

## FC015

# Communicative room temperature and CO<sub>2</sub> controller for heating and cooling panels and VAV damper



### Summary

**FC015 is a communicative controller of heating and cooling panels and a VAV (variable air volume) damper. It measures temperature and CO<sub>2</sub> concentration in the room air using a room unit and it may either work autonomously, or be connected to a primary controller (MiniPLC or SoftPLC) or SCADA (RcWare Vision or any other SCADA able to act as Modbus master). As a room unit, UC095 is used.**

### Application

- **Individual room control for systems with heating and cooling panels and VAV dampers**

### Function

The controller communicates with a room unit UC095 over a dedicated bus (K2+, K2-). The room unit UC095 reads room temperature, CO<sub>2</sub> concentration in the room air, setpoint correction by a knob, and operating status, which is selected by a short push of the button or in the menu. Measured temperature range is 0 to +50 °C, CO<sub>2</sub> range 0 to 2000 ppm. Read and entered values are processed in a PI (temperature) and proportional (CO<sub>2</sub>) control algorithm. On the output, there are analogue 0..10 V sequences to control the valve actuators and VAV controller.

The binary input DI1 switches between Comfort and Standby operating modes. The DI2 switches to Off mode.

To the firmware version 100 (3. 2. 2017) triac outputs DO1 and DO2 can be controlled over the bus as auxiliary outputs. From firmware version 100 it is possible to copy AO to the DO like PWM signal or control outputs manually.

The controller incorporates real time clock with weekly scheduler (6 events per day). It switches between the Comfort, Precomfort, and Off operation modes. There is a binary presence input on the controller for access card reader, PIR sensor etc. Both NO and NC contact may be used, the selection follows in the configuration software. Each operation mode has separate setpoints for heating and cooling which are used as basis setpoints for setpoint calculation: to the basic setpoint, the manual setpoint correction is added, and the result is used as actual setpoint for heating or cooling.

The air volume setpoint (0..10 V output signal for the VAV controller) is derived from the CO<sub>2</sub> concentration in the air, and operation status:

- Comfort: the CO<sub>2</sub> concentration is controlled with a proportional controller so as to achieve the setpoint (default is 800 ppm), with minimum air volume as set in a parameter of the configuration tool
- Standby: there is minimum air volume required as set in the minimum air volume parameter
- Off: the VAV output goes to 0 V.

Three LEDs indicate correct function: green (PWR) – power OK, red (TX1) – transmit data to the building bus, and red (TX2) – transmit data to the room unit. On the top there are four DIP switches: K1 bus end, and init switch to set factory defaults (Modbus address 1, communication 9600 bps, N, 8, 1).

The controller communicates with the management system over RS485 bus with Modbus RTU and therefore can be used in many control systems. See the variable list (Modbus table) in a separate document *Room units and controllers – Communication protocol description*. Another bus, K2, communicates with the room unit. To configure and commission the controller use **ModComTool**, which is free to download at [www.rcware.eu](http://www.rcware.eu).

The controllers operate in a non-aggressive environment. No maintenance is necessary. They are mounted with two screws on any flat surface, e.g. installation board. The holds can be removed and replaced by an optional DIN rail adapter fixed on the bottom of the controller.

## Technical data

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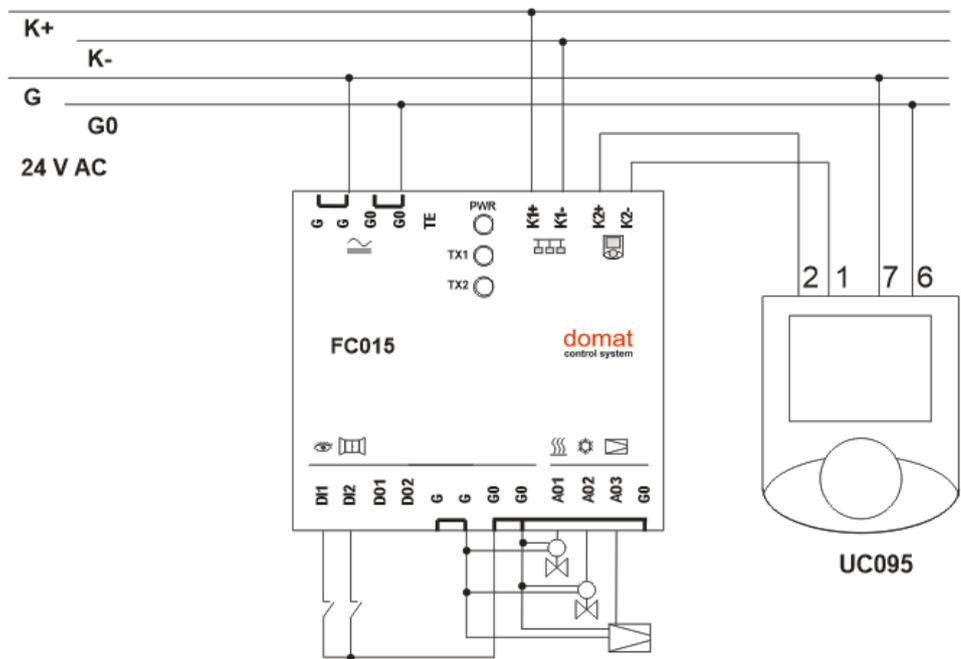
Power	24 V AC +/- 10%, 16...35 V DC (AC power necessary for optional DO control)
Consumption	3000 mVA + peripherals (cca. 6VA)
Protection	IP20
Input	2x DI for a dry contact, 24 V AC, 15 mA
Outputs	3x analogue output 0...10 V, max. 10 mA, short circuit 50 mA, permanent short-circuit proof 2x solid state relay for AC load, zero switching, 24 V AC against G0, max. current 0,4 A
Communication	to room unit: RS485 - Modbus RTU, 9600, N, 8, 1, master to BMS: RS485 - Modbus RTU, 9600, N, 8, 1, slave
Installation	2 screws, optionally DIN rail adapter
Terminals	screw terminals for wire 0,14 – 1,5 mm <sup>2</sup>
Weight	0,13 kg
Dimensions	75 mm (104 mm with the installation holds) x 90 mm x 24 mm
CE-conformity	

## Terminals

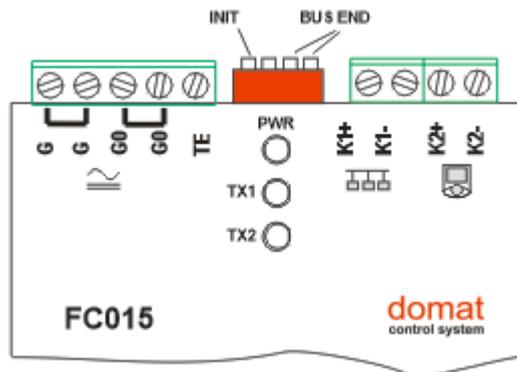
G	power
G	power
G0	power – common
G0	power – common
TE	technical ground
K1+	BMS communication, +
K1-	BMS communication, -

- K2+ room unit communication, +
- K2- room unit communication, -
  
- D11 presence input (switches Comfort - Precomfort) against G0
- D12 window contact input (switches to Off) against G0
- DO1 digital output (G, against G0)
- DO2 digital output (G, against G0)
- G power of inputs and outputs
- G power of inputs and outputs
- G0 power of inputs and outputs – common
- G0 power of inputs and outputs – common
- AO1 heating valve output (0..10 V DC against G0)
- AO2 cooling valve output (0..10 V DC against G0)
- AO3 VAV controller output (0..10 V DC against G0)
- G0 power of inputs and outputs – common

## Wiring



## DIP switches



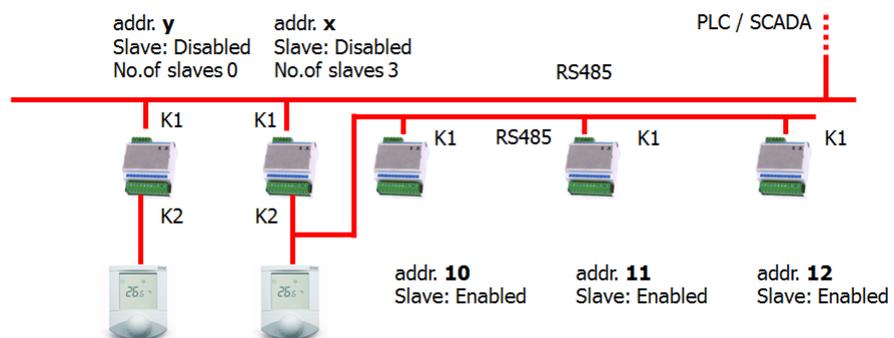
**BUS END:** if ON, the bus is terminated (if it is the last device on the line)

**INIT:**if ON at power-on, sets the controller into default state and sets bus address to 1, baud rate to 9600 bps.

Another function of the INIT switch is to bring EEPROM into default factory settings. To init the EEPROM, proceed as follows:

- connect the device over RS485 to a PC with **ModComTool** config tool
- set INIT to ON
- apply power
- find the controller in the tool (Scan)
- set INIT to OFF
- in the **ModComTool**, open the controller window
- click the Init button in the tool
- remove and apply power.

## Master – slave



In this connection, controllers with addresses x, 10, 11, and 12 are in one zone and all of them are controlled by one room unit. The controller addressed x is a master. Outputs of controllers addressed 10, 11, and 12 are controlled by the same signals as the master controller addressed x.

The Slave controllers are connected to the building bus (K1+, K1-). They must be addressed starting with 10 and all the other controllers belonging to one zone (on the same K1 bus) must be addressed 11, 12, 13, 14... etc, with no gaps. Maximum number of slave controllers is not limited (or is limited only by the upper Modbus addressing range, which is 250), however, the technology and room layout should be considered.

There may be more slave groups in the same system, each starting with address 10. The addressing of master controllers at the building bus (K1+, K1-), however, must be unique.

Parameters Slave (Enabled / Disabled), No. of slaves (integer 0..240) and controller address are set in the configuration software **ModComTool**.

## Release notes

02/2017 – Added information about new firmware function - DO copy AO.

09/2017 – Cover picture updated.

09/2017 Subject to technical changes.