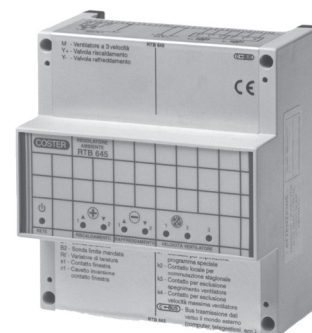


# ELECTRONIC ROOM TEMPERATURE CONTROLLER

**C ← BUS**

## RTB 645 Eng.



- Control of room temperature with flow limit
- Control valve for heating and cooling
- Automatic or manual control of fan speed
- Temperature programmable from UMT 704 c4 or by remote control
- C-Bus connection for COSTERZONE system

### 1. APPLICATION

RTB 645 controllers are designed for the control of room temperature in heating and air conditioning plants in:

- Hotels and guest houses.
- Residential homes
- Commercial and office centres.
- Schools and public buildings.

- They can be used:
  - As single controllers without timed programming using remote control CDB 100 or (SCB 110/SCB 210).
  - As controllers inserted in a multizone system with autonomous timed programming, if connected via C-Bus to a UMT 704 c4 (or higher) central display unit (remote control not required).

### 2. FUNCTIONS

- The principal characteristics of RTB 645 are:
- Setting parameters adjustable by remote control or from UMT 704 c1 (or higher) central control unit.
  - Winter and summer control of room temperature
  - Option of connecting a flow limit sensor
  - Control of two valves: modulating, On-Off proportional or On-Off in two stages
  - Three-wire electric control
  - Three On-Off controls for fan speed.
  - Manual or automatic control of fan speed (according to thermal load)
  - Option of setting minimum and maximum limits of fan speed
  - Wired for window switch (with switch inverting cable type AIC 240)
  - C-Bus for data transmission to UMT 704 c4 (or higher) central unit.

### 3. SENSORS & ACCESSORIES

Description		Model	Sensing element	Code	Type
Air temperature sensor	room	<b>SAB 010</b>	NTC 10 kΩ	B1	Passive
	room with + 1hour key	<b>SAB 210</b>	NTC 10 kΩ	B1	Passive
	room with set-point adjuster	<b>SCB 110</b>	NTC 10 kΩ	B1	Passive
	room with + 1hour key & set-point adjuster	<b>SCB 210</b>	NTC 10 kΩ	B1	Passive
Temperature sensor	for fan-coils	<b>STT 010</b>	NTC 10 kΩ	B2 – B1	Passive
	or for air duct	<b>STA 010</b>	NTC 10 kΩ	B2 – B1	Passive
	Room temperature set-point adjuster	<b>CDB 100</b>	–	Rt°	–
Inverting cable for window switch		<b>AIC 240</b>	–	c1	–

### 4. TECHNICAL DATA (factory settings in bold type)

#### • Electrical

Power supply	24 V ~ ± 10%
Frequency	50...60 Hz
Consumption	3 VA (see note)
Electromagnetic compatibility	EEC 89/336
Control valves:	
– output voltage	24 V ~
– maximum current	300 mA
Fan output switches:	
– maximum applied voltage	250 V ~
– maximum current 5 (1)A	5 (1) A
Construction standards	Italian Electr. Committee (CEI)
Software	Class A
Ambient humidity	Class F DIN 40040

Note: The consumption data refer only to RTB; in order to have complete data it is essential to know the consumptions of all the devices connected to each of the triac outputs.

#### • Mechanical

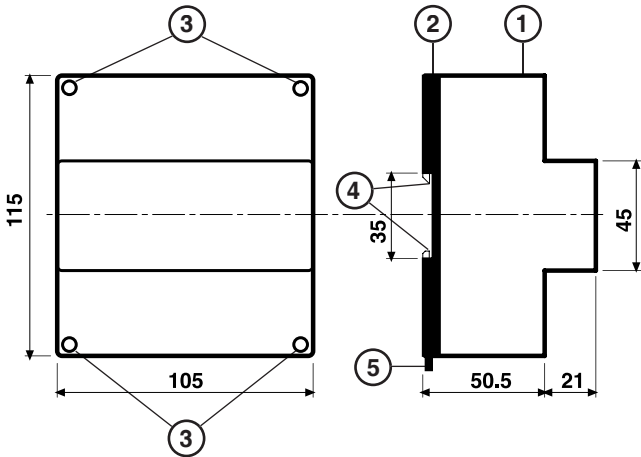
Enclosure	DIN 6E module
Materials:	
– base	NYLON
– cover	ABS
Ambient temperature :	
– operation	0 to 45 °C
– storage	-25...+60°C
Output heating and cooling.	
– control valve	Modulating or On-Off
– control fan	three speeds On – Off
Weight	0.5 Kg

**• Measurement ranges**

- room sensor 0 ... 30 °C
- limit sensor 0 ... 60 °C
- Setting ranges**
- temp. Frostprot ---- (excluded)... 6 ... 25 °C
- temp. Heating. (Day-Night) ---- (excluded)... 20/16 ... 29 °C
- temp. Cooling (Day-Night) ---- (excluded)... 25/30 ... 30 °C
- max. increase by set-point adjuster (heat.) 0 ... 5 °C
- max. decrease by set-point adjuster (heat.) 0 ... -15 °C
- max. decrease by set-point adjuster (cool.) 0 ... -5 °C
- max. increase by set-point adjuster (cool.) 0 ... 15 °C
- flow temp. limit ---- (excluded)... 0 ... 60 °C
- differential flow limit 0 ... 3 ... 5 °C

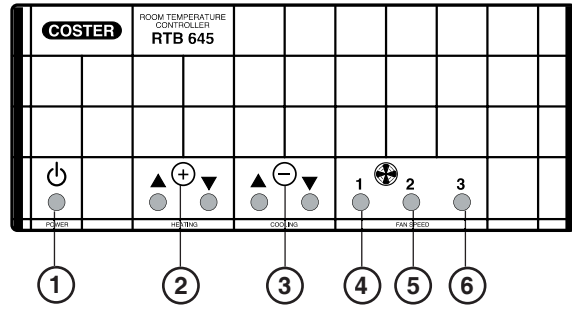
- Proportional Band (heating) ± 0.5 ... 2 ... 10 °C
- Proportional Band (cooling) ± 0.5 ... 1 ... 10 °C
- Integral Time (heating) 1 ... 20 ... 99 min
- Integral Time (cooling) 1 ... 20 ... 99 min
- actuator run or half-run time 10 ... 60 ... 510 min
- multiplier dead zone 1 ... 4
- Fan operation :
- minimum operating time 0 ... 5 ... 15 min
- start time (B1 on extract) 0 ... 60 ... 300 s
- stop time (B1 on extract) 0 ... 6 ... 30 min
- speed fan 0 - 1 - 2 - 3
- local controls enabled

**5. OVERALL DIMENSIONS**



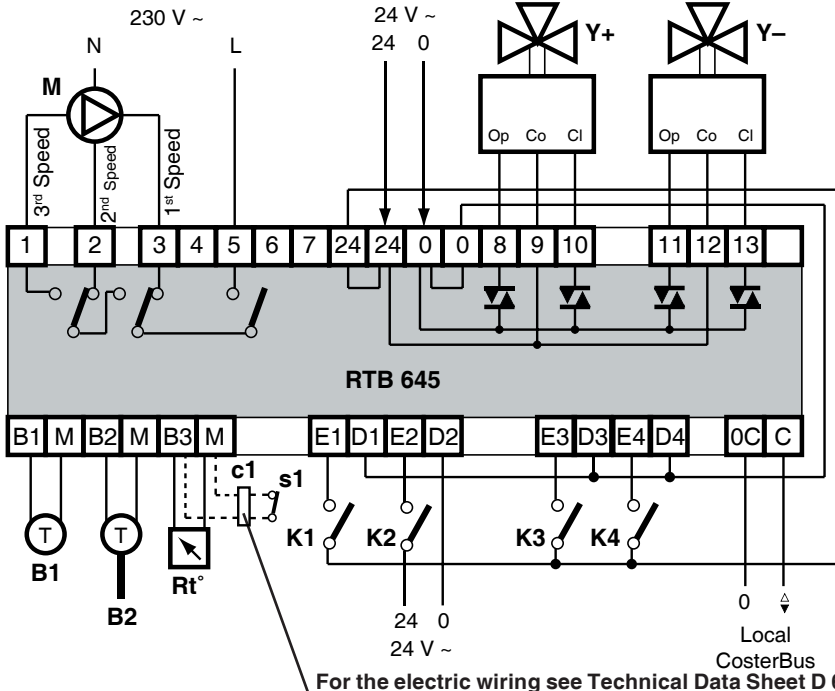
- 1 - Protective cover for electronic components
- 2 - Base with transformer, relay and terminal blocks
- 3 - Screws for securing base and cover
- 4 - DIN rail securing elements
- 5 - DIN rail release lever

**6. FACIA**



- 1 - Power LED
- 2 - Control heating valve LED
- 3 - Control cooling valve LED
- 4 - Low fan speed LED
- 5 - Medium fan speed LED (1-2 On)
- 6 - High fan speed (1-2-3 On)

**7. WIRING DIAGRAM**



- B1 - Room sensor
- B2 - Flow limit sensor
- Rt° - Set-point adjuster
- c1 - Window switch inverting cable
- s1 - Window switch
- M - Three-speed fan
- Y+ - Heating valve (two pipes)
- Y- - Cooling valve
- k1 - Switch for setting special program
- k2 - Local switch for season switching  
Open = Winter; Closed = Summer
- k3 - Switch for exclusion switching off fan
- k4 - Switch for exclusion maximum speed

**In the presence of electrical disturbances the output controls of the controller may change status but will return to normal automatically.**

**For the electric wiring see Technical Data Sheet D 615 - AIC 240**

**8. SITING CONTROLLER**

The controller must be sited in a dry location that meets the ambient conditions listed under 4. TECHNICAL DATA. If installed in a location classified as "Hazardous" it must be installed in a cabinet for electrical equipment constructed according to the regulations in force for the class of danger concerned. The controller can be mounted on a DIN rail and housed in a standard DIN enclosure. RTB 645 controllers use a remote room sensor; this must be installed at a height of 1.5 to 1.6 metres from the floor, on an internal wall of the space, at a point which represents the average temperature. It must be sited as far as possible from windows, doors and sources of heat, and corners and curtains must be avoided.

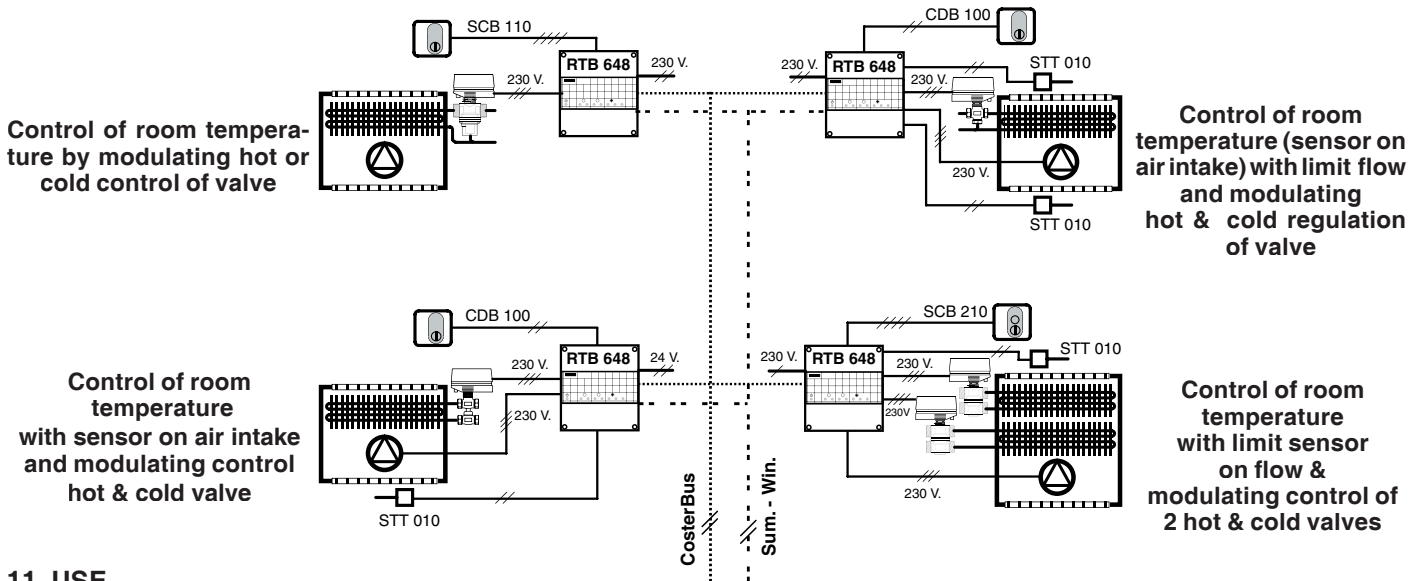
**9. WIRING DIAGRAM**

Proceed as follows:

- Separate base from cover after having removed the securing screws
- Mount the base on the DIN profile and check that the securing elements (5.4) block it correctly
- Carry out the electrical connections according to the diagram and in respect of the regulations in force, using the following cables::
  - Power supply 24V~ and relay controls 1.5 mm<sup>2</sup>.
  - Power for valve actuator 1.5 mm<sup>2</sup>.
  - Connections sensors and remote controls: 1 mm<sup>2</sup> minimum
  - C-Bus connections: 1 mm<sup>2</sup> of different colours; for length limits, see data sheets T021 and T022
- Apply power (24V~) and check its presence at terminals concerned.
- Remove power, replace cover on base and secure it with the screws supplied..

*You are advised not to insert more than two cables in a single terminal of the controller and if necessary to use an external terminal block.*

**10. EXAMPLE OF APPLICATION**



**11. USE**

RTB 645 controllers can be used

- As controllers for single fan-coils
  - The available outputs are used: two for modulating control of 3-way mixing valves or for On-Off control in two stages or On-Off proportional (for hot and cold); the remaining three are for controlling the speed of the fan in relation to the thermal load.
  - It is essential to connect to the controller one or two remote sensors and a temperature set-point adjuster (see 3. SENSOR & ACCESSORIES).*
- For centralised control of several fan-coils:
  - By connecting all the controllers (max. 239) to a single central display unit (UMT 704 c4 or higher), by means of C=Bus parallel connection it is possible to see and adjust all the setting parameters of each single controller.
  - In this case one or two sensors are essential while the temperature set-point adjuster is not essential.*

**12. OPERATION**

RTB 645 are microprocessor-based electronic controllers which store and apply the control instructions entered.

The control parameters for heating and for cooling are separate and the controllers use one or the other according to the room temperature measured. As a consequence, if the temperature is higher than the one set, the controller uses the cooling parameters; vice versa, it uses the heating parameters set.

When the controllers are connected via CosterBus to a central display unit (UMT 704 c4 or higher), all the data can be adjusted; moreover, there is the possibility of using timed 24hour and 7day programs.

**12.1 TEMPERATURE MEASUREMENT**

The room temperature is measured by a remote sensor with an NTC 10kW sensing element; another, optional remote sensor permits monitoring the limit temperature on the flow.

The desired temperature value (Heating or Cooling) can be adjusted by a remote set-point adjuster (CDB 100, SCB 110 or SCB 210). If connected to a central display unit the desired temperature value can be adjusted from this unit, thereby avoiding the need for a set-point adjuster.

**12.2 ROOM SENSOR INSTALLED ON EXTRACT AIR**

If the room sensor is installed on the air intake (fan-coil or duct), in order that the temperature reading is as accurate as possible the option is provided of switching on the fan (at minimum speed) at set intervals and for a set time; this setting only possible by UMT 704 c4 (or higher) or by the Telemangement program.

**12. 3 ROOM FLOW LIMIT SENSOR**

This must be installed on the flow (fan-coil or duct). Its purpose is to prevent air entering the room at too low a temperature. Intervenes only in the winter period or when there is a call for heat in the room. If the temperature of the incoming air is below the desired temperature by the  $\Delta T$  set, the controller opens the heating valve, closes the cooling valve and turns off the fan (unless the room sensor on the extract air has been programmed to switch it on at intervals).

**12. 4 OUTPUTS**

- Two modulating outputs PI for control of three-wire actuators or On-Off proportional or On-Off in two stages (for Heating and/or Cooling), powered by 24 V~ (switch output (250 V~, 5 (3)A) for control fan speed..

**12. 5 OPERATING FEATURES**

Four types of control are available

- HEAT. or COOL. two-pipe plant (use Y+ output)
- HEAT. or COOL. three-pipe plant
- HEATING only (use only Y+ output)
- COOLING only (use only Y- output)

When the output is 0% the valve control is always Off, and the fan should be Off; when it is above 33% the valve control is always On, and the controller itself automatically sets the various fan speeds until it reaches the maximum (if the thermal load of the plant requests it). If the controller is connected to a central unit, the fan speed is limited in relation to the preceding program. The various speeds are indicated by the controller by means of LEDs on the RTB 645 facia.

**12. 6 SEASON SWITCHING**

In the controllers it is possible (if only one output is used) to invert the action so as to pass from winter to summer operation in three different ways:

- Single switching by means of an external switch powered by 24 V~ (k2).
- Centralised switching from the central display unit (UMT 704 c2 or higher).
- Switching via the Telemangement program.

**12. 7 WINDOW OPEN SWITCH**

An electric switch (s1), of the burglar alarm type, installed on the window of the room controlled, and connected to the controller, permits switching the heating to frost protection and excluding cooling, when the window is opened. To reverse the action of the switch, use the AIC 240 (C1) cable; connect it according to the diagram in Technical Data Sheet D 615.

**12. 8 + HOUR KEY**

The room sensors SAB 210 and SCB 210 are fitted with a key which permits the user to prolong by an hour the cooling and heating period at normal desired temperature (Day).

**12.9 LIMITING FAN SPEED**

This can be done using the k3/k4 local controls or remotely from the UMT 704 central unit or from a Telemangement PC. Using the local digital inputs (k3 – k4):

- **k3** = switch for exclusion switching off fan.
- **k4** = switch for exclusion maximum speed.

So: **k3 closed** = Switching off fan excluded (minimum speed always on, the others enabled).

**k4 closed** = Maximum fan speed completely excluded.

Limits managed by remote control (UMT 704 or Telemangement PC):

If the digital inputs (k3 – k4) are not used and switching off the fan by remote control (UMT 704 or Telemangement PC) is excluded, all the fan speeds (1-2, or 1-2-3) are enabled; in this event, if you want to switch off the fan during the setback or Frosprot mode, you can do so using the **k3** digital input.

So: **k3 open** = Switching off fan excluded, both in setback and Frosprot modes.

**k3 closed** = Total switching off fan enabled both in setback and Frosprot modes; fan speeds excluded.

**12. 9 DEPARTURE CLIENT**

There is a feature of the controller, known as "Departure client" which, if enabled (by remote control) disables completely the controller.

**Amendment to Data sheet**

Date	Revision No.	Page	Section	Details of amendment	Firmware Version	Software Version
13.03.06 LB		4	12.3 Room flow sensor limit...	Amended flow limit function		
08.11.06 MC		1 - 2	4. Technical data 7. Wiring diagrams General	Added note regarding consumption of controller In description added detail of c1 cable which corresponds: (AIC 240) Page reset with more detail at 12.7.		
25.01.07 MC		2	7. Wiring diagrams 12.5 Operating features	In description added detail of Y+ (2 pipes) Added detail in the description		
26.09.07 MC	<b>01</b>	2	7. Wiring diagram	The numbers of the terminals shown in the actuators have been eliminated	07	≥ 0.98.2295
07.11.07 MC	<b>02</b>	4	12.8 + 1 Hour key	Delete sentence "It does not operate in periods of cooling"	07	≥ 0.98.2295
07.01.08 MC	<b>03</b>	4	12.9 Limiting fan speed	Added section on use of local digital inputs (k3 – k4); new page make up.	08	≥ 0.98.2295