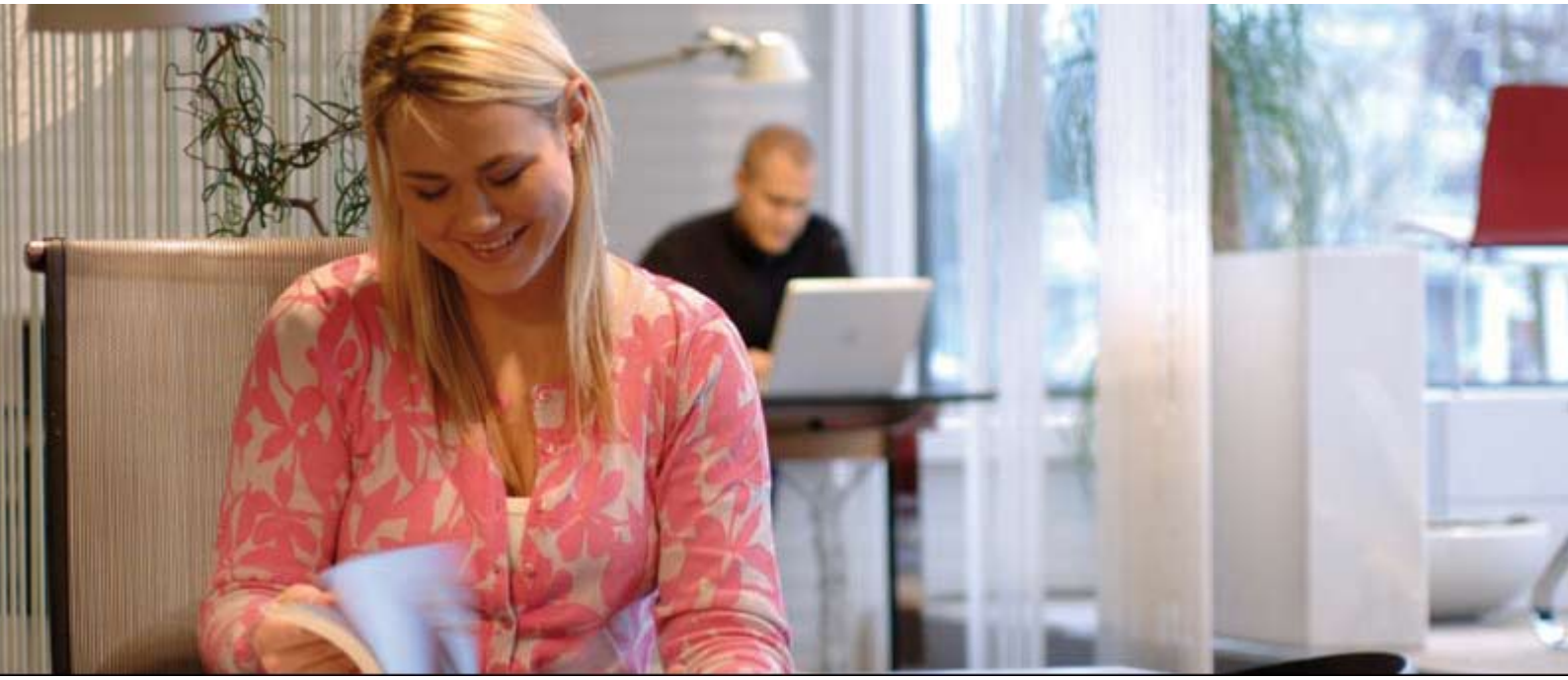
Regio Midi - Manual



REGIN

THE CHALLENGER IN BUILDING AUTOMATION

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Contents At a Glance

Part I Introduction

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Part I Introduction

Chapter 1 About the manual

This manual describes the Regio Midi controllers.

Terms

Term used in the manual:

FS	Factory setting

More information

More information about Regio Midi can be found in:

- ***Regio Tool*© *Manual*** – Manual of how to configure the controllers
- ***Regio in EXO 2005 Projects*** – Information on how to use Regio in the EXO system
- ***Regio Room Controllers*** – Brochure for the Regio series

The information can be downloaded from Regin's homepage, www.regin.se.

Chapter 2 Introduction to Regio

Regio zone controllers

Regio is a wide series of room controllers which handle everything from heating, cooling and ventilation to lighting, humidity, CO_2 monitoring and blinds. Regio can be used for creating everything from stand-alone systems for managing the functions in one room, to large, integrated systems with a comprehensive SCADA-system.

Regio also offers web and Internet solutions. Temperature and other functions in a room can be individually controlled from a PC connected to the office network.

Mini, Midi, Maxi

The Regio controllers can be divided into three different series, Mini, Midi and Maxi.

Mini (RC) are 24 V AC-supplied stand-alone controllers for controlling heating and cooling in a room. The series consists of different room control units and a relay box for fan control. The control units are pre-programmed to handle different functions, but can easily be configured. The controllers have a built-in temperature sensor. An external temperature sensor can also be connected.

The Midi controllers (RC-C) have the same characteristics as Mini. They can be used stand-alone or in a system with communication. The controllers are connected to bus lines such as Modbus or Regin's own bus system EXOline, to communicate with a central SCADA-system via RS485. They can also be configured for a specific application with Regin's software tool Regio Tool©.

Maxi (RCP) are 240 V AC-supplied, freely programmable room controllers, which can handle all functions in a zone system. The controllers are pre-programmed on delivery but can be configured using Regio Tool©. Different room units (RU-units) with built-in temperature sensor are connected to the controller. Maxi can be connected to standardised bus systems like Modbus or EXOline, with communication via TCP/IP or RS485 for integration with a central SCADA-system. With EXO4 Web Server, no room units are needed. Instead, all functions can be handled from a PC with Internet Explorer, which keeps the investment down.

Awarded design

Regio has a modern design which enhances the indoor environment. The design has been awarded the 2007 "iF product design award", an honour which more than 1100 participants from over 30 countries compete for every year. An international panel judges the contributions according to a large number of criteria. The competition has been running for 53 years and is one of the most acknowledged design competitions in the world.

Applications

The Regio controllers have an appealing design and functionality. They are suitable in buildings where you want optimal comfort and low energy consumption, for example offices, schools, shopping centres, airports, hotels and hospitals.

Mounting

The modular design with a separate bottom plate for wiring makes the whole Regio series easy to install and commission. The controllers are mounted directly on the wall or on a wallbox.

Regio Midi

Communication

The controllers can be connected to a central SCADA-system via RS485 (EXOline or Modbus) and configured for a particular application using the configuration tool Regio Tool©, which is available for download, free of charge, from Regin's homepage www.regin.se. See the manual for Regio Tool© for more information.

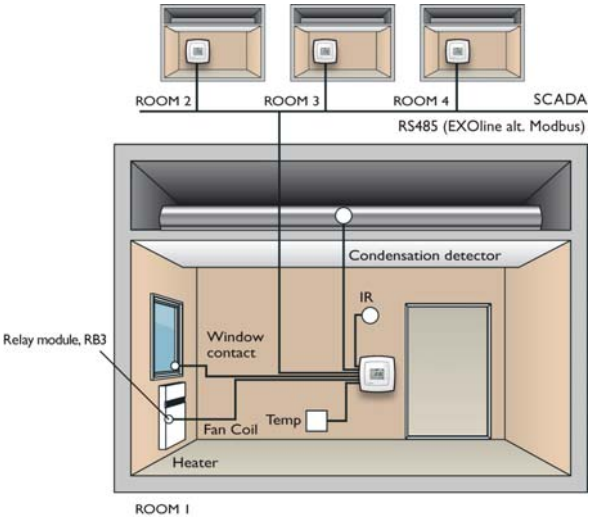
Control states

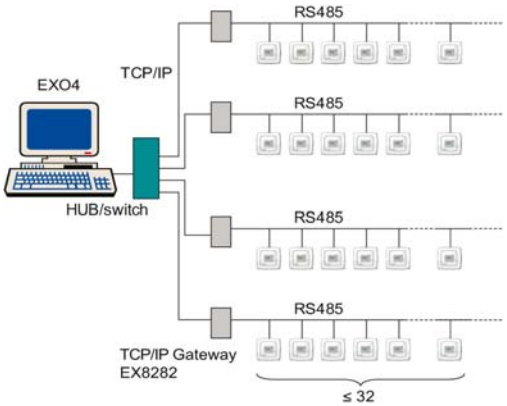
The controllers can be configured for different control states/control sequences:

- Heating
- Heating or cooling via the change-over function
- Heating/Heating
- Heating/Cooling
- Heating/ Cooling, forced
- Heating/ Cooling with VAV-control
- Cooling
- Cooling / Cooling

The basic models can be used for controlling analogue actuators or thermal actuators. The -F-models can control analogue actuators, thermal actuators or fan coil. The -T-models are used for control of three-point actuators.

Application examples





Chapter 3 **Models**

There are 10 different Midi room controllers. They can be divided according to type of control in basic models, models for fan control and models for three-point control.

Basic models Basic models control analogue actuators or thermal actuators.

-F-models Like basic models, models for fan control (-F-models) control analogue actuators or thermal actuators. They also have a button/fan switch and three digital outputs for control of a three-speed fan (fan coil, etc.).

-T-models Models for three-point control (-T-models) have four digital outputs for control of two three-point actuators.

Models	Functions	Display	Occupancy button	Fan control	3-point control	Setpoint knob	Hidden setpoint
Basic models without fan control/three-point control	**RC-CH**						●
	RC-C					●	
	RC-CO		●			●	
	RC-CDO	●	●				
Models for fan control (-F-models)	**RC-CF**			●		●	
	RC-CFO		●	●		●	
	RC-CDFO	●	●	●			
Models for three-point control (-T-models)	**RC-CT**				●	●	
	RC-CTO		●		●	●	
	RC-CDTO	●	●		●		

Table 1. The Midi models and their functions

The design of the models

RC-CH

RC-C, RC-CT

RC-CO, RC-CTO

RC-CDO, RC-CDTO

RC-CF

RC-CFO

RC-CDFO

Chapter 4 **Technical data**

Supply voltage	18...30 V AC, 50...60 Hz
Internal consumption	2.5 VA
Ambient temperature	0...50°C
Ambient humidity	Max 90% RH
Storage temperature	-20...+70°C
Terminal blocks	So-called lift type for cable cross-section 2.1 mm^2
Protection class	IP20
Material casing	Polycarbonate, PC
Colour	
Cover	Polar white RAL9010
Bottom plate	Light gray
Weight	110 g

Dimensions

Models without setpoint knob	95 x 95 x 28 mm
Models with setpoint knob	95 x 95 x 31 mm

Communication

Type	RS485 (EXOline or Modbus) with automatic detection/change-over
Modbus	8 bits, 1 or 2 stop bits. Odd, even (FS) or no parity
Communication speed	9600 bps (not changeable)
Galvanically isolated port	No

Memory

Non-volatile (EEPROM) ..... All settings and configurations are preserved
See also chapter *Memory function on power failure*.

Built-in temperature sensor

Type	NTC, linearised, 15 kOhm
Measuring range	0...50°C
Accuracy	+/-0.5°C at 15...30°C

Models with display

Display type ..... LCD with background illumination

LVD, Low Voltage Directive

This product conforms with the requirements of European LVD standard IEC 60 730-1.

EMC emission and immunity standard

This product conforms with the requirements of European EMC standards CENELEC EN 61000-6-1 and EN 61000-6-3 and carries the CE mark.

Inputs (see table 2 below for number and function for different models)

AI	PT1000-sensor, 0...50°C
CI	Regin's condensation detector, KG-A
DI	Closing potential-free contact connected to +C in one end
UI	AI: PT1000-sensor, 0...100°C or DI: see DI above

Outputs (see table 2 below for number and function for different models)

DO .....24 V AC, max 0.5 A
UO .....DO:24 V AC, max 2.0 A or AO:0.5...10 V DC, max 5 mA
+C, power output for DI only .....24 V DC, max 10mA, short circuit protected

Terminals									
12	**13**	**14**	**22**	**23**	**24**	**30**	**31**	**32**	**33**
Basic models (RC-CH, RC-C, RC-CO, RC-CDO)									
DO1 Forc. vent.	-	-	-	UO1* Heating actuator (FS) alt. Cooling actuator	UO2* Cooling actuator (FS) alt. Heating actuator	AI1 Ext. room sensor	UI1 Change-over	DI1 Occu-pancy sensor	DI2 alt. CI Window contact alt. Condensation detector
Models for fan control (RC-CF, RC-CFO, RC-CDFO)									
DO1 Fan speed I	DO2 Fan speed II	DO3 Fan speed III	DO4 Forc. vent.	UO1* Heating actuator (FS) alt. Cooling actuator	UO2* Cooling actuator (FS) alt. Heating actuator	AI1 Ext. room sensor	UI1 Change-over	DI1 Occu-pancy sensor	DI2 alt. CI Window contact alt. Condensation detector
Models for three-point control (RC-CT, RC-CTO, RC-CDTO)									
DO1 Forc. vent.	DO2 Heating actuator increase	DO3 Heating actuator decrease	DO4 Cooling actuator increase	DO5 Cooling actuator decrease	-	AI1 Ext. room sensor	UI1 Change-over	DI1 Occu-pancy sensor	DI2 alt. CI Window contact alt. Condensation detector

Table 2. Available connections and their functions for the Midi controllers.

*The function for these outputs depends on the control state setting, see chapter *Control states*.

For more information about inputs and outputs, see the chapter *Wiring*.

Accessories for Regio Midi

External temperature sensors.....TG-R5/PT1000,TG-UH/PT1000,TG-A1/PT1000
Occupancy detector IR24-P
Relay module for -F-models..... RB3
Change-over TG-A1/PT1000
Condensation detector .....KG-A

The accessories are available from Regin. For more information, see the product sheets and instructions for each product, search via www.regin.se.

Part II Installation

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Part II Installation

Chapter 5 **Preparations for installation**

Using labels

On the back of the electronics cassette, there is a set of labels which makes it easier to install large numbers of Midi controllers. By using the labels as carriers of information for those responsible for the wiring, much time can be saved and wiring errors be kept at a minimum.

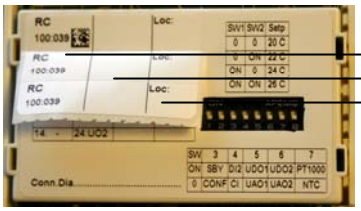

Figure 1. Label on the back of the controller

You can split the three-piece label and fasten the parts to the installation drawing and to the bottom plate of the controller. The label carries information on communication address etc., and has a note area where a reference number to the connection diagram can be written.

If you need to configure the electronics cassette, it is a benefit to do this before sending the cassette to the installation site. For more information about configuration, see the chapter *Configuration*.

The bottom plate with placement and wiring information can be sent separately to the installation for electric installation.

Configuration

To configure the electronics cassette, use Regio Tool©. For more information, see the manual for Regio Tool©. Models without display have dipswitches that need to be set, see the section *Dipswitches* below.

The computer with Regio Tool© is connected to the cassette with a RS232 to RS485 alternatively USB to RS485 converter. The adapter is connected to terminals 42(A) and 43(B). Use a 24 V AC trafo for supply voltage of the electronics cassette on terminals 10 and 11.

Setting of dipswitches (only models without display)

Models without display have seven dipswitches (SW1-7) for setting of basic functions on the back of the electronics cassette.

Figure 2. Dipswitches

SW1-2

Basic setpoint (°C)	SW1	SW2
20	OFF	OFF
22 (FS)	OFF	ON
24	ON	OFF
26	ON	ON

Table 3. Setting of basic heating setpoint with dipswitch SW1 and SW2

See also the chapter *Setpoint calculation* for setting of SW1-2.

SW3 Occupied is the preset operating mode, SW3: OFF (FS). If you want Stand-by to be the preset operating mode, set SW3 in mode ON. For more information, see the chapter *Operating modes.*

SW4-7 Follow the tables in the chapter *Installation* for setting SW4-7.

Models with display

Models with display have no dipswitches. For these models, the corresponding settings are made in the parameter menu in the display or using Regio Tool©, see the chapter *Display handling*.

Chapter 6 **Installation**

Mounting

Place the controller in a location that has a temperature representative for the room. A suitable location is approx. 1.6 m above floor level in a place with unobstructed air circulation. Remove the frame by depressing the locking tab in the lower edge of the cover with a screwdriver. See figure 1.

Then prize out the electronics cassette using the four rectangular screwdriver slots and levering against the edge of the bottom plate. See figure 2. **Note:** Take care not to damage the electronics when inserting the screwdriver into the slots.

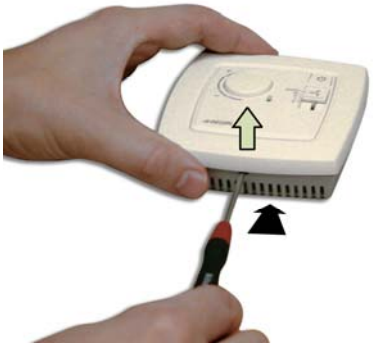

Figure 3.

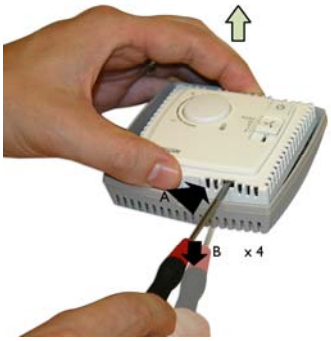

Figure 4.

The bottom plate with terminals has a number of fixing hole combinations. Select suitable holes and screw the bottom plate onto the wall or connection box, so that the arrows on the bottom plate point upwards. Do not tighten the screws too hard!

With surface-mounted cabling, break out suitable holes from the marks in the plastic.

Wiring

The figure below shows the location of the terminals. The following connection diagrams and tables show the wiring for basic models, models for fan control and models for three-point control.

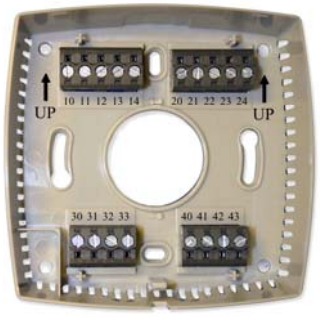

Figure 5. Bottom plate with mounting alternatives and location of terminals

Wiring for basic models (RC-CH, RC-C, RC-CO, RC-CDO)

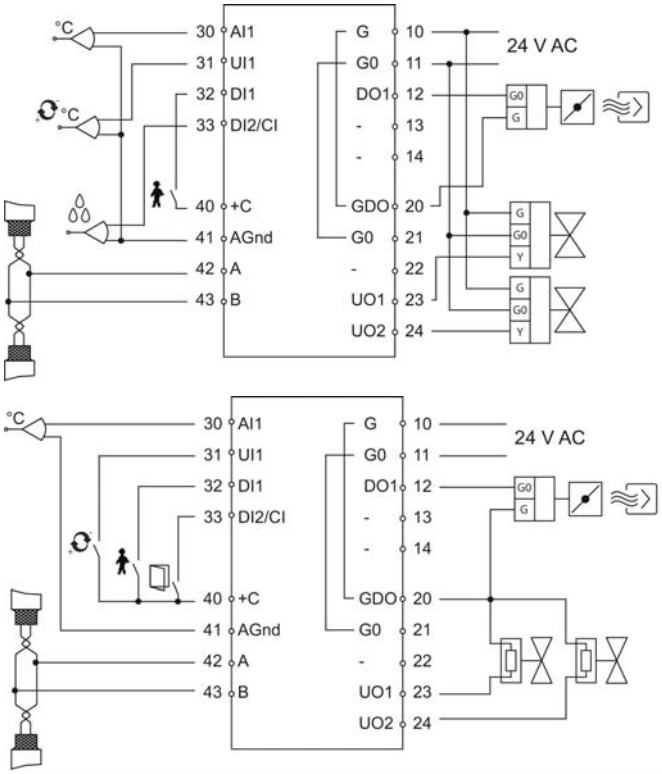

Figure 6. Connection diagrams for basic models

Ter-minal	Desig-nation	Operation
10	G	Supply voltage 24 V AC
11	G0	Supply voltage 0 V
12	DO1	For forced ventilation. 24 V AC output, max 0,5 A. 24 V AC actuator is connected between terminal 12 and terminal 20, GDO.
13-14		No function.
20	GDO	24 V AC out common for DO. Internally connected to terminal 10, G.
21	G0	0 V common for UO. Internally connected to terminal 11, G0.
22		No function.
23	UO1	Control of heating (FS) or cooling via change-over. For 0...10 V DC valve actuator, max 5 mA (FS). The valve actuator's 0…10 V control signal terminal is connected to terminal 23 and its supply terminals to terminals 10 and 11. Make sure that the reference pole G0 is connected to the correct terminal on the actuator. *alternative* For 24 V AC thermal actuator, max 2,0 A. The thermal actuator is connected between terminals 23 and 20, GDO. *Selection of output function, analogue or digital, see table 4, SW5. On models with display, go into the parameter menu and change parameter 20 to thermal actuator.*

24	UO2	Control output heating or cooling (FS). For 0...10 V DC valve actuator, max 5 mA (FS). The valve actuator's 0…10 V control signal terminal is connected to terminal 24 and its supply terminals to terminals 10 and 11. Make sure that the reference pole G0 is connected to the correct terminal on the actuator. *alternative* For 24 V AC thermal actuator, max 2,0 A. The thermal actuator is connected between terminals 24 and 20, GDO. *Selection of output function, analogue or digital, see table 4, SW6. On models with display, go into the parameter menu and change parameter 21 to thermal actuator.*
30	AI1	For external room sensor, PT1000. Measuring range 0...50°C. Sensor is connected between terminals 30 and 41, AGnd. *See table 4, SW7.*
31	UI1	For switching between heating and cooling on a two-pipe system (Change-over). PT1000-sensor is connected between terminals 31 and 41, AGnd. Measuring range: 0...100°C. *alternative* For potential-free contact. A potential-free contact is connected between terminals 31 and 40, +C.
32	DI1	Occupancy detector. A potential-free contact is connected between terminals 32 and 40, +C. Closed contact corresponds to occupancy. *See also section Occupancy detector in the chapter Operating modes.*
33	DI2/CI	Regin's condensation detector, KG-A (FS). The sensor is connected between terminals 33 and 41, AGnd. *alternative* Window contact (DI). A potential-free contact is connected between terminals 33 and 40, +C. Closed contact indicates closed window. *See table 4, SW4.*
40	+C	24 V DC out common for DI and UI (with digital function)
41	AGnd	Analogue ground, reference for AI and UI (with analogue function)
42	A	RS485-communication A
43	B	RS485-communication B

Table 4. I/O connection terminals for basic models

Dipswitches (only models without display)

The ON-position is marked on the dipswitch. FS = Factory setting.

	ON	OFF	Comment
SW4	DI, window contact. Closed contact indicates closed window.	CI, Regin's condensation detector, KG-A (FS).	Function terminal 33, DI2/CI.
SW5	Digital output for 24 V AC thermal actuator.	Analogue output for 0...10 V DC valve actuator (FS).	Function terminal 23, UO1.
SW6	Digital output for 24 V AC thermal actuator.	Analogue output for 0...10 V DC valve actuator (FS).	Function terminal 24, UO2.
SW7	External, PT1000-sensor.	Internal NTC-sensor (FS).	Temperature sensor.

Table 5. Dipswitches SW4-SW7

Wiring for models for fan control (RC-CF, RC-CFO, RC-CDFO)

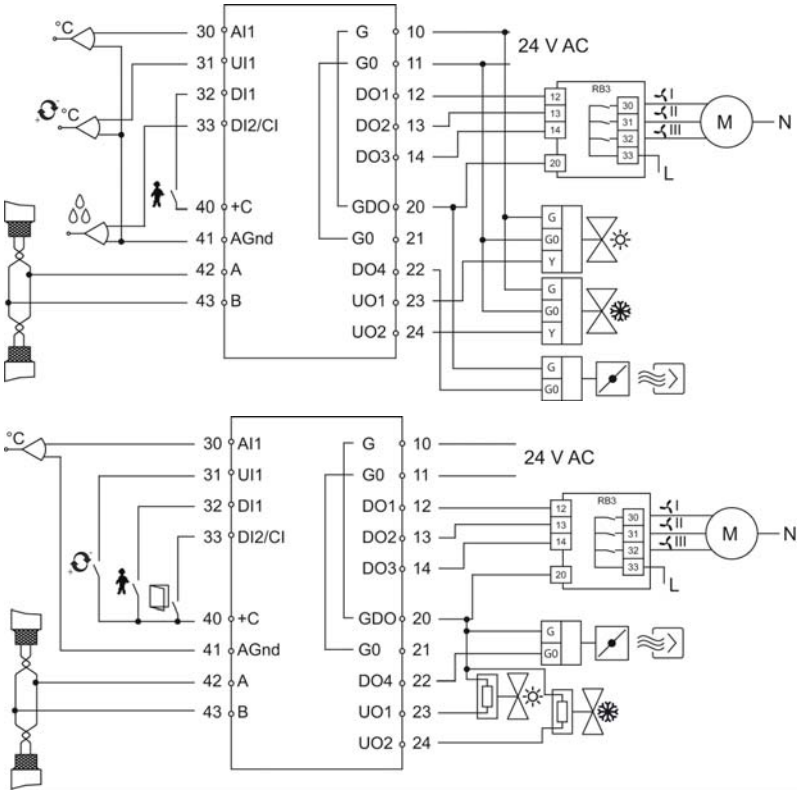

Figure 7. Connection diagrams for models for fan control

Ter-minal	Desig-nation	Operation
10	G	Supply voltage 24 V AC
11	G0	Supply voltage 0 V
12	DO1	For fan control, low speed. 24 V AC output, max 0.5 A. 24 V AC relay is connected between terminal 12 and terminal 20, GDO.
13	DO2	For fan control, medium speed. 24 V AC output, max 0.5 A. 24 V AC relay is connected between terminal 13 and terminal 20, GDO.
14	DO3	For fan control, high speed. 24 V AC output, max 0.5 A. 24 V AC, relay is connected between terminal 14 and terminal 20, GDO.
20	GDO	24 V AC out common for DO. Internally connected to terminal 10, G.
21	G0	0 V common for UO. Internally connected to terminal 11, G0.
22	DO4	For forced ventilation. 24 V AC output, max 0,5 A. 24 V AC actuator is connected between terminal 22 and terminal 20, GDO.
23	UO1	Control of heating (FS) or cooling via change-over. For 0...10 V DC valve actuator, max 5 mA (FS). The valve actuator's 0…10 V control signal terminal is connected to terminal 23 and its supply terminals to terminals 10 and 11. Make sure that the reference pole G0 is connected to the correct terminal on the actuator. *alternative* For 24 V AC thermal actuator, max 2,0 A. The thermal actuator is connected between terminals 23 and 20, GDO. *Selection of output function, analogue or digital, see table 6, SW5. On models with display, go into the parameter menu and change parameter 20 to thermal actuator.*

24	UO2	Control output heating or cooling (FS). For 0...10 V DC valve actuator, max 5 mA (FS). The valve actuator's 0…10 V control signal terminal is connected to terminal 24 and its supply terminals to terminals 10 and 11. Make sure that the reference pole G0 is connected to the correct terminal on the actuator. *alternative* For 24 V AC thermal actuator, max 2,0 A. The thermal actuator is connected between terminals 24 and 20, GDO. *Selection of output function, analogue or digital, see table 6, SW6. On models with display, go into the parameter menu and change parameter 21 to thermal actuator.*
30	AI1	For external room sensor, PT1000. Measuring range 0...50°C. Sensor is connected between terminals 30 and 41, AGnd. *See table 6, SW7.*
31	UI1	For switching between heating and cooling on a two-pipe system (Change-over). PT1000-sensor is connected between terminals 31 and 41, AGnd. Measuring range: 0...100°C. *alternative* For potential-free contact. A potential-free contact is connected between terminals 31 and 40, +C.
32	DI1	Occupancy detector. A potential-free contact is connected between terminals 32 and 40, +C. Closed contact corresponds to occupancy. *See also section Occupancy detector in the chapter Operating modes.*
33	DI2/CI	Regin's condensation detector, KG-A (FS). The sensor is connected between terminals 33 and 41, AGnd. *alternative* Window contact (DI). A potential-free contact is connected between terminals 33 and 40, +C. Closed contact indicates closed window. *See table 6, SW4.*
40	+C	24 V DC out common for DI and UI (with digital function)
41	AGnd	Analogue ground, reference for AI and UI (with analogue function)
42	A	RS485-communication A
43	B	RS485-communication B

Table 6. I/O connection terminals for models for fan control

Dipswitches (only models without display)

The ON-position is marked on the dipswitch. FS = Factory setting.

	ON	OFF	Comment
SW4	DI, window contact. Closed contact indicates closed window.	CI, Regin's condensation detector, KG-A (FS).	Function terminal 33, DI2/CI.
SW5	Digital output for 24 V AC thermal actuator.	Analogue output for 0...10 V DC valve actuator (FS).	Function terminal 23, UO1.
SW6	Digital output for 24 V AC thermal actuator.	Analogue output for 0...10 V DC valve actuator (FS).	Function terminal 24, UO2.
SW7	External, PT1000-sensor.	Internal NTC-sensor (FS).	Temperature sensor.

Table 7. Dipswitches SW4-SW7

Wiring for models for three-point control (RC-CT, RC-CTO, RC-CDTO)

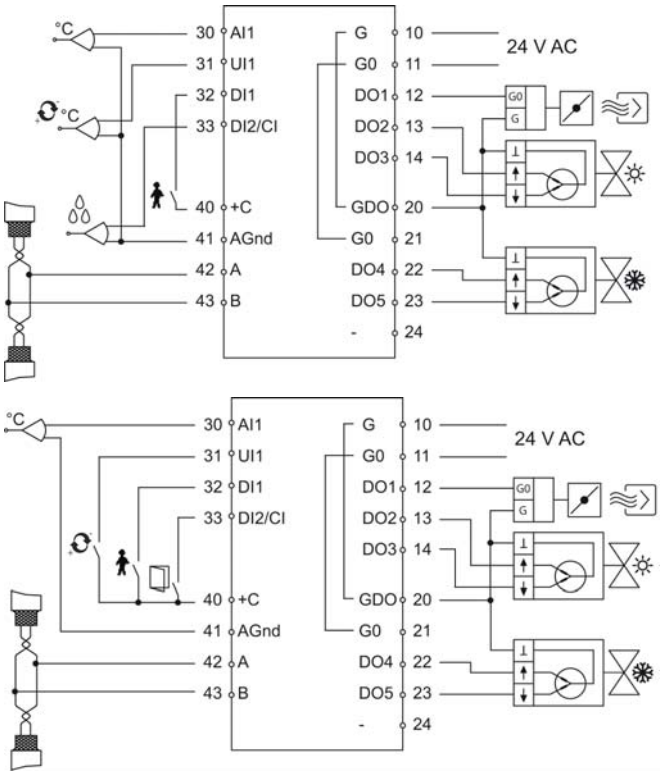

Figure 8. Connection diagrams for models for three-point control

Ter-minal	Desig-nation	Operation
10	G	Supply voltage 24 V AC
11	G0	Supply voltage 0 V
12	DO1	For forced ventilation. 24 V AC output, max 0,5 A. 24 V AC actuator is connected between terminal 12 and terminal 20, GDO.
13	DO2	For three-point actuator, heating increase. 24 V AC output, max 0.5 A. Actuator terminal for opening signal is connected to terminal 13. Common pole on actuator is connected to terminal 20, GDO.
14	DO3	For three-point actuator, heating decrease. 24 V AC output, max 0.5 A. Actuator terminal for closing signal is connected to terminal 14.
20	GDO	24 V AC out common for DO. Internally connected to terminal 10, G.
21	G0	0 V common for DO. Internally connected to terminal 11, G0.
22	DO4	For three-point actuator, cooling increase. 24 V AC output, max 0.5 A. Actuator terminal for opening signal is connected to terminal 22. Common pole on actuator is connected to terminal 20, GDO.
23	DO5	For three-point actuator, cooling decrease. 24 V AC output, max 0.5 A. Actuator terminal for closing signal connected to terminal 23.
24		No function.
30	AI1	For external room sensor, PT1000. Measuring range 0...50°C. Sensor is connected between terminals 30 and 41, AGnd. *See table 8, SW7.*

31	UI1	For switching between heating and cooling on a two-pipe system (Change-over). PT1000-sensor is connected between terminals 31 and 41, AGnd. Measuring range: 0...100°C. *alternative* For potential-free contact. A potential-free contact is connected between terminals 31 and 40, +C.
32	DI1	Occupancy detector. A potential-free contact is connected between terminals 32 and 40, +C. Closed contact corresponds to occupancy. *See also section Occupancy detector in the chapter Operating modes.*
33	DI2/CI	Regin's condensation detector, KG-A (FS). The sensor is connected between terminals 33 and 41, AGnd. *alternative* Window contact (DI). A potential-free contact is connected between terminals 33 and 40, +C. Closed contact indicates closed window. *See table 8, SW4.*
40	+C	24 V DC out common for DI and UI (with digital function)
41	AGnd	Analogue ground, reference for AI and UI (with analogue function)
42	A	RS485-communication A
43	B	RS485-communication B

Table 8. I/O connection terminals for models for three-point control

Dipswitches (only models without display)

The ON-position is marked on the dipswitch. FS = Factory setting.

	ON	OFF	Comment
SW4	DI, window contact. Closed contact indicates closed window.	CI, Regin's condensation detector, KG-A (FS).	Function terminal 33, DI2/CI.
SW5	DO5 activated (FS).	Not permitted.	Skall be ON.
SW6			Not used.
SW7	External, PT1000-sensor.	Internal NTC-sensor (FS).	Temperature sensor.

Table 9. Dipswitches SW4-SW7

Chapter 7 **Commissioning**

The easiest way to set parameters is by using Regio Tool©.

If you want to calibrate a measured room temperature, this should be done under stable conditions.

Troubleshooting

The Hand/Auto function in Regio Tool© makes it possible to test run outputs. You do not affect the output itself, but the software object that controls the output, which means that you cannot disregard built-in safety functions.

The controllers have different indications, which can help you when you are troubleshooting, see the section *Indications*.

Part III Configuration

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Part III Configuration

Chapter 8 **Control states**

The controllers can be configured for different control states/control sequences:

- Heating
- Heating or cooling via the change-over function
- Heating/Heating
- Heating/Cooling
- Heating/Cooling with VAV-control and forced supply air function supply air function
- Heating/Cooling with VAV-control
- Cooling
- Cooling/Cooling

For the control states, UO1 is used for the left control function and UO2 is used for the right control function. For control states where only one control function is active (Heating, Heating or cooling via the change-over function, and Cooling), only UO1 is used.

Heating

In control state Heating, the controller is always a heating controller. It controls according to the heating setpoint plus/minus the setpoint displacement. The setpoint can be adjusted in the display or using the setpoint knob.

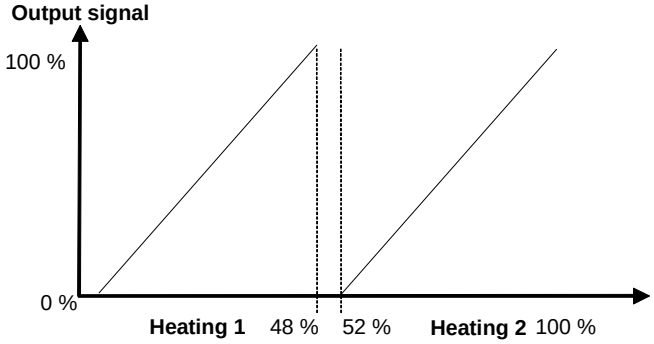
Heating or cooling via the change-over function

Like control state Heating but with change-over function, i. e. when the change-over input is active, the controller becomes a cooling controller and regulates according to the basic cooling setpoint plus/minus the setpoint displacement. See more in the chapter *Change-over*.

Heating/Heating

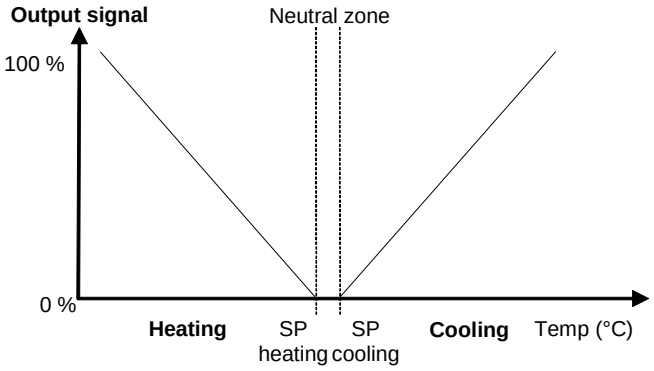
Split output signal

In control state Heating/Heating, the controller is always a heating controller and controls according to the basic heating setpoint plus the setpoint displacement. At half the controller output signal (50%), the output signal is split between two actuators. 0…48% of the signal is sent to actuator 1 and 52…100% of the signal is sent to actuator 2. See the figure below.



Heating/Cooling

In control state Heating/Cooling, the controller functions as a heating controller when the room temperature is lower than the basic heating setpoint plus half the neutral zone. The neutral zone is the difference in temperature between the heating setpoint and the cooling setpoint. When the room temperature exceeds this limit, the controller becomes a cooling controller. There is a hysteresis of 0.1°C when the controller changes from heating to cooling controller and vice versa. When the controller is heating, it regulates according to the basic heating setpoint plus the setpoint displacement, and when it is cooling according to the basic cooling setpoint plus the setpoint adjustment.

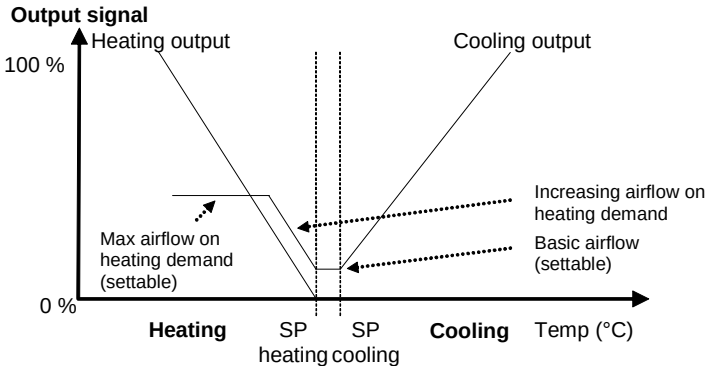


Heating/Cooling with VAV-control and forced supply air function

Like control state Heating/Cooling but the cooling is controlled via a supply air damper (sub-tempered supply air). When the ventilation is forced (See the chapter *Forced ventilation*), the cooling output is set to full cooling (full supply air volume), regardless of what the controller output signal is.

Heating/Cooling with VAV-control

Heating and cooling are controlled in the same way as in the VAV-control above. The damper cannot be forced like above. There is also a function that allows the supply air damper to open on heating demand. This is normally always required if the heater is placed in the supply air duct to carry the heat to the room. On heating demand, a maximum limit for the opening of the damper is set. The factory setting is zero, which means that the function to open the damper on heating demand is not active. The basic flow can also be set separately.



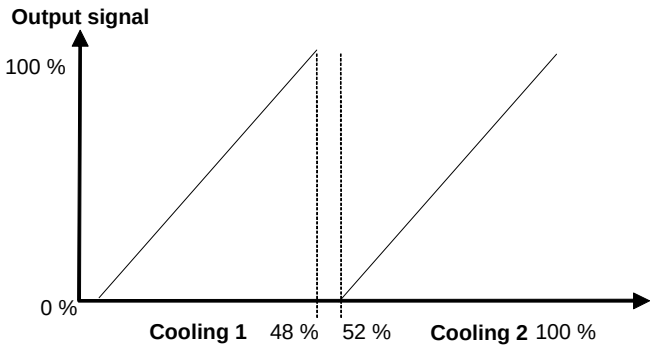
Cooling

In control state Cooling, the controller always functions as a cooling controller and controls according to the basic cooling setpoint plus the setpoint displacement.

Cooling/Cooling

Split output signal

In control mode Cooling/Cooling, the controller always functions as a cooling controller and controls according to the basic cooling setpoint plus the setpoint displacement. At half the controller output signal (50%), the output signal is split between two actuators. 0…48% of the signal is sent to actuator 1 and 52…100% of the signal is sent to actuator 2. See the figure below.



Chapter 9 **Operating modes**

Different operating modes

The Regio controllers have the following operating modes:

- 0 = Off
- 1 = Unoccupied
- 2 = Stand-by
- 3 = Occupied (FS)
- 4 = Bypass

Off

Operating mode Off means that the controller is neither heating nor cooling, and the fans are stopped. However, the temperature must not drop below the set minimum temperature (FS=8°C). If the room temperature drops below the minimum temperature, the controller will start heating, and (if a fan is used) start the fan whether it has been manually stopped or not.

For controllers with display the background light is not lit, and only OFF is shown in the display.

Unoccupied

Operating mode Unoccupied means that the room where the controller is placed is not used for an extended period, for example during holidays or long weekends. Both heating and cooling are disconnected and the fans are stopped within a temperature interval with configurable min/max temperatures (FS min=15°C, max=30°C).

For controllers with display the background light is not lit, but the current room temperature (or setpoint depending on the configuration) is shown in the display. OFF is shown in the display.

Stand-by

Operating mode Stand-by means that the room is in an energy save mode and is not used at the moment. This can for example be during nights, weekends, evenings etc. The controller is prepared to change operating mode to Occupied (comfort) if someone enters the room (presence). The room temperature is controlled around the applicable heating and cooling setpoints, with an extended temperature interval (FS=+/-3°C). For example, if the heating setpoint=22°C and the cooling setpoint=24°C, the controller will allow the temperature in the room to be between 19°C and 27°C. The setpoints can also be adjusted +/- 3°C via the setpoint knob or in the display.

For controllers with display the background light is lit (dimmed), and STANDBY as well as the current room temperature (or setpoint depending on the configuration) are shown in the display.

Occupied

Operating mode Occupied means that the room is in use and is therefore in a comfort mode. The controller regulates the room temperature around a heating setpoint and a cooling setpoint (FS heating setpoint=22°C, cooling setpoint=24°C). The setpoints can also be adjusted +/- 3°C locally via the setpoint knob or in the display, or via a central command.

For controllers with display the background light is lit (dimmed), and the occupancy indication is shown (see the chapter *Display handling*). The current room temperature (or setpoint depending on the configuration) is also shown in the display.

Bypass

Operating mode Bypass means that the controller controls the room temperature in the same way as in operating mode Occupied. The output for forced ventilation is also active. After a configurable time (FS=2 hours) in Bypass, the controller automatically returns to the preset operating mode. Bypass is normally activated when the Occupancy button is pressed, via an Occupancy detector or via a central command. The operating mode is useful for example in conference rooms, where many people are present at the same time for a certain period.

For controllers with display the background light is lit (dimmed). The occupancy indication and the symbol for forced ventilation are shown (see the chapter *Display handling*). The current room temperature (or setpoint depending on the configuration) is shown in the display.

Activation of the different operating modes

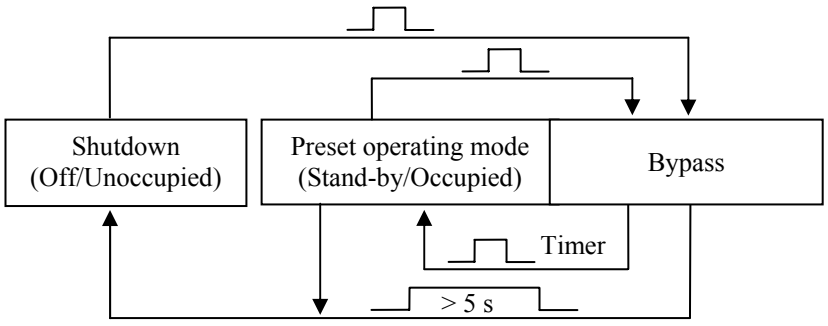
Preset operating mode

Occupied is the preset operating mode. On models without display the preset mode can be changed to Stand-by using dipswitch SW3. OFF (FS): Occupied, ON: Stand-by. On models with display, this is configured in the parameter menu in the display, parameter 45.

The operating mode is changed at the following events:

- When the Occupancy button is pressed (if the controller has an Occupancy button).
- When an Occupancy detector is activated/deactivated on the digital input.
- Via central control, for example central time control, central booking system etc.

Occupancy button



Shutdown

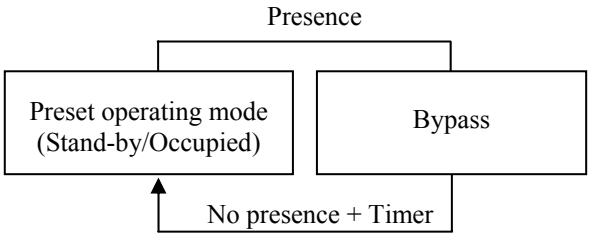
When the Occupancy button is held depressed for more than 5 seconds, the controller changes operating mode to ”Shutdown” (Off/Unoccupied), regardless of the current operating mode. Via the display or Regio Tool©, you can configure which operating mode, Off or Unoccupied, should be activated on ”Shutdown”. The delivery setting is that Unoccupied is activated.

If you press the Occupancy button for less than 5 seconds when the controller is in operating mode Shutdown or the preset operating mode, the controller changes to operating mode Bypass. If you press the button for less than 5 seconds when the controller is in Bypass, it changes operating mode to the Preset operating mode.

After a configurable time in Bypass (FS=2 hours), the controller returns to the preset operating mode.

For handling of the Occupancy button in combination with central control, see the section Central control below.

Occupancy detector



For local control of the operating mode between the preset operating mode and Bypass, an Occupancy detector is connected.

When occupancy is indicated, the controller changes operating mode to Bypass. If you want to be able to enter the room temporarily without activating Bypass, for example to pick something up, you can configure a power-up delay. This means that Bypass is not activated until the power-up delay has expired. The Bypass delay can be set to a value between 0 and 60 minutes (FS=0 min).

In Bypass on presence, there is a switch-off timer, which means that if there is no occupancy indication during this time (FS=10 min), the controller will return to the preset operating mode.

Central control

Central control of the operating mode is also possible. By changing the variable ***RegioRemoteState***, you can centrally control the operating mode of the controller, according to the following table (there is a variable list for central control in the appendix of this manual):

RegioRemoteState	Description
0	Central operating mode Off
1	Central operating mode Unoccupied
2	Central operating mode Stand-by
3	Central operating mode Occupied
4	(Not used)
5 (FS)	No central control

Table 10. The variable RegioRemoteState

The occupancy button

When you are using central control (i. e. RegioRemoteState <> 5) and you press the Occupancy button, the controller will change to Bypass and stay in this mode for as long time as you have configured. If you press the Occupancy button again when the controller is in Bypass, the controller will change to Stand-by, regardless of what has been set in the central control (RegioRemoteState).

When the controller is in Bypass and the Bypass time has run out, the controller will change to the operating mode given by ***RegioRemoteState***. If ***RegioRemoteState*** equals 5 it will change to the preset operating mode.

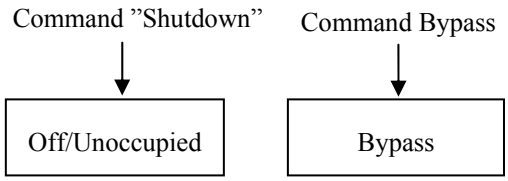
If the controller is in Stand-by and the central control is changed, the controller will change to this new operating mode.

Occupancy detector

When central control is used and the occupancy detector is activated, the controller will go to Bypass for a configured time, and thereafter return to the central operating mode.

Central command

Via central commands from a comprehensive system, for example EXO4, you can manage the controller in the same way as you can manage it locally with the Occupancy button, i. e. you can change its operating mode to Off/Unoccupied (Shutdown) or Bypass.



Central commands should be regarded as events and can be changed locally using the Occupancy button.

Chapter 10 Setpoint calculation

Basic setpoint

There are two basic setpoints, one basic heating setpoint and one basic cooling setpoint (FS basic heating setpoint=22°C, cooling=24°C). In units with dipswitches for setting the basic setpoint (units without display), the basic heating setpoint is set. The basic cooling setpoint is automatically changed at the same time. Therefore, the difference between the basic heating setpoint and the basic cooling setpoint is always the same.

Basic setpoint (°C)	SW1	SW2
20	OFF	OFF
22 (FS)	OFF	ON
24	ON	OFF
26	ON	ON

Table 11. Setting of basic heating setpoint with dipswitch SW1 and SW2

On models with display, the basic setpoint is set in the display.

On all models, you can also configure the setpoints via a central system or Regio Tool©. When the model has dipswitches, the latest setpoint change will be valid.

Setpoint displacement

On all models, except RC-CH, the setpoint value can be adjusted up and down from the basic setpoint value, via the setpoint knob or the display. How much the value can be adjusted can be configured in Regio Tool© or in the parameter menu in the display (FS=+/-3°C).

In models with display, you use the INCREASE button to increase the current setpoint in steps of 0.5°C to the max. limit, and the DECREASE button to decrease the current setpoint in steps of 0.5°C to the min. limit.

RC-CH RC-CH does not have a setpoint knob. On this model, the setpoint is adjusted from the back of the electronics cassette with a small screwdriver.

Calculation of the active setpoint

What setpoint value the controller should control according to depends on the operating mode, the control state and the current setpoint displacement.

Off In operating mode Off or on open window it is a heating controller, and controls according to the frost protection setpoint (FS=8°C), regardless of the setpoint displacement.

Unoccupied In operating mode Unoccupied it controls according to the heating setpoint (FS=15°C), if a control state with heating has been set and the room temperature is lower than this setpoint. If the room temperature exceeds the cooling setpoint (FS=30°C) and a control state with cooling is set, it works as a cooling controller and controls according to this setpoint. The active setpoint changes in the middle of the neutral zone with a hysteresis of 0.1°C. A setpoint displacement is not active in this operating mode.

Stand-by

In operating mode Stand-by it controls according to the basic heating setpoint and the basic cooling setpoint plus/minus a settable neutral zone (FS=3°C). The setpoint can also be adjusted with the setpoint knob or via the display. This means that the heating setpoint's factory setting will be 19°C +/-3°C (local displacement) and the cooling setpoint will be 27°C +/-3°C (local displacement). On heating demand it will control according to the heating setpoint and on cooling demand it will control according to the cooling setpoint. The setpoint change takes place halfway between the setpoints with a hysteresis of 0.1°C.

Occupied/Bypass

In operating mode Occupied or Bypass it controls according to the basic heating setpoint and the basic cooling setpoint respectively. The setpoint can also be adjusted with the setpoint knob or via the display. On heating demand, it will control according to the heating setpoint and on cooling demand it will control according to the cooling setpoint. The setpoint change takes place halfway between the setpoints with a hysteresis of 0.1°C.

Chapter 11 **Actuators**

Regio can be used with three types of actuators:

- Analogue 0…10 V actuators
- Thermal actuators
- 3-point actuators (Increase/Decrease actuators)

On units without display, you choose with a dipswitch per universal output if thermal or analogue actuators are used. On units with display, you set the actuator type via Regio Tool© or in the parameter menu in the display.

Analogue actuators

The following output signal settings can be made for analogue actuators:

- 0…10 V (FS)
- 2…10 V
- 10…2 V
- 10…0 V

Thermal actuators

When thermal actuator control has been selected, this is controlled digitally with time proportional pulses via output UO…. By pulsing, the opening degree of the actuator (and its valve) is varied. The period time (in seconds) is the sum of the on and off output time on the output and the period time is FS=60s. The controller varies the on and off output time proportionally depending on the output signal demand to the actuator.

3-point actuators

For 3-point actuators (increase/decrease actuators, -T-models), two digital outputs are used to control one actuator, one output to open the actuator and one to close it. It is possible to configure the run time (in seconds) for the different actuators (FS=120 s). The program calculates the position of the actuator (0…100%) and sends an increase or decrease signal when the controller output signal deviates more from the calculated position than the neutral zone value (FS=2%).

Actuator exercise

All actuators are exercised. The exercise takes place at set intervals in hours (FS=23 hours interval). An opening signal is sent to the actuator for as long time as the run time for the actuator has been configured. Then a closing signal is sent for as long time and the exercise is finished.

Chapter 12 **Fan control**

In controllers for fan control (-F-models) it is possible to control a fan using the following speeds: Off, Low speed, Medium speed, High speed, Auto. The current fan speed in the Auto position depends on the controller output signal and the settings for each speed.

Manual control

The fan can be manually controlled to work at any speed. On models with display, you press the fan button once. A fan symbol is lit for 10 seconds in the display. When the symbol is lit, you can change the fan speed with the INCREASE/DECREASE buttons. Models without display have a fan switch.

Figure 9. Fan button on models with display

Figure 10. Fan switch on models without display

The controller has the following positions:

Auto	=	Automatic control of the fan speed to maintain desired room temperature
0	=	Fan off
I	=	Manual position with low speed
II	=	Manual position with medium speed
III	=	Manual position with high speed

Manual setting of speed I-III means that the speed of the fan in operating modes Stand-by, Occupied and Bypass is always the set speed. In the other operating modes, the fan works according to requirements.

Auto control

Auto means that the fan is controlled by the controller output signal. When the signal exceeds the start value that has been set for each speed (FS speed 1=20%, speed 2=60%, speed 3=100%), the fan starts. It stops when the controller output signal becomes lower than the set value minus the set hysteresis (FS=5%).

When the fan speed changes, there is always a minimum delay (2-3 s) between the inactivation of the output for the current speed and the activation of the output for the new speed. Only one fan speed output is defined at a time.

Off/Unoccupied

In operating modes Off and Unoccupied, the fan is stopped, regardless of the position of the fan switch or the setting in the display, on condition that the temperature is within the set temperature limits. If the temperature is not within the set temperature limits, the fan will be started in the corresponding Auto position, regardless of the settings.

Chapter 13 **Change-over function**

Change-over is a function for installations with 2-pipe systems. It makes it possible to use the same pipe for both heating and cooling, depending on requirements during for example the summer (cooling output) and the winter (heating output).

Control states

To activate the change-over function, control mode Heating or cooling via the change-over function shall be configured.

All controllers in the Regio series have an input for change-over. The input can be either of the type analogue Pt1000-sensor or a closing contact connected to a digital input (FS=Pt1000-input).

The Pt1000-sensor is mounted so that it senses the temperature on the feed wire to the battery. If the temperature drops below 18°C (FS), change-over is activated and the heating output, UO1 alt. DO2/DO3 (-T-models), is set to cooling. When the temperature exceeds 22°C (FS) the change-over function is deactivated and the heating output is set to heating.

When using a digital signal input (potential-free contact), closing the contact switches the change-over function and sets the heating output, UO1 alt. DO2/DO3 (-T-models), to cooling. On open contact, the change-over function sets the heating output to heating.

It is also possible to control change-over via a central command. See the variable list in the appendix of this manual.

Chapter 14 Forced ventilation / Condensation detector / Frost protection

Forced ventilation

All controllers in the Regio series have a digital output for controlling a forcing damper to increase the airflow to the room. This output is always activated in operating mode Bypass.

When control state “Heating/Cooling with VAV-control and forced supply air function supply air function” is active, the cooling output is used to control the forcing damper. When forced ventilation is active, the cooling output is set to full cooling, regardless of what the controller output signal is.

Condensation detector

Special input CI

There is a special input (CI) on all Regio controllers. This input is intended for Regin’s condensation detector, KG-A, and functions internally as a digital input, i. e. condensation or no condensation.

When the condensation detector is activated, the cooling control is blocked and the controller is set in neutral position. When condensation ceases, the controller will start controlling from the neutral position.

Frost protection

Regio has built-in frost protection, which is activated when the controller is not in use. The frost protection prevents the temperature from dropping below 8°C. Return to normal fan speed and control occurs automatically when the room temperature exceeds 8°C.

Chapter 15 **Indications**

LED

All the controllers without display, except RC-CH, have a LED shaped like a thermometer on the front. A red indication is shown when heating control is functional and a blue indication is shown when cooling control is active. When there is something wrong with the controller, the LED flashes red and blue.

Figure 11. The LED

The occupancy button

On models without display, the occupancy button has the following indications:

- Occupied: Fixed green indication
- Standby: Flashing green indication
- Bypass: Fixed green indication with a short flash
- Off and Unoccupied: No indication

Figure 12. The occupancy button

On Regio models with display these indications are shown in the display, see the chapter *Display handling*.

Communication LED

When the frame has been removed, a LED is visible in the right edge of the controller. It shows a green indication when the controller is sending information.

Chapter 16 **Display handling**

The Midi models RC-CDO, RC-CDFO and RC-CDTO have a display instead of a setpoint knob.

INCR./DECR. button These models also have an Occupancy button, and an INCREASE button and a DECREASE button to increase and decrease the setpoint.

Figure 13. Buttons for display handling

Display indications

The display has the following indications (indications marked with an asterisk (*) are only available on -F-models):

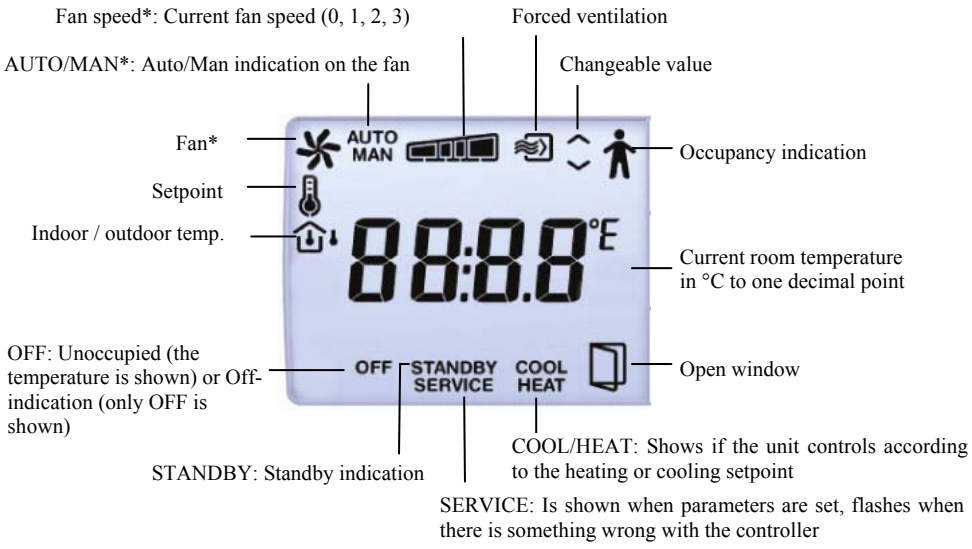


Figure 14. Indications in the display

Parameter menu

It is possible to set different parameter values in a parameter menu. The parameter menu is accessed by simultaneously holding the INCREASE and DECREASE buttons depressed for about 5 seconds and then pressing the INCREASE button twice. The Service indication will be displayed.

First the display will show the parameter-number 1. Scroll between parameters by using the INCREASE and DECREASE buttons.

Press the Occupancy button to select the desired parameter. The parameter number will be replaced by the parameter value. The value can be changed using the INCREASE and DECREASE buttons. If a button is held depressed the value will start scrolling, first slowly and then with increasing speed in 3 – 4 steps with 2 – 3 seconds between steps.

Acknowledge/Regret To acknowledge and store a set parameter value, press the Occupancy button again, the display then returns to showing the parameter number. To retrieve the original value, i.e. the value before change, press the INCREASE and DECREASE buttons at the same time. The original value is shown on the display.

Return After a certain time, about 1 minute, or when the INCREASE and DECREASE buttons are pressed at the same time while in the menu, the display returns to the normal view. Exit is shown on the display after the last parameter. The parameter menu is exited by pressing the Occupancy button while in Exit. Pressing on INCREASE goes to the first parameter and pressing on DECREASE goes to the last parameter.

Parameters

The following parameters can be changed in the parameter menu (FS = Factory setting):

Parameter number	Description	FS
1	Basic heating setpoint	22°C
2	Basic cooling setpoint	24°C
3	Neutral zone at Stand-by, Heating sp=Basic sp heating-3, Cooling sp=Basic sp cooling+3	3°C
4	Heating setpoint at Unoccupied	15°C
5	Cooling setpoint at Unoccupied	30°C
6	Frost protection setpoint	8°C
7	P-band for room controller	10°C
8	I-time (s) for room controller	300 s
9	With a lower temperature on the analogue Change-over input, the cooling function is selected	18
10	With a higher temperature on the analogue Change-over input, the heating function is selected	22
11	Control states: 0=Heat, 1=Heat/Heat, 2=Heat or cooling via Change-over, 3=Heat/Cooling , 4=Heat/Cooling with VAV-control and forced supply air, 5=Heat/Cooling with VAV control, 6=Cooling, 7=Cooling/Cooling	3
12	Time in Bypass mode	120 min
13	Disconnect timer with occupancy/unoccupancy	10 min
14	Switch on delay for occupancy	0 min
15	State connected sensor on AI1: 0=Internal sensor, 1=External room sensor	0
16	State connected sensor on UI1: 0=None, 1=Change-over digital, 2=Change-over analogue	2
18	State connected sensor on DI2: 1=Window contact, 2=Condensation detector	2

20	State function of signal on UO1: 0=None, 1=Thermal actuator heat, 2=None, 3=Heating actuator 0...10V, 4=None	3
21	State function of signal on UO2: 0=None, 1=None, 2=Thermal actuator cooling, 3=None, 4=Cooling actuator 0…10V	4
29	State output signal range for heating actuator: 0=0…10V, 1=2…10V, 2=10…2V, 3=10…0V	0
30	State output signal range for cooling actuator: 0=0…10V, 1=2…10V, 2=10…2V, 3=10…0V	0
31	Period time for heating actuator with thermal actuator	60 s
32	Period time for cooling actuator with thermal actuator	60 s
33	Run time for heating actuator with increase/decrease actuator	120 s
34	Run time for cooling actuator with increase/decrease actuator	120 s
35	Neutral zone for increase/decrease actuator	2%
36	Time in hours between exercise of heating actuator	23
37	Time in hours between exercise of cooling actuator	23
42	Select if setpoint or actual value is to be shown on display, 0=Actual, 1=Heating setpoint, 2=Cooling setpoint, 3=Average value of heating and cooling setpoint, 4=Only setpoint displacement	0
43	Highest permitted setpoint offset upwards	3°C
44	Highest permitted setpoint offset downwards	3°C
45	Preset operating mode: 1=Unoccupied, 2=Stand-by, 3=Occupied. Forced ventilation is not set in Occupied mode.	3
46	State operating mode by depressing Occupancy button for 5 sec: 0=Off, 1=Unoccupied. Forced ventilation is not set in Occupied mode.	1
47	Select operating mode for central control: 0=Off, 1=Unoccupied, 2=Stand-by, 3=Occupied, 5=No central control	5
48	Min. flow at cooling output with regulating state heat/cool when VAV-control is selected	20
49	Max. flow at cooling output with regulating state heat/cool when VAV-control is selected and heating is applied	0
50	Configuration of fan control: 0=No control, 1=The fan is controlled by heating requirement, 2=The fan is controlled by cooling requirement, 3=The fan is controlled by heating and cooling requirement	3
51	Start signal in % for fan speed 1 on heating or cooling control	20
52	Start signal in % for fan speed 2	60
53	Start signal in % for fan speed 3	100
54	Hysteresis for start/stop of fans	5
55	State number of speeds for fan	3
56	Temperature compensation on AI1	0°C
57	Temperature compensation on UI1	0°C
58	Temperature compensation for internal room sensor	0°C
59	Filter factor for analogue temperature inputs	0.2
60	State NO/NC digital input 1 0=NO (Normally open), 1=NC (Normally closed)	0
61	State NO/NC digital input 2 0=NO (Normally open), 1=NC (Normally closed)	1
62	State NO/NC universal input 1 0=NO (Normally open), 1=NC (Normally closed)	0
63	Manual/Auto heating output signal: 0=Off, 1=Manual, 2=Auto	2
64	Manual/Auto cooling output signal: 0=Off, 1=Manual, 2=Auto	2
65	Manual/Auto forced ventilation: 0=Off, 1=On, 2=Auto. Can e.g. be activated from a central system for e.g. night cooling	2
66	Manual/Auto control of change-over mode: 0=Heating control, 1=Cooling control, 2=Automatic change-over depending on analogue temperature sensor or digital input	2
67	Heating output signal in manual mode	0

68	Cooling output signal in manual mode	0
69	Controller Modbus address	254
70	Parity bit Modbus communication: 0=No parity, 1=Odd parity, 2=Even parity	2
71	Modbus timeout for character (t1.5), in ms. Shall be 1.5 times a character, i. e. at least 2 ms.	2
72	Answer delay Modbus (t3.5), in ms. Shall be 3.5 times a character, i. e. at least 5 ms.	5

Table 12. Parameter list

Chapter 17 Memory function on power failure

On power failure, settings and configurations are preserved in the controller in a so called non-volatile memory (EEPROM). All changes made in the settings and configuration are saved in the memory, which means that the latest values are always stored. Measured values and other variables that change often, on the other hand, are not stored.

Values can be saved up to approximately 100 000 times in the non-volatile memory. Therefore, you should not systematically and very often send changed values to the controller via the network communication. Still, you can send normal changes via the network, for example that the operating mode is changed a few times a day.

Example

Activation of Bypass is not stored in the memory. Instead, the controller will return to the preset operating mode after power failure. However, the set operating mode will be saved if central control is being used (parameter 47).

Part IV **Signals**

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Part IV **Signals**

Chapter 18 **Signal types**

EXOL Types

The EXOL types of the signals:

R = Real (-3.3E38 - 3.3E38)

I = Integer (-32768 - 32767)

X = Index (0 - 255)

L = Logic (0/1)

Modbus Type

The Modbus types of the signals (types in the list below):

1 = Coil Status Register (Modbus function = 1, 5 and 15)

2 = Discrete Input (Modbus function = 2)

3 = Holding Register (Modbus function = 3, 6 and 16)

4 = Input Register (Modbus function = 4)

Supported Modbus functions:

1 = Read Coils

2 = Read Discrete Input

3 = Read Holding Register

4 = Read Input Register

5 = Write Single Coil

6 = Write Single Register

15 = Write Multiple Coils

16 = Write Multiple Registers

Scale factor Modbus

All real signals have scale factor 10. Integer, Index and Logic has always scale factor 1.

EXOline/Modbus

The Midi controller automatically switches between EXOline and Modbus depending on the present communication type, without any communication error.

Modbus wiring etc.

A protocol such as Modbus consists of several layers (OSI-model). The bottom layer is always the physical layer, number of wires and signal levels. The next layer describes the communication digits (number of data bits, stop-bits, parity etc). Then come the layers describing the Modbus specific functions (number of digits per message, the meaning of different messages etc).
For Modbus, the bottom layer can be RS485, RS422 or RS232.

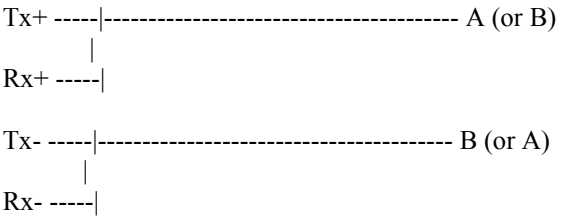
RS485 contra RS422

RS485 and RS422 are the electric part of the protocol, i. e. the physical layer.
RS485 has two connections, A and B. Often there is also a protective earth (N on EXO controllers). RS485 units are connected A → A and B → B. You may have to shift A and B in order for Modbus to work. RS485 is so called half duplex communication: Communication can only go in one direction at a time; i. e. the master will first send an enquiry and will thereafter listen for the reply. A and B are used for both transmission and reception.

RS422 is a full duplex communication which means you need 4 wires, 2 for transmit (Tx+ and Tx-) and 2 for receive (Rx+ and Rx-). Tx is used to transmit and Rx to

receive, which means that Tx in one unit must be connected to Rx in the other and vice versa. As for signal levels etc. RS422 and RS485 are identical.

To interconnect RS485 and RS422: On the RS422 unit connect Tx+ with Rx+ and Tx- with Rx-. We have now changed a 4-wire system to a 2-wire system and can connect them to A and B on the RS485 unit. Which goes where is something you most often need to find out by trial and error. Incorrect polarity will just give nonfunction but cannot harm either unit.



Bitrate, two stop bits, parity is the next layer

These settings must correspond to the settings in the master unit. Find out how the master is set and then give the Controller the same settings.

Parity can be set to odd, even (FS) or none. If none is chosen, two stopbits will automatically be used. If odd or even is chosen only one stop-bit is used otherwise there will be too many bits altogether: 1 start-bit, 8 data-bits, 1 parity-bit and 1 stop-bit give a total of 11 bits which is maximum.

Chapter 19 **Signals**

Discrete inputs

Signal name	Type	Modbus address	Default value	Description
RC_Actual_L.RegioDigIn(0)	L,2	1		Not used
RC_Actual_L.RegioDigIn1	L,2	2		Value of digital input 1
RC_Actual_L.RegioDigIn2	L,2	3		Value of digital input 2
RC_Actual_L.RegioUDigIn1	L,2	4		Value of universal digital input 1
RC_Actual_L.RegioDigOut(0)	L,2	5		Not used
RC_Actual_L.RegioDigOut1	L,2	6		Value of digital output 1
RC_Actual_L.RegioDigOut2	L,2	7		Value of digital output 2
RC_Actual_L.RegioDigOut3	L,2	8		Value of digital output 3
RC_Actual_L.RegioDigOut4	L,2	9		Value of digital output 4
RC_Actual_L.RegioDigOut5	L,2	10		Value of digital output 5
RC_Actual_L.RegioUDigOut1	L,2	11		Value of universal digital output 1
RC_Actual_L.RegioUDigOut2	L,2	12		Value of universal digital output 2
RC_Actual_L.RegioDIOpenWindow	L,2	13		Indicate open window
RC_Actual_L.RegioDICondenseAlarm	L,2	14		Indicate condense alarm from digital input
RC_Actual_L.RegioDIPresences	L,2	15		Indicate presence from digital input
RC_Actual_L.RegioDIChangeOver	L,2	16		Indicate change over from digital input
RC_Actual_L.RegioFanSpeed1	L,2	17		Indicate fan speed 1
RC_Actual_L.RegioFanSpeed2	L,2	18		Indicate fan speed 2
RC_Actual_L.RegioFanSpeed3	L,2	19		Indicate fan speed 3
RC_Actual_L.RegioForcedventilation	L,2	20		Indicate forced ventilation
RC_Actual_L.RegioCVHeatPulsProp	L,2	21		Indicate pulse prop heating
RC_Actual_L.RegioCVCoolPulsProp	L,2	22		Indicate pulse prop cooling
RC_Actual_L.RegioCVHeatInc	L,2	23		Indicate increase heating
RC_Actual_L.RegioCVHeatDec	L,2	24		Indicate decrease heating
RC_Actual_L.RegioCVCoolInc	L,2	25		Indicate increase cooling
RC_Actual_L.RegioCVCoolDec	L,2	26		Indicate decrease cooling
RC_Actual_L.RegioAIChangeOverState	L,2	27		Indicate change over state from analog input
RC_Actual_L.RegioChangeOverState	L,2	28		Indicate change over state from both digital and analog input
RC_Actual_L.RegioRoomTempSensorAlarm	L,2	29		Indicate sensor alarm on room sensor

Coil status register

Signal name	Type	Modbus address	Default value	Description
RC_Setp_L.RegioBypass	L,1	1	0	Force the unit in Bypass mode. Is automatically returned after Bypass time (default=120 min)
RC_Setp_L.RegioShutDown	L,1	2	0	Force the unit in ShutDown state
RC_Setp_L.RegioNotUsedL	L,1	3	0	Not used
RC_Setp_L.RegioDiNC(0)	L,1	4	0	Not used
RC_Setp_L.RegioDi1NC	L,1	5	0	Normally open (NO) or normally closed (NC) on digital input 1. 0=NO, 1=NC.
RC_Setp_L.RegioDi2NC	L,1	6	1	Normally open (NO) or normally closed (NC) on digital input 2. 0=NO, 1=NC.
RC_Setp_L.RegioUDi1NC	L,1	7	0	Normally open (NO) or normally closed (NC) on universal digital input 1. 0=NO, 1=NC.

Input register

Signal name	Type	Modbus address	Default value	Description
RC_Actual_X.RegioSoftware	X,4	1		Type of Regio software: 0 = RCP 1 = RC
RC_Actual_X.RegioVerMajor	X,4	2		Major version
RC_Actual_X.RegioVerMinor	X,4	3		Minor version
RC_Actual_X.RegioVerBranch	X,4	4		Branch version
RC_Actual_X.RegioRevision	X,4	5		Revision
RC_Actual_X.RegioFanSwitch	X,4	6		Indicate Fan switch state
RC_Actual_X.RegioUnitState	X,4	7		Indicate current unit state: 0 = Off 1 = Unoccupied 2 = Stand-by 3 = Occupied 4 = Bypass
RC_Actual_X.RegioControllerState	X,4	8		Indicate current controller state: 0 = Off 1 = Heating 2 = Cooling
RC_Actual_X.RegioFanSpeed	X,4	9		Indicate current fan speed: 0 = Off 1 = Fan speed 1 is on 2 = Fan speed 2 is on 3 = Fan speed 3 is on
RC_Actual_R.RegioNotUsedX	X,4	10		Not used
RC_Actual_R.RegioRoomTemp	R,4	11		Room temperature

RC_Actual_R.RegioRoomTempExt	R,4	12		Room temperature from external sensor
RC_Actual_R.RegioRoomTempInt	R,4	13		Room temperature from internal sensor
RC_Actual_R.RegioAIChangeOver	R,4	14		Change over temperature
RC_Actual_R.RegioAnaIn1	R,4	15		Value of analog input 1
RC_Actual_R.RegioUAnaIn1	R,4	16		Value of universal analog input 1
RC_Actual_R.RegioUAnaOut1	R,4	17		Value of universal analog output 1
RC_Actual_R.RegioUAnaOut2	R,4	18		Value of universal analog output 2
RC_Actual_R.RegioSetPAdjustment	R,4	19		Setpoint adjustment from internal device
RC_Actual_R.RegioPIDSetP	R,4	20		The controller setpoint
RC_Actual_R.RegioPIDOutput	R,4	21		The controller output (0…100%)
RC_Actual_R.RegioHeatOutput	R,4	22		Heat output (0…100%)
RC_Actual_R.RegioCoolOutput	R,4	23		Cool output (0…100%)
RC_Actual_R.RegioAI1Raw	R,4	24		The raw value on analog input 1
RC_Actual_R.RegioUI1Raw	R,4	25		The raw value on universal input 1

Holding register

Signal name	Type	Modbus address	Default value	Description
RC_Setp_X.AlaModStat	X,3	1	-	Not used
RC_Setp_X.RegioPIDSelect	X,3	2	-	Not used
RC_Setp_X.RegioHeatOutputSelect	X,3	3	2	Manual/Auto heat output: 0 = Off 1 = Manual output 2 = Automatic output
RC_Setp_X.RegioCoolOutputSelect	X,3	4	2	Manual/Auto cool output
RC_Setp_X.RegioFanSelect	X,3	5	4	Select fan mode: 0 = Off 1 = Manual speed 1 2 = Manual speed 2 3 = Manual speed 3 4 = Auto (5 = Auto 2) (only room unit with select (6 = Auto 1) button)
RC_Setp_X. RegioFanControlMode	X,3	6	3	Select fan control: 0 = No control 1 = The fan is controlled on heating demand 2 = The fan is controlled on cooling demand 3 = The fan is controlled by both heating and cooling demand
RC_Setp_X.RegioFanSpeed1Start	X,3	7	20	Controller output limit start fan speed 1
RC_Setp_X.RegioFanSpeed2Start	X,3	8	60	Controller output limit start fan speed 2
RC_Setp_X.RegioFanSpeed3Start	X,3	9	100	Controller output limit start fan speed 3
RC_Setp_X.RegioFanSpeedHyst	X,3	10	5	Controller output hysteresis start/stopp fan speed.
RC_Setp_X.RegioFanSpeedMax	X,3	11	3	Number of fan speeds (1-3)

RC_Setp_X.RegioForcedVentSelect	X,3	12	2	Manual/Auto forced ventilation (0=Off, 1=Manual On, 2=Auto)
RC_Setp_X.RegioChangeOverSelect	X,3	13	2	Manual/Auto change-over (0=Heating, 1=Cooling, 2=Auto)
RC_Setp_X.RegioRemoteState	X,3	14	5	Is used for remote control unit state: 0 = Off 1 = Unoccupied 2 = Stand-by 3 = Occupied 5 = No remote control
RC_Setp_X.RegioUnitReturnState	X,3	15	3	Select unit preset state: 2 = Stand-by 3 = Occupied
RC_Setp_X.RegioUnitShutDownState	X,3	16	1	Select unit shutdown state: 0=Off 1=Unoccupied
RC_Setp_X.RegioBtnOnOffTime	X,3	17	5	Time (sec) that On/Off button must be pushed before Shutdown state
RC_Setp_X.RegioControllerMode	X,3	18	3	Select controller mode, 0 = Heating 1 = Heat/Heat 2 = Heat with change over 3 = Heat/Cool 4 = Heat/Cool with VAV-control and forced supply air 5 = Heat/Cool with VAV-control 6 = Cooling 7 = Cool/Cool
RC_Setp_X.RegioCVHeatType	X,3	19	0	Type of control valve heating: 0 = 0…10 V 1 = 2…10 V 2 = 10…2 V 3 = 10…0 V
RC_Setp_X.RegioCVCoolType	X,3	20	0	Type of control valve cooling
RC_Setp_X.RegioCVHeatExerciseInterval	X,3	21	23	Exercise interval control valve heating (hour)
RC_Setp_X.RegioCVCoolExerciseInterval	X,3	22	23	Exercise interval control valve cooling (hour)
RC_Setp_X.RegioAi(0)	X,3	23	-	Not used
RC_Setp_X.RegioAi1	X,3	24	0	Connected signal on AI1: 0 = Not used (internal room sensor is used) 1 = External room sensor
RC_Setp_X.RegioAi2	X,3	25	-	Not used
RC_Setp_X.RegioDi(0)	X,3	26	-	Not used
RC_Setp_X.RegioDi1	X,3	27	3	Presence sensor connected on DI1.
RC_Setp_X.RegioDi2	X,3	28	2	Signal connected to DI2: 1 = Open window 2 = Condense alarm
RC_Setp_X.RegioDi3	X,3	29	0	Not used
RC_Setp_X.RegioUi1	X,3	30	2	Connected signal on UI1: 0 = Disable 1 = Change over sensor digital 2 = Change over sensor analogue
RC_Setp_X.RegioAo(0)	X,3	31	-	Not used

RC_Setp_X.RegioAo1	X,3	32	1	Not used
RC_Setp_X.RegioAo2	X,3	33	2	Not used
RC_Setp_X.RegioDo(0)	X,3	34	-	Not used
RC_Setp_X.RegioDo1	X,3	35	1	Connected signal on DO1: 0 = Disable 1 = Fan speed 1 2 = Fan speed 2 3 = Fan speed 3 4 = Forced ventilation 5 = Termal actuator heating 6 = Termal actuator cooling 7 = Control valve heating increase 8 = Control valve heating decrease 9 = Control valve cooling increase 10 = Control valve cooling decrease
RC_Setp_X.RegioDo2	X,3	36	2	Connected signal on DO2
RC_Setp_X.RegioDo3	X,3	37	3	Connected signal on DO3
RC_Setp_X.RegioDo4	X,3	38	4	Connected signal on DO4
RC_Setp_X.RegioDo5	X,3	39	0	Connected signal on DO5
RC_Setp_X.RegioDo6	X,3	40	5	Not used
RC_Setp_X.RegioDo7	X,3	41	6	Not used
RC_Setp_X.RegioUo1	X,3	42	3	Connected signal on UO1: 0 = Disable 1 = Thermal actuator heating 2 = Thermal actuator cooling 3 = Control valve heating analogue 4 = Control valve cooling analogue
RC_Setp_X.RegioUo2	X,3	43	4	Connected signal on UO2
RC_Setp_X.RegioModbusSlaveAddr	X,3	44		Modbus slave address
RC_Setp_X.RegioModbusParity	X,3	45	2	Modbus parity bit: 0 = No parity 1 = Odd parity 2 = Even parity
RC_Setp_X.RegioModbusCharTimeout	X,3	46	2	Modbus character timeout (t1.5), in unit of ms. Should be 1.5 times a character, i.e. at least 2 ms.
RC_Setp_X.RegioModbusAnswerDelay	X,3	47	5	Modbus answer delay (t3.5), in unit of ms. Should be 3.5 times a character, i. e. at least 5 ms.
RC_Setp_X.RegioDispBacklightLO	X,3	48	20	Lighting low (0-255)
RC_Setp_X.RegioDispBacklightHi	X,3	49	100	Lighting high (0-255)
RC_Setp_X.RegioDispContrast	X,3	50	15	Contrast (0-15)
RC_Setp_X.RegioDisplayViewMode	X,3	51	0	Select view mode for the display: 0 = Room temp 1 = Heat setpoint 2 = Cool setpoint 3 = Average cool/heat setpoint 4 = Only setpoint offset
RC_Setp_X.RegioNotUsedX	X,3	52	-	Not used
RC_Setp_X.RegioNotUsedX	X,3	53	-	Not used
RC_Setp_X.RegioNotUsedX	X,3	54	-	Not used
RC_Setp_X.RegioNotUsedX	X,3	55	-	Not used
RC_Setp_I.RegioBypassTime	I,3	56	120 min	Time in Bypass mode (min)

RC_Setp_I.RegioPresenceOffTime	I,3	57	10 min	Off delay for changing to not presence (min)
RC_Setp_I.RegioPresenceOnTime	I,3	58	0 min	On delay for changing to presence (min)
RC_Setp_I.RegioCVHeatPeriodTime	I,3	59	60 sec	Period time if pulse prop control valves heating (sec)
RC_Setp_I.RegioCVCoolPeriodTime	I,3	60	60 sec	Period time if pulse prop control valves cooling (sec)
RC_Setp_I.RegioCVHeatRunTime	I,3	61	120 sec	Run time close to open valve heating (sec)
RC_Setp_I.RegioCVCoolRunTime	I,3	62	120 sec	Run time close to open valve cooling (sec)
RCPInternal.RegioNotUsedX	X,3	63	-	Not used
RCPInternal.RegioNotUsedX	X,3	64	-	Not used
RCPInternal.RegioNotUsedX	X,3	65	-	Not used
RCPInternal.RegioNotUsedX	X,3	66	-	Not used
RCPInternal.RegioNotUsedX	X,3	67	-	Not used
RC_Setp_R.RegioOccSetPHeat	R,3	68	22 °C	Room base setpoint heating
RC_Setp_R.RegioOccSetPCool	R,3	69	24 °C	Room base setpoint cooling
RC_Setp_R.RegioStandbySetPDeadBand	R,3	70	3 °C	Deadband in Standby mode
RC_Setp_R.RegioUnOccSetPHeat	R,3	71	15 °C	Room heat setpoint in Unoccupied mode
RC_Setp_R.RegioUnOccSetPCool	R,3	72	30 °C	Room cool setpoint in Unoccupied mode
RC_Setp_R.RegioFrostSetP	R,3	73	8 °C	Frost protection setpoint
RC_Setp_R.RegioSetpointOffsetPos	R,3	74	3 °C	Max setpoint adjustment pos
RC_Setp_R.RegioSetpointOffsetNeg	R,3	75	3 °C	Max setpoint adjustment neg
RC_Setp_R.RegioSetPOffset	R,3	76	0 °C	Setpoint adjustment
RC_Setp_R.RegioPIDPGain	R,3	77	10 °C	Room controller P-band
RC_Setp_R.RegioPIDITime	R,3	78	300 sec	Room controller I-time
RC_Setp_R.RegioCVDeadband	R,3	79	2 %	Deadband control valve
RC_Setp_R.RegioAIChangeOverLimitLow	R,3	80	18 °C	If lower change-over temp it is cooling
RC_Setp_R.RegioAIChangeOverLimitHigh	R,3	81	22 °C	If higher change-over temp it is heating
RC_Setp_R.RegioAi1Comp	R,3	82	0 °C	Analog input 1 compensation
RC_Setp_R. RegioUi1Comp	R,3	83	0 °C	Universal input 1 compensation
RC_Setp_R.RegioInternalTempComp	R,3	84	0 °C	Internal room sensor compensation
RC_Setp_R.RegioTempFilterFactor	R,3	85	0.2 °C	Filter factor for temperature on analog input 0 = No filter 1 = Max filter
RC_Setp_R.RegioMinFlow	R,3	86	20 %	Min flow of cool output when VAV-control is configured
RC_Setp_R.RegioMaxFlowHeat	R,3	87	0 %	Max flow of cool output when controller mode “Heat/Cool with VAV-control” is configured and heating is controlling the cool output
RC_Setp_R.RegioNotUsedR	R,3	88	-	Not used
RC_Setp_R.RegioNotUsedR	R,3	89	-	Not used
RC_Setp_R.RegioNotUsedR	R,3	90	-	Not used
RC_Setp_R.RegioNotUsedR	R,3	91	-	Not used
RC_Setp_R.RegioNotUsedR	R,3	92	-	Not used
RC_Setp_R.RegioPIDManSet	R,3	93	-	Not used

RC_Setp_R.RegioHeatOutputManual	R,3	94	0 %	Manual value heat output (0…100%)
RC_Setp_R.RegioCoolOutputManual	R,3	95	0 %	Manual value cool output (0…100%)
RC_Setp_R.RegioRoomTempRemote	R,3	96	-255	Is used for remote control of the room temperature. (-255 = no remote control of the room temperature) External room sensor must be selected.

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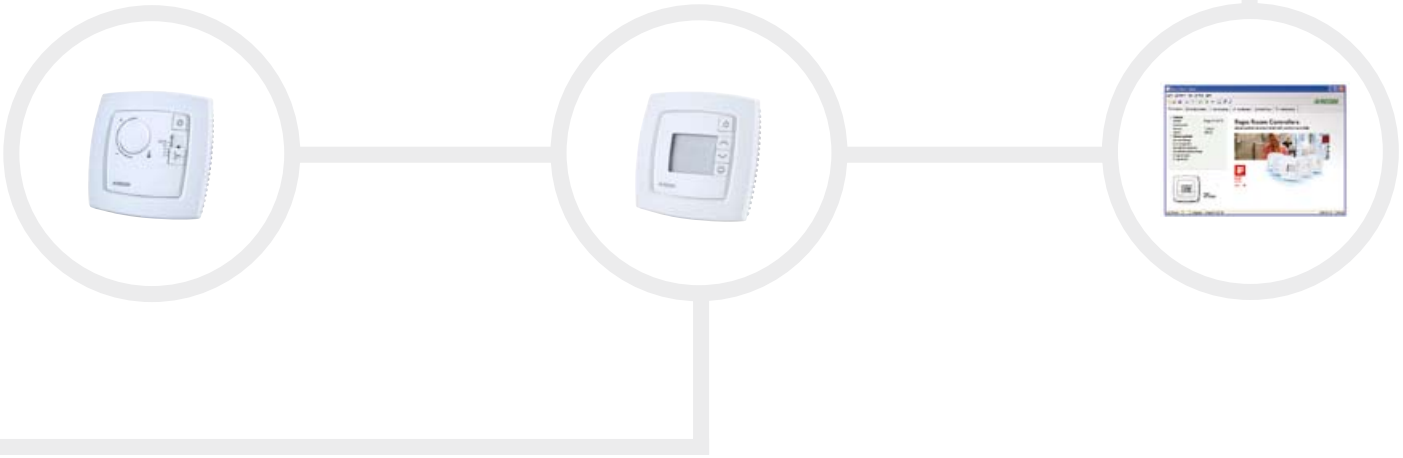

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