1 or 2.
5. Tap the *Controller Type* field, select the controller type and tap the *Ok* button.

   You can select the controller type from heating, cooling, or heating and cooling. You can select *Cooling* or *Heating and Cooling* in this application example.
6. Configure the settings for the controller.

   Configure the control settings, for example, proportional band and dead zones. Set the *Max control Influenced By Cooling* and *Max control Influenced By CO2* parameter values to *Enabled*.
7. Tap the *Confirm* button at the top of the page to save the changes to the application.
8. Tap a number button in the *Outputs* column to select the output you are going to configure.
9. Tap the *Output Type* field to select the output type.
10. Select the output type and tap the *Ok* button.
11. Select the controller that you set up above from the list in the *Control Source* parameter.
12. Select *Maximum control* as the *Output control type* parameter value.
13. Tap the *Confirm* button at the top of the page to save the changes to the application.
14. Tap the *Apply these settings to device* button at the bottom of the *Component setup* page to write the changes to the device.

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5 Commissioning

5.1 Mounting the device

This device is suitable for hidden installation, for example, above a false ceiling, and does not normally require any additional cover for the cabling. However, the installation regulations may be different in your country.

Important: Check the local installation regulations before making any installations.

Use cable ties or equivalent to have some strain relief and to tidy up the installation. If it is necessary to protect the cables from tampering, use the CUCC cable covers.

Mount the device to a 35 mm DIN rail or on the wall with screws.

If you connect a room unit, external room temperature sensors or CO_2 sensors to this control unit, follow the installation instructions for each device to get accurate measurement results.

5.2 Wiring

WARNING: Only connect wires and commission the device if you are qualified for electrical work and familiar with building automation products. Risk of electric shock and damage to the device.

WARNING: Always commission the device in a de-energised electricity network. Risk of electric shock.

WARNING: Protect the external power sources and power wiring with a fuse or circuit breaker. The maximum rating for the external circuit breaker is 16 A.

WARNING: Connect this device to SELV (separated extra low voltage) electricity network only. This device is appliance class III product according to IEC 60664-1.

CAUTION: Connect the device only to overvoltage category I, II or III electricity network according to IEC 60664-1.

Important: This product cannot detect an abnormal condition of input or output ports. External supervising (automated/human) can be necessary depending on the application where this product is used.

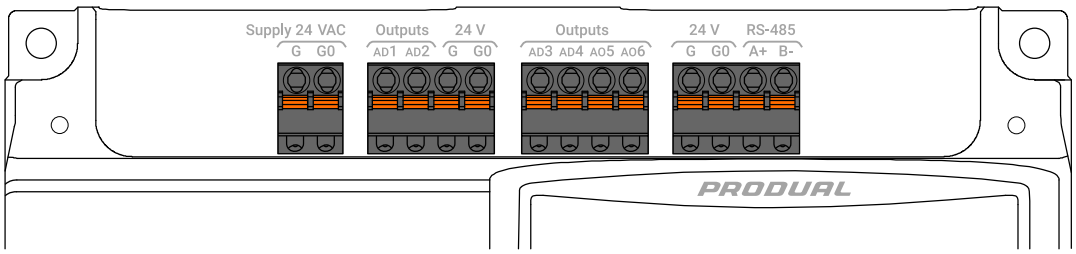
The device terminals are grouped according to their functions to avoid any wiring mistakes. You can get supply voltage for other devices by connecting them to the additional supply voltage connectors.

Use a maximum of 1.5 mm^2 wires for wiring. Use twisted pair cables (2x2 pairs) for communication (RS-485). Connect room units to the control unit with cables that are less than 10 m in length.

Note: This device and the connected 24 Vac devices must have the same power supply voltage potential. For example, you can connect all devices to the same power supply.

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5.2.1 Top connectors



Supply 24 VAC

G	24 Vac/dc supply input, < 7 VA **Note:** Only the DC functions work when using DC power supply. To get full functionality, use AC power supply.
G0	0 V

Outputs

AD1	Output 1. 24 Vac (switched to 0 V, < 1 A) / 0...10 Vdc (-0.5...+2 mA) output.
AD2	Output 2. 24 Vac (switched to 0 V, < 1 A) / 0...10 Vdc (-0.5...+2 mA) output.

24 V

G	24 Vac supply output, < 8 A (total load for all supply outputs). Additional supply voltage connectors for connected devices.
G0	0 V

Outputs

AD3	Output 3. 24 Vac (switched to 0 V, < 1 A) / 0...10 Vdc (-0.5...+2 mA) output.
AD4	Output 4. 24 Vac (switched to 0 V, < 1 A) / 0...10 Vdc (-0.5...+2 mA) output.
AO5	Output 5. 0...20 mA (< 700 Ω) / 0...10 Vdc (-0.5...+2 mA) output.
AO6	Output 6. 0...20 mA (< 700 Ω) / 0...10 Vdc (-0.5...+2 mA) output.

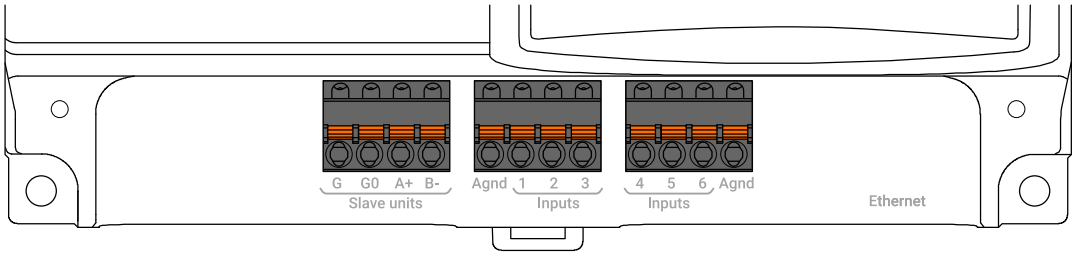
24 V

G	24 Vac supply output, < 8 A (total load for all supply outputs). Additional supply voltage connectors for connected devices.
G0	0 V

RS-485

A+	RS-485 bus connection for Modbus RTU and BACnet MS/TP.
B-	

5.2.2 Bottom connectors



Slave units

G	24 Vac supply for room unit.
G0	0 V
A+	RS-485 bus for room unit.
B-	

Inputs

Agnd	0 V
1	Input 1. NTC10 / PT1000 / 0...10 Vdc / Resistive / Contact
2	Input 2. NTC10 / PT1000 / 0...10 Vdc / Resistive / Contact
3	Input 3. NTC10 / PT1000 / 0...10 Vdc / Resistive / Contact
4	Input 4. NTC10 / PT1000 / 0...10 Vdc / Resistive / Contact
5	Input 5. NTC10 / PT1000 / 0...10 Vdc / Resistive / Contact
6	Input 6. NTC10 / PT1000 / 0...10 Vdc / Resistive / Contact
Agnd	0 V

Ethernet

Ethernet	RJ-45 connector for Modbus TCP and BACnet IP.

5.3 Configuring control unit settings

To configure the device, you first need to connect it to MyProdual application. When the device is connected to the application, you can make changes to the configuration.

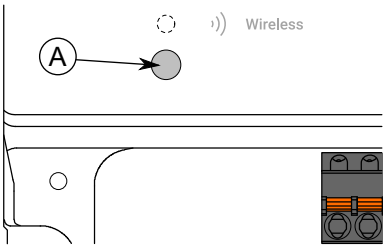
1. Connect the supply voltage to the control unit.
2. Start the MyProdual application.
3. Tap the *Quick access* button.
4. Tap the *Bluetooth connection* button.
   The device list shows the devices that have Bluetooth activated.

   Note: The Bluetooth connection is enabled when you turn on the power supply for the first time.

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5. If the device is not on the list, press the connection button until the *Wireless* indicator light flashes.

   Press the connection button for one second but less than two seconds. One flash indicates that Bluetooth is enabled in the device.



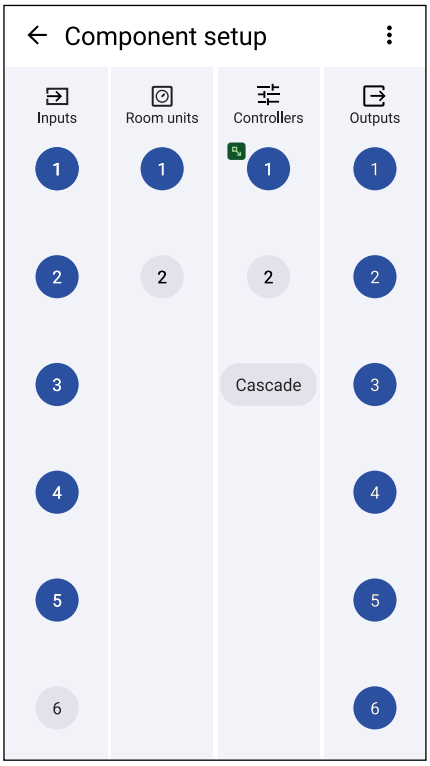
A. Connection button

Note: Use a small screwdriver or a similar tool to push the button.

6. Tap a device on the list to connect.

   The *CPU* indicator light is illuminated continuously when the MyProdual application is connected to the device.

7. Tap the *Configuration* button.
8. Tap the *Component setup* button.



The *Component setup* page is divided into sections:

Inputs	Configure input settings.
Room units	Configure room unit settings.
Controllers	Configure controller settings.
Outputs	Configure output settings.

See the following chapters for more information about the settings.

9. Make the changes to the configuration.

10. Tap the *Confirm* button at the top of each settings page to save the settings to the application.
11. Go back to the *Configuration* page.
12. Tap the *General communication settings* button to configure the communication settings.
13. Tap the *Install to device* button at the bottom of the *Configuration* page to write the changes to the device.
14. Tap the ← button.
15. Tap the connection info button to disconnect the device.



16. Select the disconnecting method.
    - Select *Disconnect but keep Bluetooth active* to disconnect the device without deactivating the device Bluetooth.
    - Select *End commissioning* to disconnect the device and deactivate the device Bluetooth.
    - Select *Cancel* to cancel disconnecting.

5.3.1 Setting inputs

The control unit has six inputs and all the inputs are multifunctional. You can configure each multifunctional input for a different input signal and the controller will change its behaviour according to the selected configuration.

1. Tap the *Component setup* button on the *Configuration* page to open the *Component setup* page.
2. Tap a number button in the *Inputs* column to select the input you are going to configure.
3. Tap the *Input Type* field to select the input type.
4. Select the input type and tap the *Ok* button.
   The following input types are available:

Not Used	The input is deactivated.
0...10V Input	Input for 0...10 Vdc signal.
Temperature Transmitter	Input for 0...10 Vdc temperature transmitter.
RH Transmitter	Input for 0...10 Vdc humidity transmitter.
CO2 Transmitter	Input for 0...10 Vdc CO_2 transmitter.
Temperature Sensor NTC10K	Input for NTC 10K temperature sensor.
Temperature Sensor PT1000	Input for Pt1000 temperature sensor.
Resistance Trigger	Input for resistance signal. For example, you can connect a condensation switch (e.g. KA 10) to this input.
Potentiometer	Input for potentiometer.
PIR	Input for occupancy sensor signal. You can connect an external PIR sensor to this input. The control unit supports normally open (NO) and normally closed (NC) sensor types.

5. Configure the settings for the input.
   See the following chapters for more information about the settings.
6. Tap the *Confirm* button at the top of the page to save the changes to the application.
7. Tap the *Apply these settings to device* button at the bottom of the *Component setup* page to write the changes to the device.

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5.3.1.1 Available settings for voltage control input

Parameter name	Values	Default	Description
Measurement scale			
Voltage @ 0%	*0...10.000 V*	*0.000 V*	Input voltage at 0 %. Set the value for voltage input when the transmitter output is 0 %. For example, 1 V to the input should be read as 0 % input.
Voltage @ 100%	*0...10.000 V*	*10.000 V*	Input voltage at 100 %. Set the value for voltage input when the transmitter output is 100 %. For example, 8 V to the input should be read as 100 % input.
Override settings			
Override Enabled	*Enabled / Disabled*	*Disabled*	Input override status. Enable to write a value to the input.
Override Value	*0.00...100.00 %*	*0.00 %*	Input override value. Set the value to be written to the input.
Contact settings			
Contact-On Level	*0.00...100.00 %*	*100.00 %*	Contact on level. Set the input value that is interpreted as contact ON on value. You can use this software contact function to override an output at a certain input voltage level.
Contact-Off Level	*0.00...100.00 %*	*0.00 %*	Contact off level. Set the input value that is interpreted as contact OFF on value. You can use this software contact function to release the output override at a certain input voltage level.
Contact hold-on time	*0 h 0 min 0 s...18 h 12 min 15 s*	*0 h 0 min 0 s*	Contact hold on time. Set the hours, minutes and seconds for the contact ON time. This time defines how long the contact stays on even if the contact off level condition is fulfilled.
Contact hold-off time	*0 h 0 min 0 s...18 h 12 min 15 s*	*0 h 0 min 0 s*	Contact hold off time. Set the hours, minutes and seconds for the contact OFF time. This time defines how long the contact stays off even if the contact on level condition is fulfilled.
Contact turn-on delay	*0 h 0 min 0 s...18 h 12 min 15 s*	*0 h 0 min 0 s*	The delay before the contact is turned on after the contact on level condition is fulfilled.
Contact turn-off delay	*0 h 0 min 0 s...18 h 12 min 15 s*	*0 h 0 min 0 s*	The delay before the contact is turned off after the contact off level condition is fulfilled.
Effective power			
Efficient Control Range Min	*0.00...100.00 %*	*0.00 %*	The minimum limit for the effective control range.
Efficient Control Range Max	*0.00...100.00 %*	*100.00 %*	The maximum limit for the effective control range.
Input responsiveness			
Filtering Mode	*Normal / Fast*	*Normal*	Input reaction time.
BACnet COV settings			
Voltage COV-limit	*0.001...5.000 V*	*0.100 V*	Change of Value limit for voltage.

5.3.1.2 Available settings for temperature transmitter input

Parameter name	Values	Default	Description
Measurement scale			
Voltage @ 0%	*0...10.000 V*	*0.000 V*	Input voltage at 0 %. Set the value for voltage input when the transmitter output is 0 %. For example, 1 V to the input should be read as 0 % input.
Voltage @ 100%	*0...10.000 V*	*10.000 V*	Input voltage at 100 %. Set the value for voltage input when the transmitter output is 100 %. For example, 8 V to the input should be read as 100 % input.
Temperature @ 0%	*-50.0...100.0 °C*	*-50.0 °C*	Input temperature at 0 %. Set the value for temperature input when the transmitter output is 0 %. For example, 0 % input voltage (0 V, or scaled to *Voltage @ 0%* setting) from the transmitter should be interpreted as 0 °C.
Temperature @ 100%	*-50.0...100.0 °C*	*100.0 °C*	Input temperature at 100 %. Set the value for temperature input when the transmitter output is 100 %. For example, 100 % input voltage (10 V, or scaled to *Voltage @ 100%* setting) from the transmitter should be interpreted as +50 °C.
Measurement correction			
Temperature Offset	*-100.0...100.0 °C*	*0.0 °C*	Input temperature offset. Set the offset for temperature input according to calibration.
Override settings			
Override Enabled	*Enabled / Disabled*	*Disabled*	Input override status. Enable to write a value to the input.
Override Value	*0.00...100.00 %*	*0.00 %*	Input override value. Set the value to be written to the input.
Contact settings			
Contact-On Level	*0.00...100.00 %*	*100.00 %*	Contact on level. Set the input value that is interpreted as contact ON on value. You can use this software contact function to override an output at a certain input voltage level.
Contact-Off Level	*0.00...100.00 %*	*0.00 %*	Contact off level. Set the input value that is interpreted as contact OFF on value. You can use this software contact function to release the output override at a certain input voltage level.
Contact hold-on time	*0 h 0 min 0 s...18 h 12 min 15 s*	*0 h 0 min 0 s*	Contact hold on time. Set the hours, minutes and seconds for the contact ON time. This time defines how long the contact stays on even if the contact off level condition is fulfilled.
Contact hold-off time	*0 h 0 min 0 s...18 h 12 min 15 s*	*0 h 0 min 0 s*	Contact hold off time. Set the hours, minutes and seconds for the contact OFF time. This time defines how long the contact stays off even if the contact on level condition is fulfilled.
Contact turn-on delay	*0 h 0 min 0 s...18 h 12 min 15 s*	*0 h 0 min 0 s*	The delay before the contact is turned on after the contact on level condition is fulfilled.
Contact turn-off delay	*0 h 0 min 0 s...18 h 12 min 15 s*	*0 h 0 min 0 s*	The delay before the contact is turned off after the contact off level condition is fulfilled.
Effective power			

Parameter name	Values	Default	Description
Efficient Control Range Min	*0.00...100.00 %*	*0.00 %*	The minimum limit for the effective control range.
Efficient Control Range Max	*0.00...100.00 %*	*100.00 %*	The maximum limit for the effective control range.
Input responsiveness			
Filtering Mode	*Normal / Fast*	*Normal*	Input reaction time.
BACnet COV settings			
Voltage COV-limit	*0.001...5.000 V*	*0.100 V*	Change of Value limit for voltage.

5.3.1.3 Available settings for humidity transmitter input

Parameter name	Values	Default	Description
Measurement scale			
Voltage @ 0%	*0...10.000 V*	*0.000 V*	Input voltage at 0 %. Set the value for voltage input when the transmitter output is 0 %. For example, 1 V to the input should be read as 0 % input.
Voltage @ 100%	*0...10.000 V*	*10.000 V*	Input voltage at 100 %. Set the value for voltage input when the transmitter output is 100 %. For example, 8 V to the input should be read as 100 % input.
RH@ 0%	*0.00...100.00 %rH*	*0.00 %rH*	Input humidity at 0 %. Set the value for humidity input when the transmitter output is 0 %. For example, 0 % input voltage (0 V, or scaled to *Voltage @ 0%* setting) from the transmitter should be interpreted as 0 %rH.
RH @ 100%	*0.00...100.00 %rH*	*100.00 %rH*	Input humidity at 100 %. Set the value for humidity input when the transmitter output is 100 %. For example, 100 % input voltage (10 V, or scaled to *Voltage @ 100%* setting) from the transmitter should be interpreted 100 %rH.
Measurement correction			
RH Offset	*-50.00...50.00 %rH*	*0.00 %rH*	Input humidity offset. Set the offset for humidity input according to calibration.
Override settings			
Override Enabled	*Enabled / Disabled*	*Disabled*	Input override status. Enable to write a value to the input.
Override Value	*0.00...100.00 %*	*0.00 %*	Input override value. Set the value to be written to the input.
Contact settings			
Contact-On Level	*0.00...100.00 %*	*100.00 %*	Contact on level. Set the input value that is interpreted as contact ON on value. You can use this software contact function to override an output at a certain input voltage level.
Contact-Off Level	*0.00...100.00 %*	*0.00 %*	Contact off level. Set the input value that is interpreted as contact OFF on value. You can use this software contact function to release the output override at a certain input voltage level.

Parameter name	Values	Default	Description
Contact hold-on time	*0 h 0 min 0 s...18 h 12 min 15 s*	*0 h 0 min 0 s*	Contact hold on time. Set the hours, minutes and seconds for the contact ON time. This time defines how long the contact stays on even if the contact off level condition is fulfilled.
Contact hold-off time	*0 h 0 min 0 s...18 h 12 min 15 s*	*0 h 0 min 0 s*	Contact hold off time. Set the hours, minutes and seconds for the contact OFF time. This time defines how long the contact stays off even if the contact on level condition is fulfilled.
Contact turn-on delay	*0 h 0 min 0 s...18 h 12 min 15 s*	*0 h 0 min 0 s*	The delay before the contact is turned on after the contact on level condition is fulfilled.
Contact turn-off delay	*0 h 0 min 0 s...18 h 12 min 15 s*	*0 h 0 min 0 s*	The delay before the contact is turned off after the contact off level condition is fulfilled.
Effective power			
Efficient Control Range Min	*0.00...100.00 %*	*0.00 %*	The minimum limit for the effective control range.
Efficient Control Range Max	*0.00...100.00 %*	*100.00 %*	The maximum limit for the effective control range.
Input responsiveness			
Filtering Mode	*Normal / Fast*	*Normal*	Input reaction time.
BACnet COV settings			
Voltage COV-limit	*0.001...5.000 V*	*0.100 V*	Change of Value limit for voltage.

5.3.1.4 Available settings for CO_2 transmitter input

Parameter name	Values	Default	Description
Measurement scale			
Voltage @ 0%	*0...10.000 V*	*0.000 V*	Input voltage at 0 %. Set the value for voltage input when the transmitter output is 0 %. For example, 1 V to the input should be read as 0 % input.
Voltage @ 100%	*0...10.000 V*	*10.000 V*	Input voltage at 100 %. Set the value for voltage input when the transmitter output is 100 %. For example, 8 V to the input should be read as 100 % input.
CO2 @ 0%	*0...10000 ppm*	*0 ppm*	Input CO_2 at 0 %. Set the value for CO_2 input when the transmitter output is 0 %. For example, 0 % input voltage (0 V, or scaled to *Voltage @ 0%* setting) from the transmitter should be interpreted as 0 ppm.
CO2 @ 100%	*0...10000 ppm*	*2000 ppm*	Input CO_2 at 100 %. Set the value for CO_2 input when the transmitter output is 100 %. For example, 100 % input voltage (10 V, or scaled to *Voltage @ 100%* setting) from the transmitter should be interpreted as 2000 ppm.
Measurement correction			
CO2 Offset	*-200...200 ppm*	*0 ppm*	Input CO_2 offset. Set the offset for CO_2 input according to calibration.
Override settings			

Parameter name	Values	Default	Description
Override Enabled	*Enabled / Disabled*	*Disabled*	Input override status. Enable to write a value to the input.
Override Value	*0.00...100.00 %*	*0.00 %*	Input override value. Set the value to be written to the input.
Contact settings			
Contact-On Level	*0.00...100.00 %*	*100.00 %*	Contact on level. Set the input value that is interpreted as contact ON on value. You can use this software contact function to override an output at a certain input voltage level.
Contact-Off Level	*0.00...100.00 %*	*0.00 %*	Contact off level. Set the input value that is interpreted as contact OFF on value. You can use this software contact function to release the output override at a certain input voltage level.
Contact hold-on time	*0 h 0 min 0 s...18 h 12 min 15 s*	*0 h 0 min 0 s*	Contact hold on time. Set the hours, minutes and seconds for the contact ON time. This time defines how long the contact stays on even if the contact off level condition is fulfilled.
Contact hold-off time	*0 h 0 min 0 s...18 h 12 min 15 s*	*0 h 0 min 0 s*	Contact hold off time. Set the hours, minutes and seconds for the contact OFF time. This time defines how long the contact stays off even if the contact on level condition is fulfilled.
Contact turn-on delay	*0 h 0 min 0 s...18 h 12 min 15 s*	*0 h 0 min 0 s*	The delay before the contact is turned on after the contact on level condition is fulfilled.
Contact turn-off delay	*0 h 0 min 0 s...18 h 12 min 15 s*	*0 h 0 min 0 s*	The delay before the contact is turned off after the contact off level condition is fulfilled.
Effective power			
Efficient Control Range Min	*0.00...100.00 %*	*0.00 %*	The minimum limit for the effective control range.
Efficient Control Range Max	*0.00...100.00 %*	*100.00 %*	The maximum limit for the effective control range.
Input responsiveness			
Filtering Mode	*Normal / Fast*	*Normal*	Input reaction time.
BACnet COV settings			
Voltage COV-limit	*0.001...5.000 V*	*0.100 V*	Change of Value limit for voltage.

5.3.1.5 Available settings for temperature sensor input

Parameter name	Values	Default	Description
Measurement scale			
Temperature @ 0%	*-50.0...100.0 °C*	*-50.0 °C*	Input temperature at 0 %. Set the value for temperature input when the sensor output is 0 %.
Temperature @ 100%	*-50.0...100.0 °C*	*100.0 °C*	Input temperature at 100 %. Set the value for temperature input when the sensor output is 100 %.
Measurement correction			
Temperature Offset	*-100.0...100.0 °C*	*0.0 °C*	Input temperature offset. Set the offset for temperature input according to calibration.
Override settings			

Parameter name	Values	Default	Description
Override Enabled	*Enabled / Disabled*	*Disabled*	Input override status. Enable to write a value to the input.
Override Value	*0.00...100.00 %*	*0.00 %*	Input override value. Set the value to be written to the input.
Contact settings			
Contact-On Level	*0.00...100.00 %*	*100.00 %*	Contact on level. Set the input value that is interpreted as contact ON on value. You can use this software contact function to override an output at a certain input voltage level.
Contact-Off Level	*0.00...100.00 %*	*0.00 %*	Contact off level. Set the input value that is interpreted as contact OFF on value. You can use this software contact function to release the output override at a certain input voltage level.
Contact hold-on time	*0 h 0 min 0 s...18 h 12 min 15 s*	*0 h 0 min 0 s*	Contact hold on time. Set the hours, minutes and seconds for the contact ON time. This time defines how long the contact stays on even if the contact off level condition is fulfilled.
Contact hold-off time	*0 h 0 min 0 s...18 h 12 min 15 s*	*0 h 0 min 0 s*	Contact hold off time. Set the hours, minutes and seconds for the contact OFF time. This time defines how long the contact stays off even if the contact on level condition is fulfilled.
Contact turn-on delay	*0 h 0 min 0 s...18 h 12 min 15 s*	*0 h 0 min 0 s*	The delay before the contact is turned on after the contact on level condition is fulfilled.
Contact turn-off delay	*0 h 0 min 0 s...18 h 12 min 15 s*	*0 h 0 min 0 s*	The delay before the contact is turned off after the contact off level condition is fulfilled.
Effective power			
Efficient Control Range Min	*0.00...100.00 %*	*0.00 %*	The minimum limit for the effective control range.
Efficient Control Range Max	*0.00...100.00 %*	*100.00 %*	The maximum limit for the effective control range.
Input responsiveness			
Filtering Mode	*Normal / Fast*	*Normal*	Input reaction time.

5.3.1.6 Available settings for resistance trigger input

Parameter name	Values	Default	Description
Override settings			
Override Enabled	*Enabled / Disabled*	*Disabled*	Input override status. Enable to write a value to the input.
Override Value	*0.00...100.00 %*	*0.00 %*	Input override value. Set the value to be written to the input.
Contact settings			
Contact-On Level	*0...300000 Ω*	*300000 Ω*	Contact on level. Set the input value that is interpreted as contact ON on value. You can use this software contact function to override an output at a certain input resistance level.

Parameter name	Values	Default	Description
Contact-Off Level	*0...300000 Ω*	*0 Ω*	Contact off level. Set the input value that is interpreted as contact OFF on value. You can use this software contact function to release the output override at a certain input resistance level.
Contact hold-on time	*0 h 0 min 0 s...18 h 12 min 15 s*	*0 h 0 min 0 s*	Contact hold on time. Set the hours, minutes and seconds for the contact ON time. This time defines how long the contact stays on even if the contact off level condition is fulfilled.
Contact hold-off time	*0 h 0 min 0 s...18 h 12 min 15 s*	*0 h 0 min 0 s*	Contact hold off time. Set the hours, minutes and seconds for the contact OFF time. This time defines how long the contact stays off even if the contact on level condition is fulfilled.
Contact turn-on delay	*0 h 0 min 0 s...18 h 12 min 15 s*	*0 h 0 min 0 s*	The delay before the contact is turned on after the contact on level condition is fulfilled.
Contact turn-off delay	*0 h 0 min 0 s...18 h 12 min 15 s*	*0 h 0 min 0 s*	The delay before the contact is turned off after the contact off level condition is fulfilled.
Effective power			
Efficient Control Range Min	*0.00...100.00 %*	*0.00 %*	The minimum limit for the effective control range.
Efficient Control Range Max	*0.00...100.00 %*	*100.00 %*	The maximum limit for the effective control range.
Input responsiveness			
Filtering Mode	*Normal / Fast*	*Normal*	Input reaction time.

5.3.1.7 Available settings for potentiometer input

Parameter name	Values	Default	Description
Measurement scale			
Temperature @ 0%	*-50.0...100.0 °C*	*-50.0 °C*	Potentiometer temperature value at 0 %. Set the value for temperature when the potentiometer output is 0 %.
Temperature @ 100%	*-50.0...100.0 °C*	*100.0 °C*	Potentiometer temperature value at 100 %. Set the value for temperature input when the potentiometer output is 100 %.
Resistance (High range) min	*0...300000 Ω*	*0 Ω*	The minimum resistance for the potentiometer that is connected to the input.
Resistance (High range) max	*0...300000 Ω*	*10000 Ω*	The maximum resistance for the potentiometer that is connected to the input.
Measurement correction			
Resistance (High range) offset	*-100000... 100000 Ω*	*0 Ω*	Input resistance offset. Set the offset for the input according to calibration.
Override settings			
Override Enabled	*Enabled / Disabled*	*Disabled*	Input override status. Enable to write a value to the input.
Override Value	*0.00...100.00 %*	*0.00 %*	Input override value. Set the value to be written to the input.
Effective power			

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Parameter name	Values	Default	Description
Efficient Control Range Min	*0.00...100.00 %*	*0.00 %*	The minimum limit for the effective control range.
Efficient Control Range Max	*0.00...100.00 %*	*100.00 %*	The maximum limit for the effective control range.
Input responsiveness			
Filtering Mode	*Normal / Fast*	*Normal*	Input reaction time.

5.3.1.8 Available settings for PIR input

Parameter name	Values	Default	Description
Override settings			
Override Enabled	*Enabled / Disabled*	*Disabled*	Input override status. Enable to write a value to the input.
Override Value	*0.00...100.00 %*	*0.00 %*	Input override value. Set the value to be written to the input.
Contact settings			
Contact-On Level	*0...300000 Ω*	*300000 Ω*	Contact on level. Set the input value that is interpreted as contact ON on value. You can use this software contact function to override an output at a certain input resistance level.
Contact-Off Level	*0...300000 Ω*	*0 Ω*	Contact off level. Set the input value that is interpreted as contact OFF on value. You can use this software contact function to release the output override at a certain input resistance level.
Contact hold-on time	*0 h 0 min 0 s...18 h 12 min 15 s*	*0 h 0 min 0 s*	Contact hold on time. Set the hours, minutes and seconds for the contact ON time. This time defines how long the contact stays on even if the contact off level condition is fulfilled.
Contact hold-off time	*0 h 0 min 0 s...18 h 12 min 15 s*	*0 h 0 min 0 s*	Contact hold off time. Set the hours, minutes and seconds for the contact OFF time. This time defines how long the contact stays off even if the contact on level condition is fulfilled.
Contact turn-on delay	*0 h 0 min 0 s...18 h 12 min 15 s*	*0 h 0 min 0 s*	This is the duration the control unit waits after the external PIR sensor detects movement. After this delay, the control unit waits the same duration for the next PIR sensor event. If the PIR sensor detects movement again during this time, the control unit turns on the contact.
Contact turn-off delay	*0 h 0 min 0 s...18 h 12 min 15 s*	*0 h 0 min 0 s*	This is the duration the control unit waits after the last PIR sensor event. After this delay, the control unit waits the same duration for the next PIR sensor event. If the PIR sensor does not detect movement again during this time, the control unit turns off the contact.
Effective power			
Efficient Control Range Min	*0.00...100.00 %*	*0.00 %*	The minimum limit for the effective control range.
Efficient Control Range Max	*0.00...100.00 %*	*100.00 %*	The maximum limit for the effective control range.
Input responsiveness			

Parameter name	Values	Default	Description
Filtering Mode	*Normal / Fast*	*Normal*	Input response time. Select *Fast* mode for the PIR input.

5.3.2 Setting outputs

The control unit has six outputs and all the outputs are multifunctional.

1. Tap the *Component setup* button on the *Configuration* page to open the *Component setup* page.
2. Tap a number button in the *Outputs* column to select the output you are going to configure.
3. Tap the *Output Type* field to select the output type.
4. Select the output type and tap the *Ok* button.
   The following output types are available:

Not Used	The output is deactivated.
Voltage	Voltage output.
6-Way Valve	6-way valve output.
Fan	Fan output.
24V AC PWM	24 Vac output. Only available for outputs 1...4.
24V AC 3-point raise	3-point actuator + output. Only available for outputs 1...4.
24V AC 3-point lower	3-point actuator - output. Only available for outputs 1...4.
Current	Current output. Only available for outputs 5...6.

5. Configure the settings for the output.
   See the following chapters for more information about the settings.
6. Tap the *Confirm* button at the top of the page to save the changes to the application.
7. Tap the *Apply these settings to device* button at the bottom of the *Component setup* page to write the changes to the device.

5.3.2.1 Available settings for voltage output

Parameter name	Values	Default	Description
Output settings			
Control Source	*BMS / Controller 1 / Controller 2 / Cascade-Controller / Input 1...6 / Room-Unit 1 / Room-Unit 2*	*Controller 1*	Output control source. Select the source for the output signal.
Output control type	*Heating / Heating thermostat / Cooling / Cooling thermostat / Heating and Cooling / Changeover / RH / CO2 / Maximum control*	*Maximum control*	Output control method. This setting is available when the *Control Source* parameter value is *Controller 1*, *Controller 2* or *Cascade-Controller*.

Parameter name	Values	Default	Description
Room Unit Output Type	*Temperature / RH / CO2*	*Temperature*	Room unit output type. This setting is available when the *Control Source* parameter value is *Room-Unit 1* or *Room-Unit 2*.
Jam-Prevention Interval	*Off / 1 Day...7 Days*	*Off*	Jam prevention interval. The jam prevention function forces the actuator output open for a short time to prevent the valve from jamming. For example, if the jam prevention interval is *3 Days*, the control unit forces the actuator open once every 3 days.
Forcing settings			
Forcing Input Source	*Off / Input 1...6 / Room-Unit 1 / Room-Unit 2*	*Off*	Forcing input source. If you configured the software contact function for an input, select the input that overrides the output at the set input level.
Forcing Input Type	*PIR-Detection / "Man in House" -Button / Occupancy (PIR or MIH) / Contact*	*PIR-Detection*	Forcing input type. This setting is available when the *Forcing Input Source* parameter value is *Room-Unit 1* or *Room-Unit 2*.
Force invert output signal	*Disabled / Enabled*	*Disabled*	Forcing inversion. Inverts the output signal, if an input triggers the forcing function. This setting is available when the *Forcing Input Source* parameter value is not *Off*.
Force-Value	*0.00...100.00 %*	*0.00 %*	Forcing ON value for the forcing input source. Set the percentage for the calculated effect value. If an input triggers the forcing function, the control unit overrides the output with this value.
Off-Value	*0.00...100.00 %*	*0.00 %*	Forcing OFF value for forcing input source. Set the percentage for the calculated effect value when the output is off. The control unit overrides the output with this value when the override trigger from the input is released.
Override settings			
Output override	*Disabled / Enabled*	*Disabled*	Output override status. Enable to write a value to the output.
Output override value	*0.00...100.00 %*	*0.00 %*	Output override value. Set the value to be written to the output.
Scaling settings			
Efficient Control Range Min	*0.00...100.00 %*	*0.00 %*	Effective control range of output, minimum limit.
Efficient Control Range Max	*0.00...100.00 %*	*100.00 %*	Effective control range of output, maximum limit.
Operating Mode Source	*Not Used / Controller 1 / Controller 2 / Auto*	*Not Used*	Operation mode source. Select the source that triggers the operation mode shift.
Min output, operation mode 1	*0.00...100.00 %*	*0.00 %*	Output range at day mode, low limit. This setting is available when the *Operating Mode Source* parameter value is not *Not Used*.
Min output, operation mode 2	*0.00...100.00 %*	*0.00 %*	Output range at night mode, low limit. This setting is available when the *Operating Mode Source* parameter value is not *Not Used*.

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Parameter name	Values	Default	Description
Min output, operation mode 3	*0.00...100.00 %*	*0.00 %*	Output range at eco mode, low limit. The setting is available when the *Operating Mode Source* parameter value is not *Not Used*.
Max output, operation mode 1	*0.00...100.00 %*	*100.00 %*	Output range at day mode, high limit. This setting is available when the *Operating Mode Source* parameter value is not *Not Used*.
Max output, operation mode 2	*0.00...100.00 %*	*100.00 %*	Output range at night mode, high limit. This setting is available when the *Operating Mode Source* parameter value is not *Not Used*.
Max output, operation mode 3	*0.00...100.00 %*	*100.00 %*	Output range at eco mode, high limit. This setting is available when the *Operating Mode Source* parameter value is not *Not Used*.
Voltage @ 0%	*0...10.000 V*	*0.000 V*	Output voltage at 0 % control signal. Set the value for the voltage output when the control output is 0 %.
Voltage @ 100%	*0...10.000 V*	*10.000 V*	Output voltage at 100 % control signal. Set the value for the voltage output when the control output is 100 %.
BACnet settings			
Voltage COV-limit	*0.001...5.000 V*	*0.100 V*	Change of Value limit for voltage.

5.3.2.2 Available settings for 24 Vac PWM output

Parameter name	Values	Default	Description
Output settings			
Control Source	*BMS / Controller 1 / Controller 2 / Cascade-Controller / Input 1...6 / Room-Unit 1 / Room-Unit 2*	*Controller 1*	Output control source. Select the source for the output signal.
Output control type	*Heating / Heating thermostat / Cooling / Cooling thermostat / Heating and Cooling / Changeover / RH / CO2 / Maximum control*	*Maximum control*	Output control method. This setting is available when the *Control Source* parameter value is *Controller 1*, *Controller 2* or *Cascade-Controller*.
Room Unit Output Type	*Temperature / RH / CO2*	*Temperature*	Room unit output type. This setting is available when the *Control Source* parameter value is *Room-Unit 1* or *Room-Unit 2*.
Invert 24VAC Control	*Disabled / Enabled*	*Disabled*	24 VAC control inversion. Inverts the output signal if an input triggers an override.
PWM-Period	*0...1200 s*	*0 s*	The pulse width modulation period.
Jam-Prevention Interval	*Off / 1 Day...7 Days*	*Off*	Jam prevention interval. The jam prevention function forces the actuator output open for a short time to prevent the valve from jamming. For example, if the jam prevention interval is *3 Days*, the control unit forces the actuator open once every 3 days.

Parameter name	Values	Default	Description
Forcing settings			
Forcing Input Source	*Off / Input 1...6 / Room-Unit 1 / Room-Unit 2*	*Off*	Forcing input source. If you configured the software contact function for an input, select the input that overrides the output at the set input level.
Forcing Input Type	*PIR-Detection / "Man in House" -Button / Occupancy (PIR or MIH) / Contact*	*PIR-Detection*	Forcing input type. This setting is available when the *Forcing Input Source* parameter value is *Room-Unit 1* or *Room-Unit 2*.
Force invert output signal	*Disabled / Enabled*	*Disabled*	Forcing inversion. Inverts the output signal, if an input triggers the forcing function. This setting is available when the *Forcing Input Source* parameter value is not *Off*.
Force-Value	*0.00...100.00 %*	*0.00 %*	Forcing ON value for the forcing input source. Set the percentage for the calculated effect value. If an input triggers the forcing function, the control unit overrides the output with this value.
Off-Value	*0.00...100.00 %*	*0.00 %*	Forcing OFF value for forcing input source. Set the percentage for the calculated effect value when the output is off. The control unit overrides the output with this value when the override trigger from the input is released.
Override settings			
Output override	*Disabled / Enabled*	*Disabled*	Output override status. Enable to write a value to the output.
Output override value	*0.00...100.00 %*	*0.00 %*	Output override value. Set the value to be written to the output.
Scaling settings			
Efficient Control Range Min	*0.00...100.00 %*	*0.00 %*	Effective control range of output, minimum limit.
Efficient Control Range Max	*0.00...100.00 %*	*100.00 %*	Effective control range of output, maximum limit.
Operating Mode Source	*Not Used / Controller 1 / Controller 2 / Auto*	*Not Used*	Operation mode source. Select the source that triggers the operation mode shift.
Min output, operation mode 1	*0.00...100.00 %*	*0.00 %*	Output range at day mode, low limit. This setting is available when the *Operating Mode Source* parameter value is not *Not Used*.
Min output, operation mode 2	*0.00...100.00 %*	*0.00 %*	Output range at night mode, low limit. This setting is available when the *Operating Mode Source* parameter value is not *Not Used*.
Min output, operation mode 3	*0.00...100.00 %*	*0.00 %*	Output range at eco mode, low limit. The setting is available when the *Operating Mode Source* parameter value is not *Not Used*.
Max output, operation mode 1	*0.00...100.00 %*	*100.00 %*	Output range at day mode, high limit. This setting is available when the *Operating Mode Source* parameter value is not *Not Used*.
Max output, operation mode 2	*0.00...100.00 %*	*100.00 %*	Output range at night mode, high limit. This setting is available when the *Operating Mode Source* parameter value is not *Not Used*.

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Parameter name	Values	Default	Description
Max output, operation mode 3	*0.00...100.00 %*	*100.00 %*	Output range at eco mode, high limit. This setting is available when the *Operating Mode Source* parameter value is not *Not Used*.

5.3.2.3 Available settings for 3-point actuator outputs

Parameter name	Values	Default	Description
Output settings			
Control Source	*BMS / Controller 1 / Controller 2 / Cascade-Controller / Input 1...6 / Room-Unit 1 / Room-Unit 2*	*Controller 1*	Output control source. Select the source for the output signal.
Output control type	*Heating / Heating thermostat / Cooling / Cooling thermostat / Heating and Cooling / Changeover / RH / CO2 / Maximum control*	*Maximum control*	Output control method. This setting is available when the *Control Source* parameter value is *Controller 1*, *Controller 2* or *Cascade-Controller*.
Link to secondary 3-point raise/lower output (output 1-4)	*Not set / Output 1...4*	*Not set*	3-point actuator + output. This setting is available when the *Output Type* parameter value is *24V AC 3-point lower*.
3-point raise/lower actuator operation time	*0...1200 s*	*720 s*	3-point actuator running time. This setting is available when the *Output Type* parameter value is *24V AC 3-point raise*.
Room Unit Output Type	*Temperature / RH / CO2*	*Temperature*	Room unit output type. This setting is available when the *Control Source* parameter value is *Room-Unit 1* or *Room-Unit 2*.
Invert 24VAC Control	*Disabled / Enabled*	*Disabled*	24 VAC control inversion. Inverts the output signal if an input triggers an override.
Jam-Prevention Interval	*Off / 1 Day...7 Days*	*Off*	Jam prevention interval. The jam prevention function forces the actuator output open for a short time to prevent the valve from jamming. For example, if the jam prevention interval is *3 Days*, the control unit forces the actuator open once every 3 days.
Forcing settings			
Forcing Input Source	*Off / Input 1...6 / Room-Unit 1 / Room-Unit 2*	*Off*	Forcing input source. If you configured the software contact function for an input, select the input that overrides the output at the set input level.
Forcing Input Type	*PIR-Detection / "Man in House" -Button / Occupancy (PIR or MIH) / Contact*	*PIR-Detection*	Forcing input type. This setting is available when the *Forcing Input Source* parameter value is *Room-Unit 1* or *Room-Unit 2*.

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Parameter name	Values	Default	Description
Force invert output signal	*Disabled / Enabled*	*Disabled*	Forcing inversion. Inverts the output signal, if an input triggers the forcing function. This setting is available when the *Forcing Input Source* parameter value is not *Off*.
Force-Value	*0.00...100.00 %*	*0.00 %*	Forcing ON value for the forcing input source. Set the percentage for the calculated effect value. If an input triggers the forcing function, the control unit overrides the output with this value.
Off-Value	*0.00...100.00 %*	*0.00 %*	Forcing OFF value for forcing input source. Set the percentage for the calculated effect value when the output is off. The control unit overrides the output with this value when the override trigger from the input is released.
Override settings			
Output override	*Disabled / Enabled*	*Disabled*	Output override status. Enable to write a value to the output.
Output override value	*0.00...100.00 %*	*0.00 %*	Output override value. Set the value to be written to the output.
Scaling settings			
Efficient Control Range Min	*0.00...100.00 %*	*0.00 %*	Effective control range of output, minimum limit.
Efficient Control Range Max	*0.00...100.00 %*	*100.00 %*	Effective control range of output, maximum limit.
Operating Mode Source	*Not Used / Controller 1 / Controller 2 / Auto*	*Not Used*	Operation mode source. Select the source that triggers the operation mode shift.
Min output, operation mode 1	*0.00...100.00 %*	*0.00 %*	Output range at day mode, low limit. This setting is available when the *Operating Mode Source* parameter value is not *Not Used*.
Min output, operation mode 2	*0.00...100.00 %*	*0.00 %*	Output range at night mode, low limit. This setting is available when the *Operating Mode Source* parameter value is not *Not Used*.
Min output, operation mode 3	*0.00...100.00 %*	*0.00 %*	Output range at eco mode, low limit. The setting is available when the *Operating Mode Source* parameter value is not *Not Used*.
Max output, operation mode 1	*0.00...100.00 %*	*100.00 %*	Output range at day mode, high limit. This setting is available when the *Operating Mode Source* parameter value is not *Not Used*.
Max output, operation mode 2	*0.00...100.00 %*	*100.00 %*	Output range at night mode, high limit. This setting is available when the *Operating Mode Source* parameter value is not *Not Used*.
Max output, operation mode 3	*0.00...100.00 %*	*100.00 %*	Output range at eco mode, high limit. This setting is available when the *Operating Mode Source* parameter value is not *Not Used*.

5.3.2.4 Available settings for current output

You can select current output as the output type for outputs 5 and 6.

Parameter name	Values	Default	Description
Output settings			

Parameter name	Values	Default	Description
Control Source	*BMS / Controller 1 / Controller 2 / Cascade-Controller / Input 1...6 / Room-Unit 1 / Room-Unit 2*	*Controller 1*	Output control source. Select the source for the output signal.
Output control type	*Heating / Heating thermostat / Cooling / Cooling thermostat / Heating and Cooling / Changeover / RH / CO2 / Maximum control*	*Maximum control*	Output control method. This setting is available when the *Control Source* parameter value is *Controller 1*, *Controller 2* or *Cascade-Controller*.
Room Unit Output Type	*Temperature / RH / CO2*	*Temperature*	Room unit output type. This setting is available when the *Control Source* parameter value is *Room-Unit 1* or *Room-Unit 2*.
Jam-Prevention Interval	*Off / 1 Day...7 Days*	*Off*	Jam prevention interval. The jam prevention function forces the actuator output open for a short time to prevent the valve from jamming. For example, if the jam prevention interval is *3 Days*, the control unit forces the actuator open once every 3 days.
Forcing settings			
Forcing Input Source	*Off / Input 1...6 / Room-Unit 1 / Room-Unit 2*	*Off*	Forcing input source. If you configured the software contact function for an input, select the input that overrides the output at the set input level.
Force invert output signal	*Disabled / Enabled*	*Disabled*	Forcing inversion. Inverts the output signal, if an input triggers the forcing function. This setting is available when the *Forcing Input Source* parameter value is not *Off*.
Forcing Input Type	*PIR-Detection / "Man in House" -Button / Occupancy (PIR or MIH) / Contact*	*PIR-Detection*	Forcing input type. This setting is available when the *Forcing Input Source* parameter value is *Room-Unit 1* or *Room-Unit 2*.
Force-Value	*0.00...100.00 %*	*0.00 %*	Forcing ON value for the forcing input source. Set the percentage for the calculated effect value. If an input triggers the forcing function, the control unit overrides the output with this value.
Off-Value	*0.00...100.00 %*	*0.00 %*	Forcing OFF value for forcing input source. Set the percentage for the calculated effect value when the output is off. The control unit overrides the output with this value when the override trigger from the input is released.
Override settings			
Output override	*Disabled / Enabled*	*Disabled*	Output override status. Enable to write a value to the output.
Output override value	*0.00...100.00 %*	*0.00 %*	Output override value. Set the value to be written to the output.
Scaling settings			

Parameter name	Values	Default	Description
Efficient Control Range Min	*0.00...100.00 %*	*0.00 %*	Effective control range of output, minimum limit.
Efficient Control Range Max	*0.00...100.00 %*	*100.00 %*	Effective control range of output, maximum limit.
Operating Mode Source	*Not Used / Controller 1 / Controller 2 / Auto*	*Not Used*	Operation mode source. Select the source that triggers the operation mode shift.
Min output, operation mode 1	*0.00...100.00 %*	*0.00 %*	Output range at day mode, low limit. This setting is available when the *Operating Mode Source* parameter value is not *Not Used*.
Min output, operation mode 2	*0.00...100.00 %*	*0.00 %*	Output range at night mode, low limit. This setting is available when the *Operating Mode Source* parameter value is not *Not Used*.
Min output, operation mode 3	*0.00...100.00 %*	*0.00 %*	Output range at eco mode, low limit. The setting is available when the *Operating Mode Source* parameter value is not *Not Used*.
Max output, operation mode 1	*0.00...100.00 %*	*100.00 %*	Output range at day mode, high limit. This setting is available when the *Operating Mode Source* parameter value is not *Not Used*.
Max output, operation mode 2	*0.00...100.00 %*	*100.00 %*	Output range at night mode, high limit. This setting is available when the *Operating Mode Source* parameter value is not *Not Used*.
Max output, operation mode 3	*0.00...100.00 %*	*100.00 %*	Output range at eco mode, high limit. This setting is available when the *Operating Mode Source* parameter value is not *Not Used*.
Current @ 0%	*0...20.000 mA*	*0.000 mA*	Output current at 0 % control signal. Set the value for the current output when the control output is 0 %.
Current @ 100%	*0...20.000 mA*	*20.000 mA*	Output current at 100 % control signal. Set the value for the current output when the control output is 100 %.
BACnet settings			
Current COV-limit	*0.001...10.000 mA*	*0.500 mA*	Change of Value limit for current.

5.3.2.5 Available settings for fan output

Parameter name	Values	Default	Description
Output settings			
Control Source	*BMS / Controller 1 / Controller 2 / Cascade-Controller / Input 1...6 / Room-Unit 1 / Room-Unit 2*	*Controller 1*	Output control source. Select the source for the output signal.

Parameter name	Values	Default	Description
Output control type	*Heating / Heating thermostat / Cooling / Cooling thermostat / Heating and Cooling / Changeover / RH / CO2 / Maximum control*	*Maximum control*	Output control method. This setting is available when the *Control Source* parameter value is *Controller 1*, *Controller 2* or *Cascade-Controller*.
Room Unit Output Type	*Temperature / RH / CO2*	*Temperature*	Room unit output type. This setting is available when the *Control Source* parameter value is *Room-Unit 1* or *Room-Unit 2*.
Forcing settings			
Forcing Input Source	*Off / Input 1...6 / Room-Unit 1 / Room-Unit 2*	*Off*	Forcing input source. If you configured the software contact function for an input, select the input that overrides the output at the set input level.
Forcing Input Type	*PIR-Detection / "Man in House" -Button / Occupancy (PIR or MIH) / Contact*	*PIR-Detection*	Forcing input type. This setting is available when the *Forcing Input Source* parameter value is *Room-Unit 1* or *Room-Unit 2*.
Force invert output signal	*Disabled / Enabled*	*Disabled*	Forcing inversion. Inverts the output signal, if an input triggers the forcing function. This setting is available when the *Forcing Input Source* parameter value is not *Off*.
Force-Value	*0.00...100.00 %*	*0.00 %*	Forcing ON value for the forcing input source. Set the percentage for the calculated effect value. If an input triggers the forcing function, the control unit overrides the output with this value.
Off-Value	*0.00...100.00 %*	*0.00 %*	Forcing OFF value for forcing input source. Set the percentage for the calculated effect value when the output is off. The control unit overrides the output with this value when the override trigger from the input is released.
Override settings			
Output override	*Disabled / Enabled*	*Disabled*	Output override status. Enable to write a value to the output.
Output override value	*0.00...100.00 %*	*0.00 %*	Output override value. Set the value to be written to the output.
Scaling settings			
Efficient Control Range Min	*0.00...100.00 %*	*0.00 %*	Effective control range of output, minimum limit.
Efficient Control Range Max	*0.00...100.00 %*	*100.00 %*	Effective control range of output, maximum limit.
Operating Mode Source	*Not Used / Controller 1 / Controller 2 / Auto*	*Not Used*	Operation mode source. Select the source that triggers the operation mode shift.
Min output, operation mode 1	*0.00...100.00 %*	*0.00 %*	Output range at day mode, low limit. This setting is available when the *Operating Mode Source* parameter value is not *Not Used*.

Parameter name	Values	Default	Description
Min output, operation mode 2	*0.00...100.00 %*	*0.00 %*	Output range at night mode, low limit. This setting is available when the *Operating Mode Source* parameter value is not *Not Used*.
Min output, operation mode 3	*0.00...100.00 %*	*0.00 %*	Output range at eco mode, low limit. The setting is available when the *Operating Mode Source* parameter value is not *Not Used*.
Max output, operation mode 1	*0.00...100.00 %*	*100.00 %*	Output range at day mode, high limit. This setting is available when the *Operating Mode Source* parameter value is not *Not Used*.
Max output, operation mode 2	*0.00...100.00 %*	*100.00 %*	Output range at night mode, high limit. This setting is available when the *Operating Mode Source* parameter value is not *Not Used*.
Max output, operation mode 3	*0.00...100.00 %*	*100.00 %*	Output range at eco mode, high limit. This setting is available when the *Operating Mode Source* parameter value is not *Not Used*.
Fan settings			
Fan speed mode	*Force step 0-3 / 4-Step auto / EC auto / Room-Unit 1 / Room-Unit 2 / Room-Unit 1 EC / Room-Unit 2 EC*	*4-Step auto*	Fan speed mode.
Fan speed 0, Volt output	*0...10.000 V*	*0.000 V*	Fan off voltage.
Fan speed 1, Volt output	*0...10.000 V*	*0.000 V*	Fan speed 1 voltage.
Fan speed 2, Volt output	*0...10.000 V*	*0.000 V*	Fan speed 2 voltage.
Fan speed 3, Volt output	*0...10.000 V*	*0.000 V*	Fan speed 3 voltage.
Fan speed 0, activate @ effect	*0.00...100.00 %*	*0.00 %*	Fan off power level on the proportional band.
Fan speed 1, activate @ effect	*0.00...100.00 %*	*33.33 %*	Fan speed 1 power level on the proportional band.
Fan speed 2, activate @ effect	*0.00...100.00 %*	*66.66 %*	Fan speed 2 power level on the proportional band.
Fan speed 3, activate @ effect	*0.00...100.00 %*	*100.00 %*	Fan speed 3 power level on the proportional band.
Fan speed step delay	*0...3600 s*	*0 s*	Fan speed changing delay.
Fan boost time	*Off, 1...10 s*	*Off*	Fan starting boost timer. Select the boost duration in this parameter to enable the timer.
Fan boost voltage	*0...10.000 V*	*0.000 V*	Fan starting boost voltage. This setting is available when the *Fan boost time* parameter value is not *Off*.
Max fan step in auto mode	*No limit / Fan speed 1 / Fan speed 2 / Fan speed 3*	*No limit*	Fan speed limit in automatic mode.
Fan turn off delay	*Off, 1...300 s*	*Off*	Fan turning off delay.

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Parameter name	Values	Default	Description
BACnet settings			
Voltage COV-limit	*0.001...5.000 V*	*0.100 V*	Change of Value limit for voltage.

5.3.2.6 Available settings for 6-way valve output

Parameter name	Values	Default	Description
Output settings			
Control Source	*BMS / Controller 1 / Controller 2 / Cascade-Controller / Input 1...6 / Room-Unit 1 / Room-Unit 2*	*Controller 1*	Output control source. Select the source for the output signal.
Output control type	*Heating / Heating thermostat / Cooling / Cooling thermostat / Heating and Cooling / Changeover / RH / CO2 / Maximum control*	*Maximum control*	Output control method. This setting is available when the *Control Source* parameter value is *Controller 1*, *Controller 2* or *Cascade-Controller*.
Room Unit Output Type	*Temperature / RH / CO2*	*Temperature*	Room unit output type. This setting is available when the *Control Source* parameter value is *Room-Unit 1* or *Room-Unit 2*.
Step 0 voltage, 6-way valve	*0.000...10.000 V*	*0.000 V*	Voltage for 6-way valve's step 0.
Step 1 voltage, 6-way valve	*0.000...10.000 V*	*5.000 V*	Voltage for 6-way valve's step 1.
Step 2 voltage, 6-way valve	*0.000...10.000 V*	*5.000 V*	Voltage for 6-way valve's step 2.
Step 3 voltage, 6-way valve	*0.000...10.000 V*	*10.000 V*	Voltage for 6-way valve's step 3.
Forcing settings			
Forcing Input Source	*Off / Input 1...6 / Room-Unit 1 / Room-Unit 2*	*Off*	Forcing input source. If you configured the software contact function for an input, select the input that overrides the output at the set input level.
Forcing Input Type	*PIR-Detection / "Man in House" -Button / Occupancy (PIR or MIH) / Contact*	*PIR-Detection*	Forcing input type. This setting is available when the *Forcing Input Source* parameter value is *Room-Unit 1* or *Room-Unit 2*.
Force invert output signal	*Disabled / Enabled*	*Disabled*	Forcing inversion. Inverts the output signal, if an input triggers the forcing function. This setting is available when the *Forcing Input Source* parameter value is not *Off*.
Force-Value	*0.00...100.00 %*	*0.00 %*	Forcing ON value for the forcing input source. Set the percentage for the calculated effect value. If an input triggers the forcing function, the control unit overrides the output with this value.

Parameter name	Values	Default	Description
Off-Value	*0.00...100.00 %*	*0.00 %*	Forcing OFF value for forcing input source. Set the percentage for the calculated effect value when the output is off. The control unit overrides the output with this value when the override trigger from the input is released.
Override settings			
Output override	*Disabled / Enabled*	*Disabled*	Output override status. Enable to write a value to the output.
Output override value	*0.00...100.00 %*	*0.00 %*	Output override value. Set the value to be written to the output.
Scaling settings			
Operating Mode Source	*Not Used / Controller 1 / Controller 2 / Auto*	*Not Used*	Operation mode source. Select the source that triggers the operation mode shift.
Min output, operation mode 1	*0.00...100.00 %*	*0.00 %*	Output range at day mode, low limit. This setting is available when the *Operating Mode Source* parameter value is not *Not Used*.
Min output, operation mode 2	*0.00...100.00 %*	*0.00 %*	Output range at night mode, low limit. This setting is available when the *Operating Mode Source* parameter value is not *Not Used*.
Min output, operation mode 3	*0.00...100.00 %*	*0.00 %*	Output range at eco mode, low limit. The setting is available when the *Operating Mode Source* parameter value is not *Not Used*.
Max output, operation mode 1	*0.00...100.00 %*	*100.00 %*	Output range at day mode, high limit. This setting is available when the *Operating Mode Source* parameter value is not *Not Used*.
Max output, operation mode 2	*0.00...100.00 %*	*100.00 %*	Output range at night mode, high limit. This setting is available when the *Operating Mode Source* parameter value is not *Not Used*.
Max output, operation mode 3	*0.00...100.00 %*	*100.00 %*	Output range at eco mode, high limit. This setting is available when the *Operating Mode Source* parameter value is not *Not Used*.
BACnet settings			
Voltage COV-limit	*0.001...5.000 V*	*0.100 V*	Change of Value limit for voltage.

5.3.3 Configuring room units

You can configure functions for up to two different room units. You can use two room units to

- measure temperature from two different sources to calculate the average temperature
- control two rooms with the two built-in controllers of the control unit.

RT-CO2 and RTX transmitter settings cannot be configured through the control unit. Configure their settings first using the MyProdual smartphone application. Configure the bus as the control source for the transmitter features which the control unit controls. Then select some other control source than bus for the remaining transmitter features.

To enable the room unit in the control unit settings, do the following:

1. Open the room unit's Modbus settings.
   a. Make sure that the Modbus address is 1 for room unit 1 and 2 for room unit 2.
   b. Make sure that the room unit has the same bus speed, parity, and stop bits as the *ROU* fields in the *RS-485 Settings*in the *General communication settings* of the control unit.

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2. Connect the MyProdual application to the control unit. See chapter Configuring control unit settings on page 37 for instructions.
3. Tap the *Component setup* button on the *Configuration* page to open the *Component setup* page.
4. Tap a number button in the *Room units* column to select the room unit you are going to configure.
5. If the room unit is disabled, tap the *Room unit* field and select *Enabled* to enable the room unit.
6. Configure the settings for the room unit.
   See the following chapter for more information about the settings.
7. Tap the *Confirm* button at the top of the page to save the changes to the application.
8. Tap the *Apply these settings to device* button at the bottom of the *Component setup* page to write the changes to the device.

5.3.3.1 Available settings for room units

Parameter name	Values	Default	Description
Operation mode settings			
Default Operation Mode	*Mode 1 / Mode 2 / Mode 3*	*Mode 1*	The default operation mode for the room unit.
Operation Mode Source	*BMS / Controller 1 / Controller 2*	*BMS*	The operation mode source controls when the room unit shifts between operation modes.
Setpoint settings			
Setpoint Center	*18...26 °C*	*21 °C*	Room unit setpoint centre. **Note:** To be able to use 0.5 °C steps, the room unit must support the feature. See input register X20 for the supported features.
Setpoint Limit	*1...16 °C*	*3 °C*	Room unit setpoint range. Set how much the user can change the setpoint from the setpoint centre. For example, if the setpoint range is set to 2 °C and the setpoint centre is set at 21 °C, the user can change the setpoint ±2 °C (from 19 °C to 23 °C). **Note:** To be able to use 0.5 °C steps, the room unit must support the feature. See input register X20 for the supported features.
Setpoint Step	*0.1...0.5 °C*	*0.5 °C*	Room unit setpoint deviation step. Set how much the setpoint changes when the user presses the setpoint buttons or turns the setpoint knob.
Temperature settings			
Temperature @ 0%	*-50.0...100.0 °C*	*-50.0 °C*	Room unit temperature at 0 %. Set the temperature value when the room unit sensor output is 0 %.
Temperature @ 100%	*-50.0...100.0 °C*	*50.0 °C*	Room unit temperature at 100 %. Set the temperature value when the room unit sensor output is 100 %.
%RH settings			
RH @ 0%	*0.00...100.00 %rh*	*0.00 %rh*	Room unit humidity at 0 %. Set the humidity value when the room unit sensor output is 0 %.

Parameter name	Values	Default	Description
RH @ 100%	*0.00...100.00 %rh*	*100.00 %rh*	Room unit humidity at 100 %. Set the humidity value when the room unit sensor output is 100 %.
CO_2 settings			
CO2 @ 0%	*0...10000 ppm*	*0 ppm*	Room unit CO_2 at 0 %. Set the CO_2 value when the room unit sensor output is 0 %.
CO2 @ 100%	*0...10000 ppm*	*2000 ppm*	Room unit CO_2 at 100 %. Set the CO_2 value when the room unit sensor output is 100 %.
Contact settings			
Contact Mode	*Not Used / Temperature / RH / CO2*	*Not Used*	Room unit contact mode. Select a mode to use input signal from the room unit as a contact input. The input switches on or off depending on the signal level. For example, the CO2 signal from the room unit switches the contact function on or off at a defined level.
Contact-On Level	*0.00...100.00 %*	*0.00 %*	Room unit contact on level. Set the input signal level for switching the input contact ON. Select the signal with the *Contact Mode* parameter.
Contact-Off Level	*0.00...100.00 %*	*0.00 %*	Room unit contact off level. Set the input signal level for switching the input contact OFF. Select the signal with the *Contact Mode* parameter.
Contact hold-on time	*0 h 0 min 0 s...18 h 12 min 15 s*	*0 h 0 min 0 s*	Room unit contact hold on time. Set the hours, minutes and seconds for the contact ON time. This time defines how long the contact stays on even if the *Contact-Off Level* condition is fulfilled.
Contact hold-off time	*0 h 0 min 0 s...18 h 12 min 15 s*	*0 h 0 min 0 s*	Room unit contact hold off time. Set the hours, minutes and seconds for the contact OFF time. This time defines how long the contact stays off even if the *Contact-Off Level* condition is fulfilled.
PIR settings			
PIR contact-on delay	*0 h 0 min 0 s...18 h 12 min 15 s*	*0 h 0 min 0 s*	PIR contact on delay. Set the hours, minutes and seconds for the delay after which the ON-signal from the PIR input switches the contact ON. The PIR signal must be ON for the duration defined in this parameter before the control unit switches the contact ON. For example, if you set this parameter to 30 seconds, an ON-signal from the room unit's PIR sensor must be ON for 30 seconds (movement in the room), before the control unit switches the contact on.
PIR hold-on delay	*0 h 0 min 0 s...18 h 12 min 15 s*	*0 h 0 min 0 s*	PIR contact hold on delay. This delay defines how long the PIR contact stays ON after the PIR sensor detects movement.
PIR turn-off delay	*0 h 0 min 0 s...18 h 12 min 15 s*	*0 h 0 min 0 s*	PIR contact turn off delay. This delay defines how long the control unit waits before it switches the PIR contact OFF.
PIR hold-off delay	*0 h 0 min 0 s...18 h 12 min 15 s*	*0 h 0 min 0 s*	PIR hold-off delay. The contact stays off for the duration defined in this parameter. The contact stays off even if the room unit's PIR sensor detects movement during this delay.
MIH settings			

Parameter name	Values	Default	Description
MIH hold-on delay	*0 h 0 min 0 s...18 h 12 min 15 s*	*0 h 0 min 0 s*	Occupancy button hold-on time. Set the duration for temporary day mode. For example, you can save energy in a conference room with this function. When the users come to the conference room, they press the occupancy button on the room unit. The control unit shifts to day mode for a time period defined in this parameter. After the time period passes, the control unit will automatically shift to night mode (energy saving mode) until someone presses the button again.
MIH button mode	*Reset MIH timer / Toggle MIH timer*	*Reset MIH timer*	Occupancy button function. *Reset MIH timer* — When you press the room unit button, the occupancy timer starts or restarts. *Toggle MIH timer* — When you press the room unit button, the occupancy status changes to on or off.
MIH feedback	*Disabled / Enabled*	*Disabled*	Occupancy button feedback. When the occupancy status is on, the room unit indicator light comes on. The indicator light goes off when the occupancy status changes. This function is available only in RU room units.
Display settings			
External Display Value Type	*Disabled / None / Temperature / CO2*	*Disabled*	Type of the external measurement value shown on the room unit's display.
External Display Value Source	*Internal sensor / Input 1...6 / Value from Modbus register*	*Internal sensor*	Source of the external measurement value shown on the room unit's display. This setting is available if the parameter *External Display Value Type* value is not *Disabled*. If the parameter value is *Value from Modbus register*, the control unit reads the value shown on the display from register X38. Replace the X with the room unit number (7 = room unit 1, 8 = room unit 2).

5.3.4 Configuring controllers

Controllers manage the control logic based on the input signals and the controller settings, and regulate the outputs accordingly. You can configure the setting for the three built-in controllers in the control unit: controller 1, controller 2, and cascade controller.

Examples for using more than one controller:

- In a two-room system, you can configure settings for controllers 1 and 2, and use one controller for each room.
- In a hotel room where floor heating is used, you can use controller 1 for the main room and the cascade controller for floor heating in the bathroom.

1. Tap the *Component setup* button on the *Configuration* page to open the *Component setup* page.
2. Tap a number button in the *Controllers* column to select controller 1 or 2, or tap *Cascade* to select the cascade controller.

3. Select the *Controller Type* and tap the *Ok* button.
   The following controller types are available:

Not Used	The controller is deactivated.
Heating	Controller regulates the heating.
Cooling	Controller regulates the cooling.
Heating and Cooling	Controller regulates the heating and cooling.

4. Configure the settings for the controller.
   See the following chapters for more information about the settings.
5. Tap the *Confirm* button at the top of the page to save the changes to the application.
6. Tap the *Apply these settings to device* button at the bottom of the *Component setup* page to write the changes to the device.

5.3.4.1 Available settings for controllers 1 and 2

Parameter name	Values	Default	Description
Measurement source			
Temperature Input (main)	*Off / Input 1...6 /Room-Unit 1 / Room-Unit 2*	*Room-Unit 1*	Main temperature input.
Temperature Input (additional for average)	*Off / Input 1...6 /Room-Unit 1 / Room-Unit 2*	*Off*	Secondary temperature input for average calculation. You can use the additional input to calculate the average temperature from the main input measurement data and the secondary input measurement data.
RH Input (main)	*Off / Input 1...6 /Room-Unit 1 / Room-Unit 2*	*Input 1*	Main humidity input.
RH Input (additional for average)	*Off / Input 1...6 /Room-Unit 1 / Room-Unit 2*	*Off*	Secondary humidity input for average calculation. This setting is available when the *RH Input (main)* parameter value is not *Off*.
CO2 Input (main)	*Off / Input 1...6 /Room-Unit 1 / Room-Unit 2*	*Room-Unit 1*	Main CO_2 input.
CO2 Input (additional for average)	*Off / Input 1...6 /Room-Unit 1 / Room-Unit 2*	*Off*	Secondary CO_2 input for average calculation. This setting is available when the *CO2 Input (main)* parameter value is not *Off*.
Setpoint Source			
Setpoint Source	*Active operation mode / Input 1...6 / Room-Unit 1 / Room-Unit 2*	*Room-Unit 1*	Source for setpoint.
Operation mode selection			
Operation Mode Change Method	*BMS Only / Room-Unit 1 Setting / Room-Unit 2 Setting / Select input source*	*Select input source*	The method for shifting between operation modes. Select the source for controlling the shift between operation modes.

Parameter name	Values	Default	Description
Mode1/Mode2 Input Source	*Off / Input 1...6 / Room-Unit 1 / Room-Unit 2*	*Off*	Input source for the day/night mode. Select the input that triggers the operation mode shift between day mode and night mode. This setting is available when the *Operation Mode Change Method* parameter value is *Select input source*.
Room Unit M1/M2 Input Type	*PIR-Detection / "Man in House" -Button / Occupancy (PIR OR MIH)*	*PIR-Detection*	Room unit occupancy input method. Set the input type for selecting operation modes 1 and 2 from the room unit. This setting is available when the *Mode1/Mode2 Input Source* parameter value is *Room-Unit 1* or *Room-Unit 2*.
ModeX/Mode3 Input Source	*Off / Input 1...6 / Room-Unit 1 / Room-Unit 2*	*Off*	Input source for eco mode activation. Select the input that activates and deactivates the eco mode. This setting is available when the *Operation Mode Change Method* parameter value is *Select input source*.
Room Unit MX/M3 Input Type	*Off / Input 1...6 / Room-Unit 1 / Room-Unit 2*	*PIR-Detection*	Room unit occupancy input method. Set the input type for selecting operation mode 3 from the room unit. This setting is available when the *ModeX/ Mode3 Input Source* parameter value is *Room-Unit 1* or *Room-Unit 2*.
Changeover Input Source	*Off / Input 1...6*	*Off*	Input source for the changeover function.
Operation mode 1-2-3 parameters			
Operation Mode 1 Setpoint	*2.0...32.0 °C*	*22.0 °C*	Day mode setpoint.
Operation Mode 2 Setpoint	*2.0...32.0 °C*	*22.0 °C*	Night mode setpoint.
Operation Mode 3 Setpoint	*2.0...32.0 °C*	*22.0 °C*	Eco mode setpoint.
Operation Mode 1 Dead Zone	*0.0...30.0 °C*	*1.0 °C*	Day mode dead zone.
Operation Mode 2 Dead Zone	*0.0...30.0 °C*	*3.0 °C*	Night mode dead zone.
Operation Mode 3 Dead Zone	*0.0...30.0 °C*	*8.0 °C*	Eco mode dead zone.
Reset setpoint and fan speed when entering operation mode 1	*Disabled / Input 1...6 / Room-Unit 1 / Room-Unit 2 / Active operation mode*	*Disabled*	Source for temperature and fan speed setpoints when entering day mode. The control unit resets the fan speed source to the source defined in the *Default fan speed after power failure* parameter.
Reset setpoint and fan speed when entering operation mode 2	*Disabled / Input 1...6 / Room-Unit 1 / Room-Unit 2 / Active operation mode*	*Disabled*	Source for setpoint when entering night mode. The control unit resets the fan speed source to the source defined in the *Default fan speed after power failure* parameter.
Reset setpoint and fan speed when entering operation mode 3	*Disabled / Input 1...6 / Room-Unit 1 / Room-Unit 2 / Active operation mode*	*Disabled*	Source for setpoint when entering eco mode. The control unit resets the fan speed source to the source defined in the *Default fan speed after power failure* parameter.
PI-controller			

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Parameter name	Values	Default	Description
P-band, Heating	*0...16.0 °C*	*1.5 °C*	Proportional band for heating. 1 °C is usually a good setting for a normal room.
P-band, Cooling	*0...16.0 °C*	*1.5 °C*	Proportional band for cooling. Usually, a value between 1.0 °C and 1.5 °C is a good setting for a normal room.
I-time (integral time)	*0...1200 s*	*160 s*	Controller integral time. If the *Separate I-time for cooling* parameter value is *Off*, the integral time defined in this parameter is common for both heating and cooling. If the parameter value is not *Off*, this value is the integral time for heating only.
Separate I-time for cooling	*Off, 1...1200 s*	*Off*	Separate integral time for cooling.
Maximum control			
Max control Influenced By Heating	*Enabled / Disabled*	*Disabled*	Maximum power influenced by heating. If the *Output control type* parameter value is *Maximum control*, select the signals that should control the output. The controller selects the highest values between the selected signals. For example, if cooling is highest, it will control the output according to the cooling effect. The controller always controls the output according to the signal that is highest at that moment.
Max control Influenced By Cooling	*Enabled / Disabled*	*Disabled*	Maximum control influenced by cooling.
Max control Influenced By RH	*Enabled / Disabled*	*Disabled*	Maximum control influenced by humidity.
Max control Influenced By CO2	*Enabled / Disabled*	*Disabled*	Maximum control influenced by CO_2.
Fan speed			
Default fan speed after power failure	*Disabled / Fan speed 1...3 / 4-Step auto / EC auto / Room-Unit 1 / Room-Unit 2 / Room-Unit 1 EC auto / Room-Unit 2 EC auto*	*Disabled*	Fan speed source after power failure or operation mode shift.

5.3.4.2 Available settings for cascade controller

Parameter name	Values	Default	Description
Measurement source			
Temperature Input (main)	*Off / Input 1...6 / Room-Unit 1 / Room-Unit 2*	*Off*	Main temperature input.
Temperature Input (additional for average)	*Off / Input 1...6 / Room-Unit 1 / Room-Unit 2*	*Off*	Secondary temperature input for average calculation.
Changeover Input Source	*Off / Input 1...6*	*Off*	Input source for the changeover function.

Parameter name	Values	Default	Description
Setpoint Source			
Setpoint Source	*Controller 1 / Controller 2*	*Controller 1*	Source for the setpoint.
Setpoint Source Mode	*Heating / Cooling / Heating and Cooling*	*Heating*	Setpoint source mode.
Setpoint Min	*2.0...32.0 °C*	*22.0 °C*	Setpoint range, minimum value.
Setpoint Max	*2.0...32.0 °C*	*22.0 °C*	Setpoint range, maximum value.
PI-controller			
Deadzone	*0.0...30.0 °C*	*1.0 °C*	Dead zone.
P-band, Heating	*0...16.0 °C*	*16.0 °C*	Heating proportional band. Typically 1 °C is a good setting for a normal room.
P-band, Cooling	*0...16.0 °C*	*16.0 °C*	Cooling proportional band. Typically 1.0...1.5 °C is a good setting for a normal room.
I-time (integral time)	*0...1200 s*	*720 s*	Controller integral time. If the *Separate I-time for cooling* parameter value is *Off*, the integral time is common for both heating and cooling. If the parameter value is not *Off*, this value is the integral time for heating.
Separate I-time for cooling	*Off, 1...1200 s*	*Off*	Separate integral time for cooling.

5.3.5 Configuring communication settings

1. Tap the *General communication settings* button on the *Configuration* page to open the *Edit settings* page.
2. Tap a parameter on the list to change its value.
   See the following chapter for more information about the settings.
3. Tap the *Confirm* button at the top of the page to save the changes to the application.
4. Tap the *Apply these settings to device* button at the bottom of the *Component setup* page to write the changes to the device.

5.3.5.1 Available settings for communication

Parameter name	Values	Default	Description
Ethernet Settings			
DHCP	*Enabled / Disabled*	*Disabled*	Enable DHCP. Enable to get the IP address from server.
IP-address	*xxx.xxx.xxx.xxx*	*192.168.1.1*	Ethernet IP address.
Subnet mask	*xxx.xxx.xxx.xxx*	*255.255.255.0*	Ethernet subnet mask.
Gateway	*xxx.xxx.xxx.xxx*	*192.168.1.1*	Ethernet gateway.
Primary DNS server	*xxx.xxx.xxx.xxx*	*10.10.1.7*	Primary DNS server for Ethernet.
Secondary DNS server	*xxx.xxx.xxx.xxx*	*10.10.1.6*	Secondary DNS server for Ethernet.
RS-485 Settings			
BMS RS-485 address	*1...247*	*1*	Modbus address (RS-485).

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Parameter name	Values	Default	Description
BMS RS-485 speed	*9600 / 14400 / 19200 / 38400 / 57600 / 115200 bit/s*	*9600 bit/s*	Modbus speed (RS-485).
BMS RS-485 parity	*None / Odd / Even*	*None*	Modbus parity (RS-485).
BMS RS-485 stop-bits	*1 Stop-Bit / 2 Stop-Bits*	*1 Stop-Bit*	Modbus stop bits (RS-485).
ROU RS-485 speed	*9600 / 19200 / 38400 / 57600 / 115200 bit/s*	*9600 bit/s*	Room unit bus speed (RS-485).
ROU RS-485 parity	*None / Odd / Even*	*None*	Room unit bus parity (RS-485).
ROU RS-485 stop-bits	*1 Stop-Bit / 2 Stop-Bits*	*1 Stop-Bit*	Room unit bus stop bits (RS-485).
BMS Communication Settings			
BMS communication mode	*Modbus TCP Ethernet / BACnet over Ethernet / BACnet over RS-485*	*Modbus TCP Ethernet*	Communication mode. *Modbus TCP Ethernet* — Modbus RTU and Modbus TCP *BACnet over Ethernet* — Modbus RTU, Modbus TCP and BACnet IP *BACnet over RS-485* — BACnet MSTP and Modbus TCP
BMS TCP Slave ID	*0...255*	*1*	Modbus TCP unit identifier. This setting is available when the *BMS communication mode* parameter value is *Modbus TCP Ethernet*.
BACnet device instance	*0...4194303*	*1000*	BACnet device instance identifier. This setting is available when the *BMS communication mode* parameter value is *BACnet over Ethernet* or *BACnet over RS-485*.
BACnet network number	*1...65534*	*1*	BACnet network number. The network number must be unique inside the network. This setting is available when the *BMS communication mode* parameter value is *BACnet over Ethernet* or *BACnet over RS-485*.
BACnet MAC address	*0...127*	*1*	BACnet MAC address. The address must be unique inside the network. This setting is available when the *BMS communication mode* parameter value is *BACnet over Ethernet* or *BACnet over RS-485*.
BACnet MS/TP max masters	*1...127*	*127*	Maximum address of a master device. This setting is available when the *BMS communication mode* parameter value is *BACnet over RS-485*.
BACnet MS/TP max info frames	*1...255*	*20*	Maximum number of information frames that a node can send before it has to pass the token. This setting is available when the *BMS communication mode* parameter value is *BACnet over RS-485*.

Parameter name	Values	Default	Description
BACnet MS/TP baud rate	*9600 / 19200 / 38400 / 57600 / 76800 / 115200 bit/s*	*38400*	BACnet MSTP speed. This setting is available when the *BMS communication mode* parameter value is *BACnet over RS-485*.
BACnet MS/TP parity	*None / Odd / Even*	*None*	BACnet MSTP parity. This setting is available when the *BMS communication mode* parameter value is *BACnet over RS-485*.
BACnet MS/TP stop-bits	*1 Stop-Bit / 2 Stop-Bits*	*1 Stop-Bit*	BACnet MSTP stop bits. This setting is available when the *BMS communication mode* parameter value is *BACnet over RS-485*.
BACnet foreign device	*Enabled / Disabled*	*Disabled*	BACnet foreign device. This setting is available when the *BMS communication mode* parameter value is *BACnet over Ethernet* or *BACnet over RS-485*.
BACnet/IP broadcast management device address	*xxx.xxx.xxx.xxx*	*0.0.0.0*	BACnet/IP broadcast management device address. This setting is available when the *BMS communication mode* parameter value is *BACnet over Ethernet* or *BACnet over RS-485*.
BACnet foreign device port	*0...65535*	*47808*	BACnet foreign device port. This setting is available when the *BMS communication mode* parameter value is *BACnet over Ethernet* or *BACnet over RS-485*.
Communication settings configurability			
Changeability of communication settings	*Allowed / Denied*	*Allowed*	Protect communication parameters from changing via Modbus RTU. *Allowed* — Changes allowed. *Denied* — Changes denied.

5.3.6 Saving and uploading configurations

If you have several devices to configure, you can save the configuration and then upload it to other devices.

You can save configurations to MyCloud cloud service or locally to your smartphone.

5.3.6.1 Saving the configuration to MyCloud

1. After you have configured the settings, tap the three dots in the upper right corner of the *Configuration* page.
2. Tap *Save to MyCloud* to save the new configuration to MyCloud.
3. Enter a name for the configuration in the *Configuration name* field.
4. If necessary, enter an optional description in the *Description* field.
5. Tap *Next* to select the saving location.
6. Select *Personal workspace* or *Shared workspace*, if your company has a shared workspace.
7. Tap *Save* to save the configuration.

5.3.6.2 Uploading a saved configuration to a control unit from MyCloud

1. Tap the cloud icon on top of the *Configuration* page.
2. Tap a saved configuration on the *Open configurations* page to select it.
3. Tap the *Open* button in the top right corner.

4. Select the settings you want to import in the *Import settings* popup.
5. Tap the *Open* button to open the configuration settings.
6. Tap the *Install to device* button at the bottom of the *Configuration* page to upload the settings to the device.

5.3.6.3 Saving the configuration locally

You can save configurations locally to your smartphone.

1. After you have configured the settings, tap the three dots in the upper right corner of the *Configuration* page.
2. Tap *Save configuration locally* to save the configuration to the smartphone MyProdual is installed in.
3. Enter a name for the configuration in the *Configuration name* field.
4. If necessary, enter an optional description in the *Description* field.
5. Tap *Next* to select the saving location.
6. Navigate to the correct folder.
   a. In Android, tap the Save button to save the configuration file.
   b. In iOS, tap Open to save the configuration file.

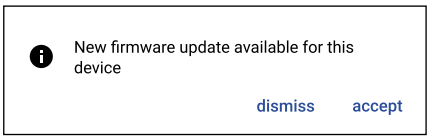
5.3.6.4 Uploading a locally saved configuration to a control unit

1. Tap the three dots in the upper right corner of the *Configuration* page.
2. Tap *Open local file* in the menu.
3. Tap a saved configuration to select it.
4. Select the settings you want to import in the *Import settings* popup.
5. Tap the *Open* button to open the configuration settings.
6. Tap the *Install to device* button at the bottom of the *Configuration* page to upload the settings to the device.

5.3.7 Updating device firmware

You can update the device firmware when the MyProdual application notifies you about the update.

1. Start the MyProdual application.
2. Connect the device to the MyProdual application.
3. Tap the *Accept* button on the update notification.



4. Review the update details and tap the *Install* button to start the update.
5. Wait for the firmware installation process to complete.

   Important: Keep the smartphone near the device to keep the Bluetooth connection active. If the connection is lost, the firmware update process cannot complete.

6. Tap the *Ok* button in the firmware update completion dialog.
7. Tap the *Close* button.

8. Tap the connection info button to disconnect the device.

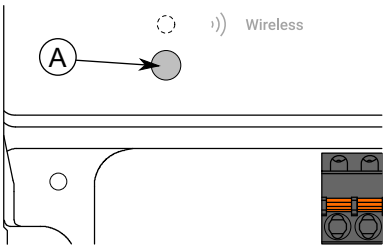


9. Remove the MyTool Connect dongle.

5.3.7.1 Resetting to factory firmware

If the firmware update fails, the device can be reset to factory firmware.

1. Disconnect the power supply.
2. Press and hold the connection button.



A. Connection button

3. Reconnect the power supply.
4. Wait for 30 seconds and release the button.

The factory firmware is now reset to the device.

6 Modbus

6.1 Modbus properties

Protocol	RS-485 Modbus RTU
Bus speed	9600*/14400/19200/38400/57600/115200 bit/s
Data bits	8
Parity	none*/odd/even
Stop bits	1* / 2
Modbus ID	1*
Unit load	1/4 UL
	* factory setting

Protocol	Modbus TCP
DHCP	Disabled*/Enabled
IP address	192.168.1.1*
Subnet mask	255.255.255.0*
Gateway	192.168.0.1*
Primary DNS	10.10.1.7*
Secondary DNS	10.10.1.6*
Modbus ID	1*
Unit ID	1*
	* factory setting

Important: This device writes the Modbus register values to non-volatile memory unless otherwise specified in this document. The non-volatile memory durability is 100000 write cycles.

6.2 Modbus function codes

The device supports the following Modbus function codes.

Decimal	Hexadec-imal	Function
3	0x03	Read Holding Registers
4	0x04	Read Input Registers
6	0x06	Write Single Register
16	0x10	Write Multiple Registers
23	0x17	Read/Write Multiple Registers

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6.3 Modbus registers

6.3.1 Input registers (read)

6.3.1.1 Input registers for device status

Input register	Parameter description	Data type	Values	Range
0	Error register.	U16	bits 0...3	0. Low voltage 1. RU1 communication 2. RU2 communication 3. Software version mismatch
1	Ethernet connection status.	U16	bits 0...1	0. Connection active 1. DHCP enabled
2	IP address 1/2 (IPv4). **XXX.XXX**.XXX.XXX	U16	*0...65535*	(0...255).(0...255)
3	IP address 2/2 (IPv4). XXX.XXX.**XXX.XXX**	U16	*0...65535*	(0...255).(0...255)
4	Subnet mask 1/2 (IPv4). **XXX.XXX**.XXX.XXX	U16	*0...65535*	(0...255).(0...255)
5	Subnet mask 2/2 (IPv4). XXX.XXX.**XXX.XXX**	U16	*0...65535*	(0...255).(0...255)
6	Gateway 1/2 (IPv4). **XXX.XXX**.XXX.XXX	U16	*0...65535*	(0...255).(0...255)
7	Gateway 2/2 (IPv4). XXX.XXX.**XXX.XXX**	U16	*0...65535*	(0...255).(0...255)
8	1st DNS 1/2 (IPv4). **XXX.XXX**.XXX.XXX	U16	*0...65535*	(0...255).(0...255)
9	1st DNS 2/2 (IPv4). XXX.XXX.**XXX.XXX**	U16	*0...65535*	(0...255).(0...255)
10	2nd DNS 1/2 (IPv4). **XXX.XXX**.XXX.XXX	U16	*0...65535*	(0...255).(0...255)
11	2nd DNS 2/2 (IPv4). XXX.XXX.**XXX.XXX**	U16	*0...65535*	(0...255).(0...255)

6.3.1.2 Input registers for inputs

Table reading instruction: The register numbers include an X in the middle. Replace the X with the input number you are reading.

Input register	Parameter description	Data type	Values	Range
X00	Input power.	S16	*0...10000*	0...100.00 %
X01	Input voltage.	S16	*0...10000*	0...10000 mV
X02	Resistance input value, high range	S16	*0...30000*	0...300000 Ω
X03	Resistance input value, low range	S16	*0...20000*	0...2000.0 Ω
X04	Temperature input value.	S16	*-500...1000*	-50.0...100.0 °C
X05	Humidity input value.	S16	*0...10000*	0...100.00 %rH
X06	CO_2 input value.	S16	*0...10000*	0...10000 ppm
X07	Contact input status.	S16	*0 - 1*	0. Inactive 1. Active
X08	Effective input power.	S16	*0...10000*	0...100.00 %

6.3.1.3 Input registers for room units

Table reading instruction: The register numbers include an X in the middle. Replace the X with the room unit number (7 = room unit 1 and 8 = room unit 2) you are adjusting.

Input register	Parameter description	Data type	Values	Range
X00	Room unit temperature value.	S16	*-500...500*	-50.0...50.0 °C
X01	Room unit humidity value.	S16	*0...10000*	0...100.00 %
X02	Room unit CO_2 value.	S16	*0...5000*	0...5000 ppm
X03	Room unit setpoint value.	S16	*20...420*	2.0...42.0 °C
X04	Room unit operation mode.	S16	*0 - 1 - 2 - 3*	0. Not selected 1. Day 2. Night 3. Eco
X05	Room unit fan speed.	S16	*0 - 1 - 2 - 3 - 4*	0. Off 1. Speed 1 2. Speed 2 3. Speed 3 4. Automatic
X06	Room unit PIR status.	S16	*0 - 1*	0. Inactive 1. Active
X07	Room unit occupancy button status.	S16	*0 - 1*	0. Inactive 1. Active
X08	Room unit temperature power.	S16	*0...10000*	0...100.00 %
X09	Room unit humidity power.	S16	*0...10000*	0...100.00 %
X10	Room unit CO_2 power.	S16	*0...10000*	0...100.00 %
X11	Room unit contact status.	S16	*0 - 1*	0. Inactive 1. Active
X12	Number of room unit communication errors.	U16	*0...65535*	0...65535
X13	Room unit feature reading status.	U16	*0 - 1 - 2*	0. Features not read 1. Feature read failed 2. Feature read successful
X14	Number of room unit feature registers.	U16	*0...65535*	0...65535
X15	Number of room unit input registers.	U16	*0...125*	0...125
X16	Number of room unit feature bits.	U16	*0...65535*	0...65535
X17	Room unit feature bits.	U16	bits 0...6	0. Humidity 1. CO_2 2. PIR 3. Left button 4. Right button 5. Encoder 6. Display

Input register	Parameter description	Data type	Values	Range
X18	Room unit left button function.	U16	*0 - 1 - 2 - 3*	0. Invalid function 1. User defined function 2. Occupancy 3. Fan speed
X19	Room unit right button function.	U16	*0 - 1 - 2 - 3*	0. Invalid function 1. User defined function 2. Occupancy 3. Fan speed
X20	Room unit extra software feature support.	U16	*0 - 1*	0. No features supported 1. 0.5 °C steps supported in setpoint centre
X21	Room unit device type.	U16	*0…65535*	0…65535
X22	Room unit hardware version.	U16	*0…65535*	0…65535
X23	Room unit serial number, most significant word.	U16	*0…65535*	0…65535
X24	Room unit serial number, least significant word.	U16	*0…65535*	0…65535
X25	Room unit firmware ID, most significant word.	U16	*0…65535*	0…65535
X26	Room unit firmware ID, least significant word.	U16	*0…65535*	0…65535
X27	Room unit firmware version, most significant word.	U16	*0…65535*	0…65535
X28	Room unit firmware version, least significant word.	U16	*0…65535*	0…65535
X29	Room unit VOC value (µg/m^3).	U16	*0…32767*	0…32767 µg/m^3
X30	Room unit VOC value (ppb).	U16	*0…10000*	0…10000 ppb
X31	Room unit VOC value (CO_2 equivalent).	U16	*0…10000*	0…10000 ppm
X32	Room unit VOC value (AQI).	U16	*1…5*	1…5

6.3.1.4 Input registers for outputs

Table reading instruction: The register numbers include an X in the middle. Replace the X with the output number you are adjusting.

Input register	Parameter description	Data type	Values	Range
1X00	Output power.	S16	*0…10000*	0…100.00 %
1X01	Output voltage.	S16	*0…10000*	0…10.000 V
1X02	Output current.	S16	*0…20000*	0…20.000 mA
1X03	Triac output status.	S16	*0 - 1*	0. Inactive 1. Active

Input register	Parameter description	Data type	Values	Range
1X04	Fan speed output value.	S16	*0 - 1 - 2 - 3*	0. Off 1. Speed 1 2. Speed 2 3. Speed 3
1X05	Fan speed percentage value.	S16	*0...10000*	0...10.000 %

6.3.1.5 Input registers for controllers 1 and 2

Table reading instruction: The register numbers include an X in the middle. Replace the X with the controller number (1 or 2) you are adjusting.

Input register	Parameter description	Data type	Values	Range
2X00	Controller heating output.	S16	*0...10000*	0...100.00 %
2X01	Controller cooling output.	S16	*0...10000*	0...100.00 %
2X02	Controller humidity output.	S16	*0...10000*	0...100.00 %
2X03	Controller CO_2 output.	S16	*0...10000*	0...100.00 %
2X04	Controller maximum selection output.	S16	*0...10000*	0...100.00 %
2X05	Controller 3P+ output status.	S16	*0 - 1*	0. Inactive 1. Active
2X06	Controller 3P- output status.	S16	*0 - 1*	0. Inactive 1. Active

6.3.1.6 Input registers for cascade controller

Input register	Parameter description	Data type	Values	Range
2300	Controller set point.	S16	*20...320*	2.0...32.0 °C
2301	Controller heating output.	S16	*0...10000*	0...100.00 %
2302	Controller cooling output.	S16	*0...10000*	0...100.00 %

6.3.1.7 Input registers for room unit input registers

The input register ranges 7000...7199 and 7200...7399 are reserved for room unit input registers that the control unit reads directly from the connected room units. The range 7000...7199 is for room unit 1 and the range 7200...7399 is for room unit 2.

The control unit reads the input registers 0...199 from the room unit. If the room unit input registers are not in this range, the controller cannot access them. For example, TRI room unit input register 200 is not accessible.

6.3.1.8 Input registers for device information

Input register	Parameter description	Data type	Values	Range
9900	Device type 1.	U16	*0...65535*	0...65535
9901	Device type 2.	U16	*0...65535*	0...65535

Input register	Parameter description	Data type	Values	Range
9902	Serial number 1.	U16	*0...65535*	0...65535
9903	Serial number 2.	U16	*0...65535*	0...65535
9904	Configuration number 1.	U16	*0...65535*	0...65535
9905	Configuration number 2.	U16	*0...65535*	0...65535
9906	Number of CPUs.	U16	*0...7*	0...7
9907	Number of PUMP bus devices.	U16	*0...7*	0...7
9908	Number of wireless devices.	U16	*0...100*	0...100
9909	Ethernet MAC address 1.	U16	*0...65535*	0...65535
9910	Ethernet MAC address 2.	U16	*0...65535*	0...65535
9911	Ethernet MAC address 3.	U16	*0...65535*	0...65535
9912	Bluetooth MAC address 1.	U16	*0...65535*	0...65535
9913	Bluetooth MAC address 2.	U16	*0...65535*	0...65535
9914	Bluetooth MAC address 3.	U16	*0...65535*	0...65535
9915	Memory status.	U16	*0 - 1 - 2 - ... - 6*	0. Idle 1. Loading latest configuration 2. Saving latest configuration 3. Loading default configuration 4. Saving default configuration 5. Loading calibration 6. Saving calibration
9916	Configuration compatibility.	U16	*0...65535*	0...65535
9917	Primary software ID1.	U16	*0...65535*	0...65535
9918	Primary software ID2.	U16	*0...65535*	0...65535
9919	Primary software version 1.	U16	*0...65535*	0...65535
9920	Primary software version 2.	U16	*0...65535*	0...65535

6.3.2 Holding registers (read/write)

6.3.2.1 Holding registers for communication

Note: The control unit must be restarted before the changes to the communication settings take effect. If the register is marked with an asterisk (*), restarting the control unit is not necessary.

Holding register	Parameter description	Data type	Values	Range	Default
12	Modbus address (RS-485).	U16	*0...255*	0...255	*1*

Holding register	Parameter description	Data type	Values	Range	Default
13	Modbus speed (RS-485).	U16	*0 - 1 - 2 - ... - 5*	0. 9600 bps 1. 14400 bps 2. 19200 bps 3. 38400 bps 4. 57600 bps 5. 115200 bps	*0*
14	Modbus parity (RS-485).	U16	*0 - 1 - 2*	0. None 1. Odd 2. Even	*0*
15	Modbus stop bits (RS-485).	U16	*0 - 1*	0. 1 stop bit 1. 2 stop bits	*0*
16	Not used.	U16	-	-	*1*
17	Room unit bus speed (RS-485).	U16	*0 - 1 - 2 - ... - 5*	0. 9600 bps 1. 14400 bps 2. 19200 bps 3. 38400 bps 4. 57600 bps 5. 115200 bps	*0*
18	Room unit bus parity (RS-485).	U16	*0 - 1 - 2*	0. None 1. Odd 2. Even	*0*
19	Room unit bus stop bits (RS-485).	U16	*0 - 1*	0. 1 stop bit 1. 2 stop bits	*0*
20	*Bluetooth status.	U16	*0 - 1*	0. Bluetooth disabled 1. Bluetooth enabled	*0*
21	BACnet device instance identifier, first two digits.	U16	*0...63*	0...63	*0*
22	BACnet device instance identifier, last five digits.	U16	*0...65535*	0...65535	*10000*
23	BACnet network number.	U16	*1...65534*	1...65534	*1*
24	BACnet MAC address.	U16	*0...127*	0...127	*1*
25	Maximum BACnet address of a master device.	U16	*1...127*	1...127	*127*
26	Maximum number of BACnet information frames that a node can send before it has to pass the token.	U16	*1...255*	1...255	*20*
27	BMS communication mode.	U16	*0 - 1 - 2*	0. Modbus RTU / Modbus TCP 1. Modbus RTU / Modbus TCP / BACnet IP 2. BACnet MSTP / BACnet IP	*0*

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Holding register	Parameter description	Data type	Values	Range	Default
28	BACnet foreign device.	U16	*0 - 1*	0. Disabled 1. Enabled	*0*
29	BACnet IP address 1/2 (IPv4). **XXX.XXX**.XXX.XXX	U16	*0...65535*	0...65535	*0*
30	BACnet IP address 2/2 (IPv4). XXX.XXX.**XXX.XXX**	U16	*0...65535*	0...65535	*0*
31	BACnet foreign device port.	U16	*0...65535*	0...65535	*47808*
32	BACnet MS/TP bus speed.	U16	*0 - 1 - 2 - ... - 5*	0. 9600 bps 1. 19200 bps 2. 38400 bps 3. 57600 bps 4. 76800 bps 5. 115200 bps	*2*
33	BACnet MS/TP parity.	U16	*0 - 1 - 2*	0. None 1. Odd 2. Even	*0*
34	BACnet MS/TP stop bits.	U16	*0 - 1*	0. 1 stop bit 1. 2 stop bits	*0*
35	Modbus TCP unit identifier.	U16	*0...255*	0...255	*1*

6.3.2.2 Holding register for protecting communication parameters

Holding register	Parameter description	Data type	Values	Range	Default
99	Protect communication parameters from changes transmitted over Modbus RTU.	U16	*0 - 1*	0. Changes allowed 1. Changes denied	*0*

6.3.2.3 Holding registers for inputs

Table reading instruction: The register numbers include an X in the middle. Replace the X with the input number you are adjusting.

Holding register	Parameter description	Data type	Values	Range	Default
X00	Input type.	S16	*0 - 1 - 2 - ... - 9*	0. Not used 1. Direct control 2. Temperature signal 3. Humidity signal 4. CO_2 signal 5. NTC 10 6. Pt1000 7. Resistive / Digital input 8. Potentiometer 9. PIR	*4*

Holding register	Parameter description	Data type	Values	Range	Default
X01	Input overdrive status.	S16	*0 - 1*	0. Disabled 1. Enabled	*0*
X02	Input overdrive value.	S16	*0...10000*	0...100.00 %	*0*
X03	Input voltage @ 0 %.	S16	*0...10000*	0...10.000 V	*0*
X04	Input voltage @ 100 %.	S16	*0...10000*	0...10.000 V	*10000*
X05	Input temperature at 0 %.	S16	*-500...1000*	-50.0...100.0 °C	*-500*
X06	Input temperature at 100 %.	S16	*-500...1000*	-50.0...100.0 °C	1000
X07	Input temperature offset.	S16	*-1000...1000*	-100.0...100.0 °C	*0*
X08	Input humidity at 0 %.	S16	*0...10000*	0...100.00 %rH	*0*
X09	Input humidity at 100 %.	S16	*0...10000*	0...100.00 %rH	*10000*
X10	Input humidity offset.	S16	*-5000...5000*	-50.00...50.00 %rH	*0*
X11	Input CO_2 at 0 %.	S16	*0...10000*	0...10000 ppm	*0*
X12	Input CO_2 at 100 %.	S16	*0...10000*	0...10000 ppm	*2000*
X13	Input CO_2 offset	S16	*-200....200*	-200...200 ppm	*0*
X14	Contact on level.	S16	*0...10000*	0...100.00 %	*9000*
X15	Contact off level.	S16	*0...10000*	0...100.00 %	*100*
X16	Contact on level.	S16	*0...30000*	0...300000 Ω	*100*
X17	Contact off level.	S16	*0...30000*	0...300000 Ω	*50*
X18	Contact hold on time (seconds).	S16	*0...59*	0...59 s	*0*
X19	Contact hold on time (minutes).	S16	*0...59*	0...59 min	*0*
X20	Contact hold on time (hours).	S16	*0...60*	0...60 h	*0*
X21	Contact hold off time (seconds).	S16	*0...59*	0...59 s	*0*
X22	Contact hold off time (minutes).	S16	*0...59*	0...59 min	*0*
X23	Contact hold off time (hours).	S16	*0...60*	0...60 h	*0*
X24	Efficient control range min	S16	*0...10000*	0...100.00 %	*3500*
X25	Efficient control range max	S16	*0...10000*	0...100.00 %	*6000*
X26	COV limit for voltage.	S16	*1...5000*	0.001...5.000 V	*100*
X27	COV limit for temperature.	S16	*1...500*	0.1....50.0 °C	*5*
X28	COV limit for humidity.	S16	*1...5000*	0.01...50.00 %	*500*
X29	COV limit for CO_2.	S16	*1...1000*	0...1000 ppm	*50*
X30	COV limit for resistance, high.	U16	*1...15000*	10...150000 Ω	*100*
X31	COV limit for resistance, low.	S16	*1...1000*	0.1...100.0 Ω	*50*
X32	Resistance high, minimum.	U16	*0...30000*	0...300000 Ω	*0*
X33	Resistance high, maximum.	U16	*0...30000*	0...300000 Ω	*1000*
X34	Resistance high, offset.	S16	*-10000...10000*	-100000...100000 Ω	*0*
X35	Input reaction time.	S16	*0 - 1*	0. Normal 1. Fast	*0*

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Holding register	Parameter description	Data type	Values	Range	Default
X36	Input contact turn on delay (seconds).	U16	*0...59*	0...59 s [1)]	*0*
X37	Input contact turn on delay (minutes).	U16	*0...59*	0...59 min [1)]	*0*
X38	Input contact turn on delay (hours).	U16	*0...18*	0...18 h	*0*
X39	Input contact turn off delay (seconds).	U16	*0...59*	0...59 s [1)]	*0*
X40	Input contact turn off delay (minutes).	U16	*0...59*	0...59 min [1)]	*0*
X41	Input contact turn off delay (hours).	U16	*0...18*	0...18 h	*0*

[1)] Maximum timer value is 18 hours, 12 minutes and 15 seconds.

6.3.2.4 Holding registers for room units

Table reading instruction: The register numbers include an X in the middle. Replace the X with the room unit number (7 = room unit 1 and 8 = room unit 2) you are adjusting.

Holding register	Parameter description	Data type	Values	Range	Default
X00	Enable room unit.	S16	*0 - 1*	0. Disabled 1. Enabled	*1*
X01	Room unit setpoint centre. **Note:** To be able to use 0.5 °C steps, the room unit must support the feature. See input register X20 for the supported features.	S16	*18...26 / 32786... 32793*	18...26 °C / 18.5...25.5 °C	*21*
X02	Room unit setpoint range. **Note:** To be able to use 0.5 °C steps, the room unit must support the feature. See input register X20 for the supported features.	S16	*1...16 / 32769... 32783*	1...16 °C / 1.5...15.5 °C	*3*
X03	Room unit setpoint deviation step.	S16	*1...5*	0.1...0.5 °C	*5*
X04	Room unit contact mode.	S16	*0 - 1 - 2 - 3*	0. Not in use 1. Temperature 2. Humidity 3. CO_2	*0*
X05	Room unit temperature at 0 %.	S16	*-500...1000*	-50.0...100.0 °C	*-500*
X06	Room unit temperature at 100 %.	S16	*-500...1000*	-50.0...100.0 °C	*500*
X07	Room unit humidity at 0 %.	S16	*0...10000*	0...100.00 %rH	*0*
X08	Room unit humidity at 100 %.	S16	*0...10000*	0...100.00 %rH	*10000*

Holding register	Parameter description	Data type	Values	Range	Default
X09	Room unit CO_2 at 0 %.	S16	*0...5000*	0...5000 ppm	*0*
X10	Room unit CO_2 at 100 %.	S16	*0...10000*	0...10000 ppm	*2000*
X11	Room unit contact on level.	S16	*0...10000*	0...100.00 %	*0*
X12	Room unit contact off level.	S16	*0...10000*	0...100.00 %	*0*
X13	Room unit contact hold on time (seconds).	S16	*0...59*	0...59 s [1)]	*0*
X14	Room unit contact hold on time (minutes).	S16	*0...59*	0...59 min [1)]	*0*
X15	Room unit contact hold on time (hours).	S16	*0...18*	0...18 h	*0*
X16	Room unit contact hold off time (seconds).	S16	*0...59*	0...59 s [1)]	*0*
X17	Room unit contact hold off time (minutes).	S16	*0...59*	0...59 min [1)]	*0*
X18	Room unit contact hold off time (hours).	S16	*0...18*	0...18 h	*0*
X19	PIR contact on delay (seconds).	S16	*0...59*	0...59 s	*0*
X20	PIR contact on delay (minutes).	S16	*0...59*	0...59 min	*0*
X21	PIR contact hold on delay (seconds).	S16	*0...59*	0...59 s [1)]	*0*
X22	PIR contact hold on delay (minutes).	S16	*0...59*	0...59 min [1)]	*0*
X23	PIR contact hold on delay (hours).	S16	*0...18*	0...18 h	*0*
X24	Occupancy button hold on time (seconds).	S16	*0...59*	0...59 s [1)]	*0*
X25	Occupancy button hold on time (minutes).	S16	*0...59*	0...59 min [1)]	*0*
X26	Occupancy button hold on time (hours).	S16	*0...18*	0...18 h	*0*
X27	Room unit setpoint.	S16	*20...420*	20...420	-
X28	Room unit operation mode.	S16	*0 - 1 - 2 - 3*	0. Not selected 1. Day 2. Night 3. Eco	-
X29	Room unit fan speed.	S16	*0 - 1 - 2 - 3 - 4*	0. Off 1. Speed 1 2. Speed 2 3. Speed 3 4. Automatic	-
X30	PIR status.	S16	*0 - 1*	0. Inactive 1. Active	-
X31	Occupancy button status.	S16	*0 - 1*	0. Inactive 1. Active	-

Holding register	Parameter description	Data type	Values	Range	Default
X32	COV limit for temperature.	S16	*1...500*	0.1....50.0 °C	*5*
X33	COV limit for humidity.	S16	*1...5000*	0.01...50.00 %	*500*
X34	COV limit for CO_2.	S16	*1...1000*	0...1000 ppm	*50*
X35	Default operation mode.	S16	*0 - 1 - 2*	0. Day 1. Night 2. Eco	*0*
X36	Operation mode source.	S16	*0 - 1 - 2*	0. BMS 1. Controller 1 2. Controller 2	*0*
X37	Source for the external measurement value in room unit's display.	S16	*0 - 1 - 2 - ... - 7*	0. Value from room unit's own register 1. Input 1 2. Input 2 3. Input 3 4. Input 4 5. Input 5 6. Input 6 7. Register X38 value	*0*
X38	External display value. The value is used if the register X37 value is 7. The value is set to 0 after a power failure.	S16	*-32768...32767*	-32768...32767	*0*
X39	Type for the external measurement value in room unit's display.	S16	*-1 - 0 - 1 - 3*	-1 = Functionality disabled 0. No unit 1. Temperature 2. N/A 3. CO_2	*-1*
X40	Room unit PIR turn off delay (seconds).	U16	*0...59*	0...59 s [1)]	*0*
X41	Room unit PIR turn off delay (minutes).	U16	*0...59*	0...59 min [1)]	*0*
X42	Room unit PIR turn off delay (hours).	U16	*0...18*	0...18 h	*0*
X43	Room unit PIR hold off delay (seconds).	U16	*0...59*	0...59 s [1)]	*0*
X44	Room unit PIR hold off delay (minutes).	U16	*0...59*	0...59 min [1)]	*0*
X45	Room unit PIR hold off delay (hours).	U16	*0...18*	0...18 h	*0*
X46	Occupancy button mode.	U16	*0 - 1*	0. Reset occupancy timer 1. Toggle occupancy	*0*
X47	Occupancy button feedback status.	U16	*0 - 1*	0. Disabled 1. Enabled	*0*

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[1] Maximum timer value is 18 hours, 12 minutes and 15 seconds.

6.3.2.5 Holding registers for outputs

Table reading instruction: The register numbers include an X in the middle. Replace the X with the output number you are adjusting.

Holding register	Parameter description	Data type	Values	Range	Default
1X00	Output type for the outputs 1...4.	S16	*0 - 1 - 2 - ... - 6*	0. Not in use 1. Analogue voltage 2. 6-way valve 3. Fan 4. 24 Vac 5. 3-point actuator + 6. 3-point actuator -	*4*
1X00	Output type for the outputs 5...6.	S16	*0 - 1 - 2 - 3 - 6*	0. Not in use 1. Analogue voltage 2. 6-way valve 3. Fan 4. N/A 5. N/A 6. Analogue current	*0*
1X01	Output control source.	S16	*0 - 1 - 2 - ... - 11*	0. BMS 1. Controller 1 2. Controller 2 3. Cascade controller 4. Input 1 5. Input 2 6. Input 3 7. Input 4 8. Input 5 9. Input 6 10. Room unit 1 11. Room unit 2	*0*
1X02	Output control method.	S16	*0 - 1 - 2 - ... - 6*	0. Heating 1. Cooling 2. Change-over 3. Humidity 4. CO_2 5. Maximum selection 6. Heating and cooling 7. Heating thermostat 8. Cooling thermostat 9. Heating and cooling thermostat	*0*
1X03	3-point actuator + output. Set this register only for the 3-point actuator - output.	S16	*0 - 1 - 2 - 3 - 4*	0. Not set 1. Output 1 2. Output 2 3. Output 3 4. Output 4	*0*

Holding register	Parameter description	Data type	Values	Range	Default
1X04	3-point actuator running time. Set this register only for the 3-point actuator + output.	S16	*0...1200*	0...1200 s	*720*
1X05	Not in use.	S16	-	-	*0*
1X06	Room unit output type.	S16	*0 - 1 - 2*	0. Temperature 1. Humidity 2. CO_2	*0*
1X07	Output override source.	S16	*0 - 1 - 2 - ... - 8*	0. Off 1. Input 1 2. Input 2 3. Input 3 4. Input 4 5. Input 5 6. Input 6 7. Room unit 1 8. Room unit 2	4
1X08	Room unit override type.	S16	*0 - 1 - 2 - 3*	0. PIR detection 1. Occupancy button 2. Occupancy detection 3. Contact	*0*
1X09	Override inversion.	S16	*0 - 1*	0. Disabled 1. Enabled	*0*
1X10	Override value for override source.	S16	*0...10000*	0...100.00 %	*0*
1X11	Fan off value.	S16	*0...10000*	0...100.00 %	*0*
1X12	24 Vac output inversion.	S16	*0 - 1*	0. Disabled 1. Enabled	*0*
1X13	Enable direct output override.	S16	*0 - 1*	0. Override disabled 1. Override enabled	*0*
1X14	Direct override value.	S16	*0...10000*	0...100.00 %	*0*
1X15	Effective control range of output, minimum limit.	S16	*0...10000*	0...100.00 %	*0*
1X16	Effective control range of output, maximum limit.	S16	*0...10000*	0...100.00 %	*10000*
1X17	Operating mode source.	S16	*0 - 1 - 2 - 3*	0. Not in use 1. Controller 1 2. Controller 2 3. Automatic	*0*
1X18	Voltage output range at day mode, low limit.	S16	*0...10000*	0...100.00 %	*0*
1X19	Voltage output range at night mode, low limit.	S16	*0...10000*	0...100.00 %	*0*
1X20	Voltage output range at eco mode, low limit.	S16	*0...10000*	0...100.00 %	*0*

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Holding register	Parameter description	Data type	Values	Range	Default
1X21	Voltage output range at day mode, high limit.	S16	*0...10000*	0...100.00 %	*0*
1X22	Voltage output range at night mode, high limit.	S16	*0...10000*	0...100.00 %	*0*
1X23	Voltage output range at eco mode, high limit.	S16	*0...10000*	0...100.00 %	*0*
1X24	Output voltage at 0 %.	S16	*0...10000*	0...10.000 V	*0*
1X25	Output voltage at 100 %.	S16	*0...10000*	0...10.000 V	*10000*
1X26	Output current at 0 %.	S16	*0...20000*	0...20.000 mA	*0*
1X27	Output current at 100 %.	S16	*0...20000*	0...20.000 mA	*20000*
1X28	Fan speed mode.	S16	*0 - 1 - 2 - ... - 9*	0. Off 1. Speed 1 2. Speed 2 3. Speed 3 4. Automatic 5. Automatic EC 6. Room unit 1, 3-speed 7. Room unit 2, 3-speed 8. Room unit 1, EC 9. Room unit 2, EC	*4*
1X29	Fan off voltage.	S16	*0...10000*	0...10.000 V	*0*
1X30	Fan speed 1 voltage.	S16	*0...10000*	0...10.000 V	*0*
1X31	Fan speed 2 voltage.	S16	*0...10000*	0...10.000 V	*0*
1X32	Fan speed 3 voltage.	S16	*0...10000*	0...10.000 V	*0*
1X33	Fan off power.	S16	*0...10000*	0...10.000 V	*0*
1X34	Fan speed 1 power.	S16	*0...10000*	0...100.00 %	*3333*
1X35	Fan speed 2 power.	S16	*0...10000*	0...100.00 %	*6666*
1X36	Fan speed 3 power.	S16	*0...10000*	0...100.00 %	*10000*
1X37	Fan speed changing delay.	S16	*0...3600*	0...3600 s	*0*
1X38	PWM pulse width.	S16	*0...1200*	0...1200 s	*600*
1X39	Valve jam prevention function interval.	S16	*0 - 1 - 2 - ... - 7*	0. Function off 1. 1 day 2. 2 days 3. 3 days 4. 4 days 5. 5 days 6. 6 days 7. 7 days	*1*
1X40	COV limit, voltage.	S16	*1...5000*	0.001...5.000 V	*100*
1X41	COV limit, current.	S16	*1...10000*	0.001...10.000 mA	*500*
1X42	6-way valve cooling low limit voltage.	S16	*0...10000*	0...10.000 V	*0*

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Holding register	Parameter description	Data type	Values	Range	Default
1X43	6-way valve cooling high limit voltage.	S16	*0...10000*	0...10.000 V	*5000*
1X44	6-way valve heating low limit voltage.	S16	*0...10000*	0...10.000 V	*5000*
1X45	6-way valve heating high limit voltage.	S16	*0...10000*	0...10.000 V	*10000*
1X46	Not in use.	S16	-	-	*0*
1X47	Not in use.	S16	-	-	*0*
1X48	Fan starting boost timer.	S16	*0...10*	0 = off, 1...10 s	*0*
1X49	Fan starting boost voltage.	S16	*0...10000*	0...10.000 V	*0*
1X50	Fan speed limit in automatic mode.	S16	*0 - 1 - 2 - 3*	0. No limit 1. Speed 1 2. Speed 2 3. Speed 3	*0*
1X51	Fan turning off delay.	S16	*0...300*	0...300 s	*0*
1X52	Fan ON minimum voltage.	S16	*0...10000*	0...10.000 V	*0*

6.3.2.6 Holding registers for controllers 1 and 2

Table reading instruction: The register numbers include an X in the middle. Replace the X with the controller number (1 or 2) you are adjusting.

Holding register	Parameter description	Data type	Values	Range	Default
2X00	Controller type.	S16	*0 - 1 - 2 - 3*	0. Not in use 1. Heating 2. Cooling 3. Heating and cooling	*3*
2X01	Main temperature input.	S16	*0 - 1 - 2 - ... - 8*	0. Not in use 1. Input 1 2. Input 2 3. Input 3 4. Input 4 5. Input 5 6. Input 6 7. Room unit 1 8. Room unit 2	*7*
2X02	Secondary temperature input for average calculation.	S16	*0 - 1 - 2 - ... - 8*	0. Not in use 1. Input 1 2. Input 2 3. Input 3 4. Input 4 5. Input 5 6. Input 6 7. Room unit 1 8. Room unit 2	*0*

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Holding register	Parameter description	Data type	Values	Range	Default
2X03	Main humidity input.	S16	*0 - 1 - 2 - ... - 8*	0. Not in use 1. Input 1 2. Input 2 3. Input 3 4. Input 4 5. Input 5 6. Input 6 7. Room unit 1 8. Room unit 2	*1*
2X04	Secondary humidity input for average calculation.	S16	*0 - 1 - 2 - ... - 8*	0. Not in use 1. Input 1 2. Input 2 3. Input 3 4. Input 4 5. Input 5 6. Input 6 7. Room unit 1 8. Room unit 2	*0*
2X05	Main CO_2 input.	S16	*0 - 1 - 2 - ... - 8*	0. Not in use 1. Input 1 2. Input 2 3. Input 3 4. Input 4 5. Input 5 6. Input 6 7. Room unit 1 8. Room unit 2	*7*
2X06	Secondary CO_2 input.	S16	*0 - 1 - 2 - ... - 8*	0. Not in use 1. Input 1 2. Input 2 3. Input 3 4. Input 4 5. Input 5 6. Input 6 7. Room unit 1 8. Room unit 2	*0*
2X07	Source for set point.	S16	*0 - 1 - 2 - ... - 8*	0. Active mode 1. Input 1 2. Input 2 3. Input 3 4. Input 4 5. Input 5 6. Input 6 7. Room unit 1 8. Room unit 2	*7*

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Holding register	Parameter description	Data type	Values	Range	Default
2X08	Operation mode change method.	S16	*0 - 1 - 2 - 3*	0. BMS only 1. Room unit 1 setting 2. Room unit 2 setting 3. Separate bits	*3*
2X09	Day/night mode source.	S16	*0 - 1 - 2 - ... - 8*	0. Not in use 1. Input 1 2. Input 2 3. Input 3 4. Input 4 5. Input 5 6. Input 6 7. Room unit 1 8. Room unit 2	*3*
2X10	Room unit day/night mode input type.	S16	*0 - 1 - 2*	0. PIR detection 1. Occupancy button 2. Occupancy detection	*0*
2X11	Eco mode activation source.	S16	*0 - 1 - 2 - ... - 8*	0. Not in use 1. Input 1 2. Input 2 3. Input 3 4. Input 4 5. Input 5 6. Input 6 7. Room unit 1 8. Room unit 2	*7*
2X12	Room unit eco mode input type.	S16	*0 - 1 - 2*	0. PIR detection 1. Occupancy button 2. Occupancy (PIR detection or occupancy button)	*2*
2X13	Changeover input.	S16	*0 - 1 - 2 - ... - 60 - 1 - 2 - 3*	0. Not in use 1. Input 1 2. Input 2 3. Input 3 4. Input 4 5. Input 5 6. Input 6	*0*
2X14	Day mode setpoint.	S16	*20...320*	2.0...32.0 °C	*220*
2X15	Night mode setpoint.	S16	*20...320*	2.0...32.0 °C	*220*
2X16	Eco mode setpoint.	S16	*20...320*	2.0...32.0 °C	*220*
2X17	Day mode dead zone.	S16	*0...300*	0...30.0 °C	*10*
2X18	Night mode dead zone.	S16	*0...300*	0...30.0 °C	*30*
2X19	Eco mode dead zone.	S16	*0...300*	0...30.0 °C	*80*
2X20	Heating proportional band.	S16	*0...160*	0...16.0 °C	*15*

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Holding register	Parameter description	Data type	Values	Range	Default
2X21	Cooling proportional band.	S16	*0...160*	0...16.0 °C	*15*
2X22	Controller integral time. If the register 2X32 value is 0, the integral time is common for both heating and cooling. If the register value is not 0, this value is the integral time for heating.	S16	*0...1200*	0...1200 s	*160*
2X23	Maximum power influenced by heating.	S16	*0 - 1*	0. Disabled 1. Enabled	*0*
2X24	Maximum power influenced by cooling.	S16	*0 - 1*	0. Disabled 1. Enabled	*0*
2X25	Maximum control influenced by humidity.	S16	*0 - 1*	0. Disabled 1. Enabled	*1*
2X26	Maximum control influenced by CO_2.	S16	*0 - 1*	0. Disabled 1. Enabled	*1*
2X27	Current controller setpoint.	S16	*20...320*	2.0...32.0 °C	-
2X28	Active operation mode.	S16	*0 - 1 - 2*	0. Day mode 1. Night mode 2. Eco mode	-
2X29	Fan speed after power failure or operating mode change.	S16	*0 - 1 - 2 - ... - 9*	0. Functionality disabled 1. Speed 1 2. Speed 2 3. Speed 3 4. Automatic 5. Automatic EC 6. Room unit 1, 3-speed 7. Room unit 2, 3-speed 8. Room unit 1, EC 9. Room unit 2, EC	*0*
2X30	Source for setpoint when entering day mode. The fan speed is reset to the speed defined with the register *2X29*.	S16	*0 - 1 - 2 - ... - 9*	0. Functionality disabled 1. Input 1 2. Input 2 3. Input 3 4. Input 4 5. Input 5 6. Input 6 7. Room unit 1 8. Room unit 2 9. Active operation mode	*0*

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Holding register	Parameter description	Data type	Values	Range	Default
2X31	Source for setpoint when entering night mode. The fan speed is reset to the speed defined with the register *2X29*.	S16	*0 - 1 - 2 - ... - 9*	0. Functionality disabled 1. Input 1 2. Input 2 3. Input 3 4. Input 4 5. Input 5 6. Input 6 7. Room unit 1 8. Room unit 2 9. Active operation mode	*0*
2X32	Source for setpoint when entering eco mode. The fan speed is reset to the speed defined with the register *2X29*.	S16	*0 - 1 - 2 - ... - 9*	0. Functionality disabled 1. Input 1 2. Input 2 3. Input 3 4. Input 4 5. Input 5 6. Input 6 7. Room unit 1 8. Room unit 2 9. Active operation mode	*0*
2X33	Separate integral time for cooling.	S16	*0...1200*	0 = off, 1...1200 s	*0*
2X34	Change-over function state.	S16	*0 - 1*	0. Heating 1. Cooling	*0*

6.3.2.7 Holding registers for cascade controller

Holding register	Parameter description	Data type	Values	Range	Default
2300	Controller type.	S16	*0 - 1 - 2 - 3*	0. Not in use 1. Heating 2. Cooling 3. Heating and cooling	*0*
2301	Main temperature input.	S16	*0 - 1 - 2 - ... - 8*	0. Not in use 1. Input 1 2. Input 2 3. Input 3 4. Input 4 5. Input 5 6. Input 6 7. Room unit 1 8. Room unit 2	*0*

Holding register	Parameter description	Data type	Values	Range	Default
2302	Secondary temperature input for average calculation.	S16	*0 - 1 - 2 - ... - 8*	0. Not in use 1. Input 1 2. Input 2 3. Input 3 4. Input 4 5. Input 5 6. Input 6 7. Room unit 1 8. Room unit 2	*0*
2303	Not in use.	S16	-	-	*0*
2304	Source for set point.	S16	*0 - 1*	0. Controller 1 1. Controller 2	*0*
2305	Set point source mode.	S16	*0 - 1 - 2*	0. Heating 1. Cooling 2. Heating and cooling	*0*
2306	Set point range, minimum value.	S16	*20...320*	2.0...32.0 °C	*220*
2307	Set point range, maximum value.	S16	*20...320*	2.0...32.0 °C	*220*
2308	Dead zone.	S16	*0...300*	0...30.0 °C	*10*
2309	Heating proportional band.	S16	*0...160*	0...16.0 °C	*160*
2310	Cooling proportional band.	S16	*0...160*	0...16.0 °C	*160*
2311	Controller integral time. If the register 2312 value is 0, the integral time is common for both heating and cooling. If the register value is not 0, this value is the integral time for heating.	S16	*0...1200*	0...1200 s	*720*
2312	Separate integral time for cooling.	S16	*0...1200*	0 = off, 1...1200 s	*0*
2313	Change-over function state.	S16	*0 - 1*	0. Heating 1. Cooling	*0*

6.3.2.8 Holding registers for temporary overdrive control

Holding register	Parameter description	Data type	Values	Range	Default
9000	Temporary overdrive timer.	U16	*0...65535*	0...65535 min	*0*
9001	Temporary overdrive, input 1.	S16	*-1...1000*	-1 = disabled, 0...100.00 %	*-1*
9002	Temporary overdrive, input 2.	S16	*-1...1000*	-1 = disabled, 0...100.00 %	*-1*
9003	Temporary overdrive, input 3.	S16	*-1...1000*	-1 = disabled, 0...100.00 %	*-1*
9004	Temporary overdrive, input 4.	S16	*-1...1000*	*-1*	*-1*
9005	Temporary overdrive, input 5.	S16	*-1...1000*	*-1*	*-1*
9006	Temporary overdrive, input 6.	S16	*-1...1000*	*-1*	*-1*

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Holding register	Parameter description	Data type	Values	Range	Default
9007	Temporary overdrive, output 1.	S16	*-1...1000*	-1 = disabled, 0...100.00 %	*-1*
9008	Temporary overdrive, output 2.	S16	*-1...1000*	-1 = disabled, 0...100.00 %	*-1*
9009	Temporary overdrive, output 3.	S16	*-1...1000*	-1 = disabled, 0...100.00 %	*-1*
9010	Temporary overdrive, output 4.	S16	*-1...1000*	-1 = disabled, 0...100.00 %	*-1*
9011	Temporary overdrive, output 5.	S16	*-1...1000*	-1 = disabled, 0...100.00 %	*-1*
9012	Temporary overdrive, output 6.	S16	*-1...1000*	-1 = disabled, 0...100.00 %	*-1*

6.3.2.9 Holding registers for device naming

Holding register	Parameter description	Data type	Values	Range	Default
9900	Characters 1 and 2 of the device name.	U16	*0...65535*	[0...255], [0...255]	*21870*
9901	Characters 3 and 4 of the device name.	U16	*0...65535*	[0...255], [0...255]	*28257*
9902	Characters 5 and 6 of the device name.	U16	*0...65535*	[0...255], [0...255]	*28005*
9903	Characters 7 and 8 of the device name.	U16	*0...65535*	[0...255], [0...255]	*25632*
9904	Characters 9 and 10 of the device name.	U16	*0...65535*	[0...255], [0...255]	*25701*
9905	Characters 11 and 12 of the device name.	U16	*0...65535*	[0...255], [0...255]	*30313*
9906	Characters 13 and 14 of the device name.	U16	*0...65535*	[0...255], [0...255]	*25445*
9907	Characters 15 and 16 of the device name.	U16	*0...65535*	[0...255], [0...255]	*0*
9908	Characters 17 and 18 of the device name.	U16	*0...65535*	[0...255], [0...255]	*0*
9909	Characters 19 and 20 of the device name.	U16	*0...65535*	[0...255], [0...255]	*0*
9910	Characters 21 and 22 of the device name.	U16	*0...65535*	[0...255], [0...255]	*0*
9911	Characters 23 and 24 of the device name.	U16	*0...65535*	[0...255], [0...255]	*0*
9912	Characters 25 and 26 of the device name.	U16	*0...65535*	[0...255], [0...255]	*0*
9913	Characters 27 and 28 of the device name.	U16	*0...65535*	[0...255], [0...255]	*0*
9914	Characters 29 and 30 of the device name.	U16	*0...65535*	[0...255], [0...255]	*0*

Holding register	Parameter description	Data type	Values	Range	Default
9915	Characters 31 and 32 of the device name.	U16	*0...65535*	[0...255], [0...255]	0

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7 BACnet

7.1 BACnet properties

Protocol	BACnet MS/TP / BACnet IP
Device profile	BACnet Application specific controller (B-ASC)
Bus speed	9600*/14400/19200/38400/57600/115200 bit/s
Stop bits	1
Unit load	1/4 UL
	* factory setting

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BACnet International has issued the BTL Certificate to this device. The BTL certification validates that the product correctly implements the extensive and complex BACnet features. This eliminates the risk of BACnet implementation errors and interoperability problems.

7.2 Object descriptions

Note: Objects become visible based on the device configuration. All objects cannot be visible at the same time.

7.2.1 Binary value objects

Object name	Values	Inactive/Active_Text	Default
Input 1 Contact	0 - 1	0. Off 1. On	0
Input 2 Contact	0 - 1	0. Off 1. On	0
Input 3 Contact	0 - 1	0. Off 1. On	0
Input 4 Contact	0 - 1	0. Off 1. On	0
Input 5 Contact	0 - 1	0. Off 1. On	0
Input 6 Contact	0 - 1	0. Off 1. On	0

7.2.2 Analog input objects

Object name	Values	Resolu-tion	Units
Input 1 Voltage	0...10	0.001	*volts (5)*

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Object name	Values	Resolu-tion	Units
Input 1 Temperature	-50...100	0.1	*degrees-celsius (62)*
Input 1 Rh	0...100	0.01	*percent-relative-humidity (29)*
Input 1 CO2	0...10000	1.0	*parts-per-million (96)*
Input 1 Resistance	0...300000	30	*ohms (4)*
Input 1 Power	0...100	0.01	*percent (98)*
Input 2 Voltage	0...10	0.001	*volts (5)*
Input 2 Temperature	-50...100	0.1	*degrees-celsius (62)*
Input 2 Rh	0...100	0.01	*percent-relative-humidity (29)*
Input 2 CO2	0...10000	1.0	*parts-per-million (96)*
Input 2 Resistance	0...300000	30	*ohms (4)*
Input 2 Power	0...100	0.01	*percent (98)*
Input 3 Voltage	0...10	0.001	*volts (5)*
Input 3 Temperature	-50...100	0.1	*degrees-celsius (62)*
Input 3 Rh	0...100	0.01	*percent-relative-humidity (29)*
Input 3 CO2	0...10000	1.0	*parts-per-million (96)*
Input 3 Resistance	0...300000	30	*ohms (4)*
Input 3 Power	0...100	0.01	*percent (98)*
Input 4 Voltage	0...10	0.001	*volts (5)*
Input 4 Temperature	-50...100	0,1	*degrees-celsius (62)*
Input 4 Rh	0...100	0.01	*percent-relative-humidity (29)*
Input 4 CO2	0...10000	1.0	*parts-per-million (96)*
Input 4 Resistance	0...300000	30	*ohms (4)*
Input 4 Power	0...100	0.01	*percent (98)*
Input 5 Voltage	0...10	0.001	*volts (5)*
Input 5 Temperature	-50...100	0.1	*degrees-celsius (62)*
Input 5 Rh	0...100	0.01	*percent-relative-humidity (29)*
Input 5 CO2	0...10000	1.0	*parts-per-million (96)*
Input 5 Resistance	0...300000	30	*ohms (4)*
Input 5 Power	0...100	0.01	*percent (98)*
Input 6 Voltage	0...10	0.001	*volts (5)*
Input 6 Temperature	-50...100	0.1	*degrees-celsius (62)*
Input 6 Rh	0...100	0.01	*percent-relative-humidity (29)*
Input 6 CO2	0...10000	1.0	*parts-per-million (96)*
Input 6 Resistance	0...300000	30	*ohms (4)*
Input 6 Power	0...100	0.01	*percent (98)*
RU 1 Temperature	-50...100	0.1	*degrees-celsius (62)*
RU 1 RH	0...100	0.01	*percent-relative-humidity (29)*
RU 1 CO2	0...10000	1.0	*parts-per-million (96)*

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Object name	Values	Resolu-tion	Units
RU 1 Power (Temp)	0...100	0.01	*percent (98)*
RU 1 Power (RH)	0...100	0.01	*percent (98)*
RU 1 Power (CO2)	0...100	0.01	*percent (98)*
RU 2 Temperature	-50...100	0.1	*degrees-celsius (62)*
RU 2 RH	0...100	1.0	*percent-relative-humidity (29)*
RU 2 CO2	0...10000	0.01	*parts-per-million (96)*
RU 2 Power (Temp)	0...100	0.01	*percent (98)*
RU 2 Power (RH)	0...100	0.01	*percent (98)*
RU 2 Power (CO2)	0...100	0.01	*percent (98)*

7.2.3 Analog value objects

Object name	Values	Resolu-tion	Units	Default
RU 1 Current Setpoint Value	2...42	0.1	*degrees-celsius (62)*	21.0
RU 2 Current Setpoint Value	2...42	0.1	*degrees-celsius (62)*	21.0
Controller 1 Current Setpoint Value	2...32	0.1	*degrees-celsius (62)*	22.0
Controller 2 Current Setpoint Value	2...32	0.1	*degrees-celsius (62)*	22.0
Output 1 Voltage	0...10	0.001	*volts (5)*	0
Output 1 6-way Valve	0...10	0.001	*volts (5)*	0
Output 1 Fan	0...10	0.001	*volts (5)*	0
Output 1 Power	0...100	0.01	*percent (98)*	0
Output 2 Voltage	0...10	0.001	*volts (5)*	0
Output 2 6-way Valve	0...10	0.001	*volts (5)*	0
Output 2 Fan	0...10	0.001	*volts (5)*	0
Output 2 Power	0...100	0.01	*percent (98)*	0
Output 3 Voltage	0...10	0.001	*volts (5)*	0
Output 3 6-way Valve	0...10	0.001	*volts (5)*	0
Output 3 Fan	0...10	0.001	*volts (5)*	0
Output 3 Power	0...100	0.01	*percent (98)*	0
Output 4 Voltage	0...10	0.001	*volts (5)*	0
Output 4 6-way Valve	0...10	0.001	*volts (5)*	0
Output 4 Fan	0...10	0.001	*volts (5)*	0
Output 4 Power	0...100	0.01	*percent (98)*	0
Output 5 Voltage	0...10	0.001	*volts (5)*	0
Output 5 6-way Valve	0...10	0.001	*volts (5)*	0
Output 5 Fan	0...10	0.001	*volts (5)*	0
Output 5 Power	0...100	0.01	*percent (98)*	0
Output 5 Current	0...20	0.001	*milliamperes (2)*	0

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Object name	Values	Resolu-tion	Units	Default
Output 6 Voltage	0...10	0.001	*volts (5)*	0
Output 6 6-way Valve	0...10	0.001	*volts (5)*	0
Output 6 Fan	0...10	0.001	*volts (5)*	0
Output 6 Power	0...100	0.01	*percent (98)*	0
Output 6 Current	0...20	0.001	*milliamperes (2)*	0

7.2.4 Multistate input objects

Object name	Values	State text	Default
RU 1 Fan Speed	1 - 2 - 3 - 4 - 5	1. Fan Speed 0 2. Fan Speed 1 3. Fan Speed 2 4. Fan Speed 3 5. Fan Speed Auto	1
RU 2 Fan Speed	1 - 2 - 3 - 4 - 5	1. Fan Speed 0 2. Fan Speed 1 3. Fan Speed 2 4. Fan Speed 3 5. Fan Speed Auto	1

7.2.5 Multistate value objects

Object name	Values	State text	Default
RU 1 Operating Mode	1 - 2 - 3 - 4	1. Mode 0 2. Mode 1 3. Mode 2 4. Mode 3	1
RU 2 Operating Mode	1 - 2 - 3 - 4	1. Mode 0 2. Mode 1 3. Mode 2 4. Mode 3	1
Output 1 Fan Control	1 - 2 - ... - 8	1. Fan Speed 0 2. Fan Speed 1 3. Fan Speed 2 4. Fan Speed 3 5. Fan Speed AUTO 6. Fan Speed AUTO EC 7. Fan Speed AUTO RU1 8. Fan Speed AUTO RU2	1

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Object name	Values	State text	Default
Output 2 Fan Control	1 - 2 - ... - 8	1. Fan Speed 0 2. Fan Speed 1 3. Fan Speed 2 4. Fan Speed 3 5. Fan Speed AUTO 6. Fan Speed AUTO EC 7. Fan Speed AUTO RU1 8. Fan Speed AUTO RU2	1
Output 3 Fan Control	1 - 2 - ... - 8	1. Fan Speed 0 2. Fan Speed 1 3. Fan Speed 2 4. Fan Speed 3 5. Fan Speed AUTO 6. Fan Speed AUTO EC 7. Fan Speed AUTO RU1 8. Fan Speed AUTO RU2	1
Output 4 Fan Control	1 - 2 - ... - 8	1. Fan Speed 0 2. Fan Speed 1 3. Fan Speed 2 4. Fan Speed 3 5. Fan Speed AUTO 6. Fan Speed AUTO EC 7. Fan Speed AUTO RU1 8. Fan Speed AUTO RU2	1
Output 5 Fan Control	1 - 2 - ... - 8	1. Fan Speed 0 2. Fan Speed 1 3. Fan Speed 2 4. Fan Speed 3 5. Fan Speed AUTO 6. Fan Speed AUTO EC 7. Fan Speed AUTO RU1 8. Fan Speed AUTO RU2	1
Output 6 Fan Control	1 - 2 - ... - 8	1. Fan Speed 0 2. Fan Speed 1 3. Fan Speed 2 4. Fan Speed 3 5. Fan Speed AUTO 6. Fan Speed AUTO EC 7. Fan Speed AUTO RU1 8. Fan Speed AUTO RU2	1
Controller 1 Active Mode	1 - 2 - 3	1. Mode 0 2. Mode 1 3. Mode 2	1
Controller 2 Active Mode	1 - 2 - 3	1. Mode 0 2. Mode 1 3. Mode 2	1

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Object name	Values	State text	Default
Output 1 Fan Step	1 - 2 - 3 - 4	1. Fan Speed 0 2. Fan Speed 1 3. Fan Speed 2 4. Fan Speed 3	1
Output 2 Fan Step	1 - 2 - 3 - 4	1. Fan Speed 0 2. Fan Speed 1 3. Fan Speed 2 4. Fan Speed 3	1
Output 3 Fan Step	1 - 2 - 3 - 4	1. Fan Speed 0 2. Fan Speed 1 3. Fan Speed 2 4. Fan Speed 3	1
Output 4 Fan Step	1 - 2 - 3 - 4	1. Fan Speed 0 2. Fan Speed 1 3. Fan Speed 2 4. Fan Speed 3	1
Output 5 Fan Step	1 - 2 - 3 - 4	1. Fan Speed 0 2. Fan Speed 1 3. Fan Speed 2 4. Fan Speed 3	1
Output 6 Fan Step	1 - 2 - 3 - 4	1. Fan Speed 0 2. Fan Speed 1 3. Fan Speed 2 4. Fan Speed 3	1

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8 Disposal

This device is considered as electrical and electronic equipment for disposal in terms of the applicable European Directive. At the end of life, the product must enter the recycling system at an appropriate collection point.

- The device must be disposed through channels provided for this purpose.
- The disposal must be completed according to the local and currently applicable laws and regulations.

Generally all metals can be recycled as material. Plastics and cardboard packaging material can be used in energy recovery. Printed circuit boards need selective treatment according to IEC 62635 guidelines. To aid recycling, plastic parts are marked with an appropriate identification code. Contact your local Produal distributor for further information on environmental aspects and recycling instructions for professional recyclers.



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