RC-C3DFOC

Pre-programmed room controller with display, communication and fan button

**RC-C3DFOC is a complete pre-programmed room controller from the Regio Midi series intended to control heating and cooling in fan-coil systems.**

RC-C3DFOC is a room controller in the Regio series. It has a button for EC fan control, as well as communication via RS485 (Modbus, BACnet or EXOline) for systems integration.

Regio

Regio is an extensive range of controllers for control of heating and cooling.

The controllers are divided into three different series; Mini, Midi and Maxi. Mini consists of pre-programmed, stand-alone controllers. Maxi consists of freely programmable controllers with communication. The Midi controllers, of which RC-C3DFOC is a part, consists of pre-programmed controllers with communication.

Applications

The Regio controllers are suitable for use in buildings requiring optimum comfort and reduced energy consumption, such as offices, schools, shopping centres, airports, hotels and hospitals etc.

See application examples on page 4.

Sensor

The controller has a built-in room temperature sensor. An external sensor for room temperature, change-over or supply air temperature limitation can also be connected (PT1000). There is also an input for CO_2 sensors.

Actuators

RC-C3DFOC can control 0...10 V DC valve actuators and/or 24 V AC thermal actuators or On/Off actuators with spring return.

Flexibility with communication

RC-C3DFOC can be connected to a central SCADA system via RS485 (EXOline, BACnet or Modbus) and configured for a specific application using the free configuration software Regio tool©. Read more about Regio tool© on page 4.

Short facts about RC-C3DFOC

- Communication via RS485 (Modbus, BACnet or EXOline)
- Quick and simple configuration via Regio tool©
- Easy installation
- On/Off or 0...10 V control
- Backlit display
- Input for occupancy detector, window contact, condensation sensor, CO_2 detector, or change-over function
- Supply air temperature limitation
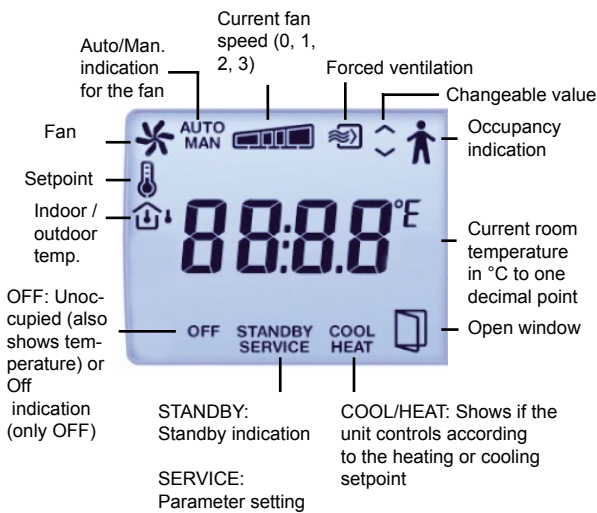
Easy to install

The modular design, featuring a separate bottom plate for wiring, makes the entire Regio range of controllers easy to install and commission. The bottom plate can be put into place before the electronics are installed. Mounting takes place directly on the wall or on an electrical connection box.
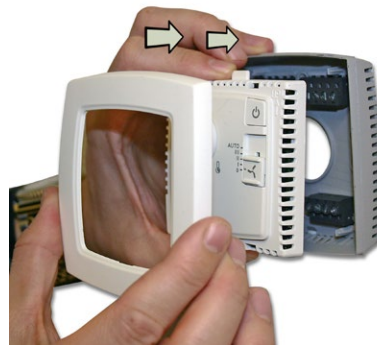
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Display handling

The display has the following indications:

- Auto/Man. indication for the fan
- Current fan speed (0, 1, 2, 3)
- Forced ventilation
- Changeable value
- Occupancy indication
- Fan
- Setpoint
- Indoor / outdoor temp.
- Current room temperature in °C to one decimal point
- OFF: Unoccupied (also shows temperature) or Off indication (only OFF)
- Open window
- STANDBY: Standby indication
- SERVICE: Parameter setting
- COOL/HEAT: Shows if the unit controls according to the heating or cooling setpoint

The buttons on the controller enables easy setting of parameter values using a parameter menu shown in the display. The parameter values are changed with the INCREASE and DECREASE buttons and changes confirmed with the Occupancy button.

- Occupancy button
- INCREASE
- DECREASE
- FAN BUTTON

To prevent unauthorised users from making changes to the settings, it is possible to block button functionality. Parameter menu access may also be blocked.

Control modes

RC-C3DFOC can be configured for different control modes/control sequences:

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

Operating modes

There are five different operating modes: Off, Unoccupied, Stand-by, Occupied and Bypass. Occupied is the preset operating mode. It can be set to Stand-by using the parameter menu in the display. The operating modes can be activated via a central command, an occupancy detector or the Occupancy button.

Off: Heating and cooling are disconnected. However, frost protection is still active (factory setting (FS))=8°C). This mode is activated if a window is opened.

Unoccupied: The room in which the controller is placed is not used for a extended time period, such as during holidays or long weekends. Both heating and cooling are kept within a temperature interval with configurable min/max temperatures (FS min=15°C, max=30°C).

Stand-by: The room is in an energy saving mode and is not used at the moment. This can, for instance, be during nights, weekends and evenings. The controller stands by to change operating mode to Occupied if presence is detected. Both heating and cooling are kept within a temperature interval with configurable min/max temperatures (FS min=15°C, max=30°C).

Occupied: The room is in use and a comfort mode is activated. The controller maintains the temperature around a heating setpoint (FS=22°C) and a cooling setpoint (FS=24°C).

Bypass: The temperature in the room is controlled in the same way as in the Occupied operating mode. The output for forced ventilation is also active. This operating mode is useful for instance in conference rooms, where many people are present at the same time for a certain period of time.

When Bypass has been activated by pressing the occupancy button, the controller will automatically return to its preset operating mode (Occupied or Stand-by) after a configurable time has elapsed (FS=2 hours). If an occupancy detector is used, the controller will automatically return to its preset operating mode if no occupancy is detected for 10 minutes.

CO_2 control

A CO_2 sensor is connected to AI2. In control modes where VAV (Variable Air Volume) has been selected, the damper will be affected by the CO_2 level. If the CO_2 concentration rises, the damper will open to increase air volume regardless of controller temperature requirements. The damper starts opening when the CO_2 level exceeds "CO_2 level for starting opening damper" and is entirely open at "CO_2 level for fully opened damper".

Occupancy detector

By connecting an occupancy detector, RC-C3DFOC can switch between the preset operating mode for presence (Bypass or Occupied) and its preset operating mode. This way, the temperature is controlled from requirement, making it possible to save energy while maintaining the temperature at a comfortable level.

The occupancy button

Pressing the occupancy button for less than 5 seconds when the controller is in its preset operating mode will cause it to change to operating mode Bypass. Pressing the button for less than 5 seconds when the controller is in Bypass mode will change its operating mode to the preset operating mode

If the occupancy button is depressed for more than 5 seconds will change the controller's operating mode to "Shutdown" (Off/Unoccupied) regardless of its current operating mode. Regio tool© or the display enables selecting which operating mode, Off or Unoccupied, should be activated on "Shutdown" (FS=Unoccupied). If the occupancy button is depressed for less than 5 seconds when in Shutdown mode, the controller will return to Bypass.

Forced ventilation

Regio has a built-in function for forced ventilation. RC-C3DFOC has no output for forced ventilation damper control. Instead, the forcing variable is activated in operating mode Bypass, enabling damper control via a SCADA system.

EC fan control

Control of an EC fan can be set using Regio tool©. It is possible to select whether the fan should run in Heating, Cooling or both Heating and Cooling.

Control of electrical heater

Models offering fan functionality have a function for controlling a heating coil on UO1 in sequence with change-over on UO2. To activate this function, Regio tool© is used to set the control mode "Heating/Heating or Cooling via change-over". The change-over function will then be used to switch between summer and winter mode.

UO2 will be used as a cooling actuator in summer mode and as a heating actuator in winter mode. When in summer mode, RC-C3DFO functions as a heating/cooling controller and when in winter mode as a heating/heating controller. UO2 will initiate first, followed by UO1 (heating coil).

The heating coil connected to UO1 will activate only if the coil on UO2 cannot fulfill the heating requirement by itself.

Note that Regio has no input for monitoring fan status or overheating of the heating coil. These functions must instead be supplied by a SCADA system.

Change-over function

RC-C3DFOC has an input for change-over (AI1) that automatically resets output UO1 to operate with heating or cooling function. The input can be connected to sensors of type PT1000, with the sensor mounted so that it senses the temperature of the coil supply pipe. As long as the heating valve is more than 20 % open, or each time a valve exercise takes place, the difference between the media and room temperature is calculated. The control mode is then changed based on the temperature difference.

Optionally, a potential-free contact can be used. When the contact is open, the controller will operate using the heating function, and when closed using the cooling function.

CO_2 control

A CO_2 sensor is connected to AI2. In control modes where VAV (Variable Air Volume) has been selected, UO2 (damper) will be affected by CO_2 levels. If the CO_2 concentration rises, the damper will open to increase air volume regardless of controller temperature requirements. The damper starts opening when the CO_2 levels exceed "CO_2 level for starting opening damper" and is entirely open at "CO_2 level for fully opened damper".

Setpoint adjustment

When in mode Occupied, the controller operates using a heating setpoint (FS=22°C) or a cooling setpoint (FS=24°C) that can be changed using the INCREASE and DECREASE buttons.

Pressing INCREASE will increase the current setpoint by 0.5°C per press until the maximum offset (FI=+3°C) has been reached. Pressing DECREASE will decrease the current setpoint by 0.5°C per press until the maximum offset (FI=-3°C) has been reached.

Switching between heating and cooling setpoints takes place automatically in the controller depending on heating or cooling requirements.

Built-in safety functions

RC-C3DFOC has an input for a condensation sensor to detect moisture accumulation. If detected, the cooling circuit will be stopped. The controller also has frost protection. This prevents frost damages by ensuring that the room temperature does not drop below 8°C when the controller is in mode Off.

Supply air temperature limitation

AI1 can be configured for use with a supply air temperature limitation sensor. A room controller will then work together with a supply air temperature controller using cascade control, resulting in a calculated supply air temperature maintaining the room temperature setpoint. It is possible to set individual min/max limitation setpoints for heating and cooling. Settable temperature range: 10…50°C.

Actuator exercise

All actuators are exercised, regardless of type or model. The exercise takes place at intervals, settable in hours (FS=23 hours interval). An opening signal is sent to the actuator for as long time as its configured run time. A closing signal is then sent for an equal amount of time, after which the exercise is completed. Actuator exercise is switched off if the interval is set to 0.

Fan control

RC-C3DFOC has a fan button used for setting the fan speed. Pressing the fan button will cause the fan to move from its current speed to the next.

The controller has the following positions:

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

In operating modes Off and Unoccupied, the fan is stopped regardless of the display setting.

Manual fan control can be blocked, if desired.

Fan boost function

If there is a great difference between the room setpoint and the current room temperature, or if one simply wishes to hear the fan start, a boost function can be activated to make the fan run at top speed for a short start-up duration.

Fan kickstart

When using today's energy-saving EC fans, there is always a risk the fan will not start due to the low control voltage preventing the fan from exceeding its starting torque. The fan will then remain at a standstill while power still flows through it, which may give rise to damage. To prevent this, a fan kickstart function can be activated. The fan output will then be set to 100 % for a set time (1...10 s) when the fan is set to run at its lowest speed when starting from an off position. In this way, the starting torque is exceeded. After the set time has elapsed, the fan will return to its original speed.

Configuration and supervision using Regio tool©

RC-C3DFOC is pre-programmed upon delivery, but can be configured using Regio tool©.

Regio tool© is a PC-based program that makes it possible to configure and supervise an installation and change its settings using a comprehensive user interface.

The program can be downloaded free of charge from Regin's website www.regincontrols.com.
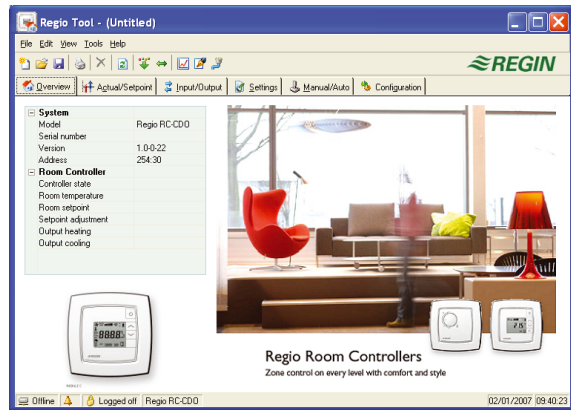
Application examples
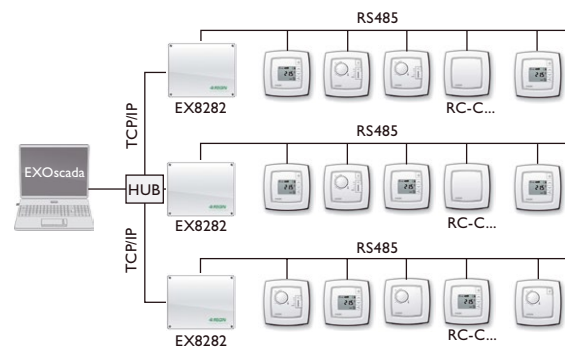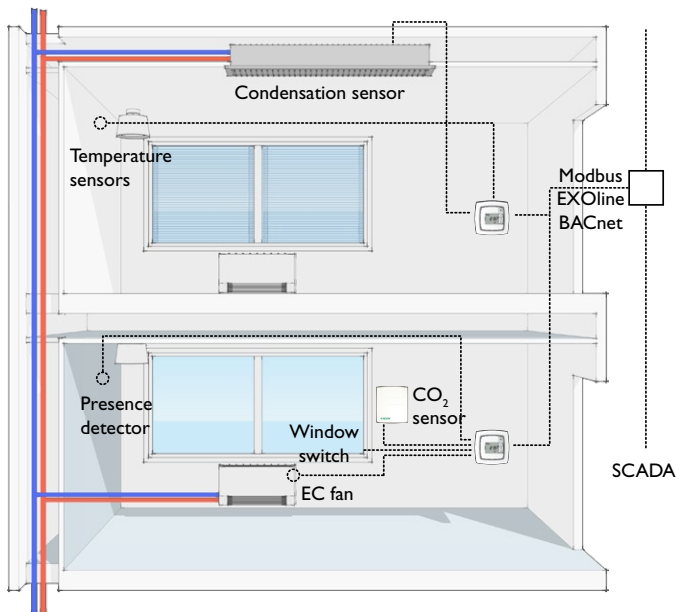
Technical data

Supply voltage	18...30 V AC, 50...60 Hz
Internal consumption	2.5 VA
Ambient temperature	0...50°C
Storage temperature	-20...+70°C
Ambient humidity	Max 90 % RH
Protection class	IP20
Communication	RS485 (EXOline or Modbus with automatic detection/change-over, or BACnet)
Modbus	8 bits, 1 or 2 stop bits. Odd, even (FS) or no parity.
BACnet	MS/TP
Communication speed	9600, 19200, 38400 bps (EXOline, Modbus and BACnet) or 76800 bps (BACnet only)
Display	Backlit LCD
Built-in temperature sensor	NTC type, measuring range 0...50°C, accuracy ±0.5°C at 15...30°C
Material, casing	Polycarbonate, PC
Weight	110g
Colour	Cover: Polar white RAL9010 Bottom plate: Light gray *Is available in other colours on inquiry, contact Regin for more information*

CE

EMC emissions & immunity standards: This product confirms to the requirements of the EMC Directive 2004/108/EC through product standards EN 61000-6-1and EN 61000-6-3.

RoHS: This product conforms to the Directive 2011/65/EU of the European Parliament and of the Council.

Inputs

External room sensor or supply air temperature limitation sensor	PT1000 sensor, 0...50°C. Suitable sensors are Regin's TG-R5/PT1000, TG-UH/PT1000 and TG-A1/PT1000.
Change-over alt. potential-free contact	PT1000 sensor, 0...100°C. Suitable sensor is Regin's TG-A1/PT1000.
Occupancy detector	Closing potential-free contact. Suitable occupancy detector is Regin's IR24-P.
Condensation sensor, window contact	Regin's condensation sensor KG-A/1 resp. potential-free contact

Outputs

Valve actuator (0...10 V), thermal actuator (On/Off pulsing) or On/Off actuator (UO1, UO2)	2 outputs
Valve actuator	0...10 V, max 5 mA
Thermal actuator	24 V AC, max 2.0 A (time-proportional pulse output signal)
On/Off actuator	24 V AC, Max. 2.0 A
Output	Heating, Cooling or VAV (damper)
EC fan (UO3)	1 output
EC fan	0...10 V DC, max. 5 mA
Output	EC fan
Exercise	FS=23 hours interval
Terminal blocks	Lift type for max cable cross-section 2.1 mm^2

Setpoint settings via Regio tool© or in display

Basic heating setpoint	5...40°C
Basic cooling setpoint	5...50°C
Setpoint displacement	±0...10°C (FI=±3°C)

Wiring

Terminal	Designation	Function
10	G	Supply voltage 24 V AC
11	G0	Supply voltage 0 V
12-14		No function
20	GDO	24 V AC out common for DO.
21	G0	0 V common for UO (if using 0...10 V actuators)
22	UO3	EC fan output (0...10 V DC)
23	UO1	Output for 0...10 V valve actuator alt. thermal actuator alt. On/Off actuator, Heating (FS) or Heating or Cooling via change-over.
24	UO2	Output for 0...10 V valve actuator alt. thermal actuator alt. On/Off actuator, Heating (FS) or Heating or Cooling via change-over.
30	AI1	Input for external sensor, alt. change-over sensor, alt. supply air temperature limitation sensor
31	AI2	Input for CO_2 sensor, 0...10 V DC, alt. air speed
32	DI1	Input for occupancy detector, alt. window contact, alt. change-over sensor
33	DI2/CI	Input for condensation sensor KG-A/1 alt. window switch alt. digital change-over
40	+C	24 V DC out common for UI and DI
41	AGnd	Analogue ground
42	A	RS485-communication A
43	B	RS485 communication B

Dimensions
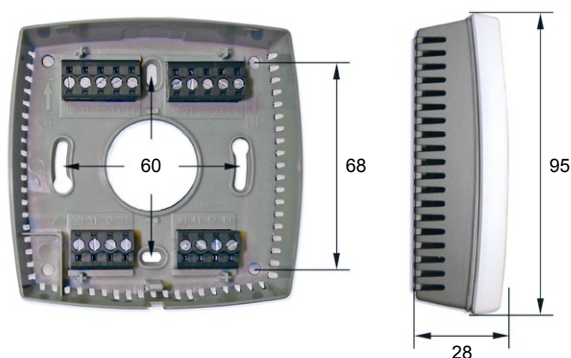
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Product documentation

Document	Type
Regio Midi manual	Manual for the controllers from the Regio Midi series
Installation instruction Regio RC-C3DFOC	Installation instruction for Regio RC-C3DFOC
Product sheet TG-R4/PT1000, TG-R5/PT...	Information on suitable sensors for RC-C3DFOC
Product sheet TG-UH/PT...	
Product sheet TG-A1/PT...	
Product sheet CO2RT (-D)	
Product sheet IR24-P	Information on suitable occupancy detectors for RC-C3FOC
Instruction IR24-P	
Instruction RB3	information on suitable relay module for RC-C3FOC
Product sheet KG-A/1	Information about condensation sensors for the Regio controllers

The documents can be downloaded from www.regincontrols.com.

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