

ELECTRONIC AMBIENT TEMPERATURE CONTROLLERS

C ←BUS

RTB C2 Eng.



- 1 On-Off output or 1 modulating & 1 On-Off
- 2 modulating outputs with PI control action
- Can be connected to central display unit via C-Bus interface
- NTC 10 kΩ temperature sensing element incorporated
- Remote detector option as alternative to above
- Choice of adjusting temperature by incorporated or remote setpoint adjuster
- Individual or centralized season switching



1. APPLICATION

RTB temperature controllers are designed for control of ambient temperature in heating and air-conditioning plants in, for example :

- hotels and guest houses
- residential complexes
- commercial centers and office blocks
- schools and public buildings.

2. FUNCTIONS

Their main uses are:

- as independent controllers without timed programming;
- as controllers in a multizone system with independent timed programming if connected via CosterBus to a central display unit (CDU).

They are suitable for control of:

- RTB 040/140 – Electric load 230 or 24 V~, max. 5(1) A, for control of fans, pumps, burners or air-conditioning units. RTB 040, if connected to a central unit, can be used also as a timeswitch by deactivating the internal detector (remove jumper 12 - 13).
- RTB 041/141 – One modulating valve with three-wire electric control and one electric load 230 or 24 V~ max. (1)A (Heating or Cooling).
- RTB 042/142 – Two modulating valves with three-wire electric control (max 50 W for one); (Heating and Cooling).
- RTB 045/145 – Up to four 24 V~ electrothermal valves. (max 50 W for one)

3. MODELS

Model	Outputs	Type of load	Season switch	Setpoint adjuster
RTB 040	1 On-Off relay (Heat. or Cool.)	24 V or 230 V, max. 5(1) A	Local or centralized	No
RTB 140	1 On-Off a relay (Heat. or Cool.)	24 V or 230 V, max. 5(1) A	Local or centralized	Yes
RTB 041	1 triac modul. & 1 On-Off relay (Heat. or Cool)	3-wire valve 24 V max. 7 W & 24 V or 230 V max. 5 (1)A	Local or centralised	No
RTB 141	1 triac modul. & 1 On-Off relay (Heat. or Cool)	3-wire valve 24 V max.7 W & 24 V or 230 V max.5 (1) A	Local or centralised	Yes
RTB 042	2 triac modul. (Heat. & Cool.)	3-wire valve 24 V max.7 W	Not applicable	No
RTB 142	2 triac modul. (Heat. & Cool.)	3-wire valve 24 V max.7 W	Not applicable	Yes
RTB 045	4 triac On-Off (Heat. or Cool.)	24 V thermal valves max.7 W	Local or centralised	No
RTB 145	4 triac On-Off (Heat. or Cool.)	24 V thermal valves max.7 W	Local or centralised	Yes

4. ACCESSORIES

Model	Description	+ 1 hour key	Sensing element	Setpoint adjuster
SAB 010	Ambient temperature detector	-	NTC 10 kΩ	No
SAB 210	Ambient temperature detector	Yes	NTC 10 kΩ	No
SCB 110	Ambient temperature detector	-	NTC 10 kΩ	Yes
SCB 210	Ambient temperature detector	Yes	NTC 10 kΩ	Yes
STT 010	Temp. detector for heating/cooling coils	-	NTC 10 kΩ	No
STA 010	Air duct temperature detector	-	NTC 10 kΩ	No
AIC 240	Window switch cable	-	-	-

5. TECHNICAL DATA

• **Electrical**

Power supply	24 V~ ± 10%
Frequency	50 ... 60 Hz
Consumption	4 VA
Electromagnetic compatibility	CEE 93/68
On-Off SPDT output (RTB .40):	
– maximum switching voltage	250 V~
– maximum switching current	5 (1) A
Auxiliary On-Off output (RTB .41):	
– maximum switching voltage	250 V~
– maximum switching current	5(1)A
Triac outputs powered by 24 V~ (RTB . 41-.42-.45):	
– output voltage	24 V~
– maximum switching current	2 A
Measurement range ambient detector:	
– heating	5 ... 25 °C
– cooling	5 ... 30 °C
Construction standards	Italian Electrotech. Comm. (CEI)

NOTE: The consumption data refers only to RTB (41, 42, 45);
 In order to have complete data it is essential to know the consumptions of all the devices connected to each of the Triac outputs.

- **Factory settings**
- desired Day Heating temp. 20 °C
- desired Night Heating temp. 16 °C

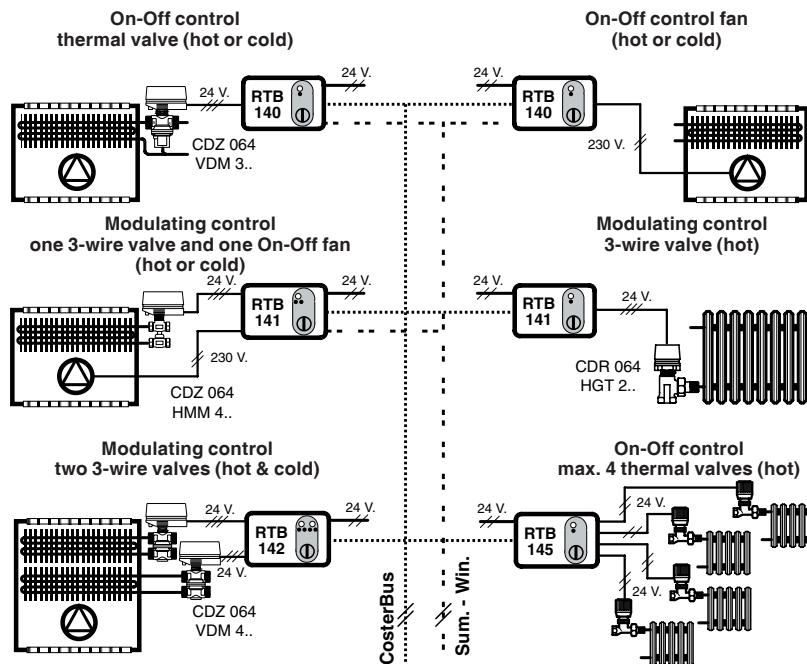
- desired Frost Protection Heating temp. 6 °C
- desired Day Cooling temp. 25 °C
- desired Night Cooling temp. excluded
- actuator run time (RTB .41-.42) 150 s
- half-load cycle (RTB .40 - .45) ± 8 min.
- proportional band - Heating ± 2 °C
- proportional band - Cooling ± 1 °C
- integral time - Heating 20 min.
- integral time - Cooling 20 min.

Setting ranges (from CDU):

- desired (Day-Night) Heating temp. ---- (excluded) ... 25 °C
- desired (Day-Night) Cooling temp. ---- (excluded) ... 30 °C
- limits of local setpoint adjuster - Heating 0 ... + 5 °C
- limits of local setpoint adjuster - Cooling 0 ... - 5 °C
- actuator run time (RTB .41-.42) 10 ... 510 s
- half-load cycle (RTB .40 -.45) 10 ... 510 s
- proportional band ± 0.5 ... ± 10 °C
- integral time 1 ... 99 min.
- Ambient temperature:
- operation 0 ... 45 °C
- storage - 20 ... + 60 °C
- Protection IP 30
- Dimensions 130 x 80 x 35 mm
- Weight 170 g

6. OPERATIONAL DIAGRAMS

TYPICAL APPLICATIONS



7. CHOICE IN RELATION TO TYPE OF PLANT

- Radiators with:
 - 2-port valve + 230 V~ electrothermal actuator
 - 2-port valve + 24 V~ electrothermal actuator
 - 2-port valve + 24 V~ three-wire actuator
- Fan coil with :
 - Control fan at 230 V~
 - 4-port valve + 230 V~ electrotherm. actuator (max. 500 W)
 - 2-port valve + 24 V~ electrotherm. actuator
 - 4-port valve + 24 V three-wire actuat. + fan (max. 500 W)
 - Two 4-port valves + 24 V~ three-wire actuator
- 230 V~ circulation pumps
- Burners or independent boilers (230 V -)
- Independent air-conditioning unit (230 V -)

- RTB .40** On-Off one or more valves in parallel (max. 20)
- RTB .45** On-Off one or more valves (max. 4)
- RTB .41** modulating one valve
- RTB .40** On-Off one or more fans in parallel (max. 500 W)
- RTB .40** On-Off one or more valves in parallel (max. 20)
- RTB .45** On-Off one or more valves (max. 4)
- RTB .41** modulating one valve & On-Off one fan (hot or cold)
- RTB .42** modulating 2 valves (hot and cold)
- RTB .40** On-Off (max. 500 W).
- RTB .40** On-Off (max. 500 W).
- RTB .40** On-Off (max. 500 W)

8. PLANTS

RTB controllers, from the plant point of view, can be used:

- As individual controllers:
 - Those with one output can switch the Heating-Cooling operation by means of their incorporated season switch.
- As individual controllers with centralized season switching:
 - By connecting to all the controllers with one output a parallel 24 V~ voltage to terminals 10-11.
- With centralized control:
 - by connecting all the controllers (max. 239) to a CDU, via C-Bus interface, it is possible to adjust all the parameters, including season switching, of each single controller.

9. OPERATION

RTB are a range of electronic temperature controllers incorporating microprocessors with all the setting data already entered.

The setting data for heating and cooling are separate and the controllers use one or the other according to the season switching.

When they are connected to a supervisory system via the C-Bus parallel interface, 24-hour and 7-day timed event programmes can be used.

9.1 Temperature monitoring

Ambient temperature is measured by an incorporated NTC 10 k Ω sensing element or by a remote detector; if the latter is connected it is necessary to remove jumper 12-13 in order to exclude the internal detector.

In event of use as remote sensor of an analogue output of another controller, it is necessary to respect the polarity.

The output B is connected to terminal 13 and output M to terminal 14 .

The value of the desired temperature (Heating and Cooling) can be adjusted, in models RTB 14., using the incorporated setpoint adjuster, or by means of the setpoint adjuster on the SCB 110 -210 ambient detector.

On the controllers it is possible to limit the adjustment range mechanically by means of two stops, or electronically if the controller is connected to a CDU.

9.2 OPERATING FEATURES

- Modulating outputs with PI control action:

The controller compares the actual temperature value t° , measured by the detector, with the desired value T° . If there is a difference, the controller calculates the output value (valve opening 0 ... 100%) according to the amount of the difference and the proportional band P_b . If the difference persists, it is corrected by the integral function which adjusts, over time, the calculated position of the valve, in relation to the integral time I_t .

To position the valve at the calculated value, the controller sends opening or closing signals to the valve (three-wire control), modulated over time, in relation to the actuator speed (150 s).

Proportional band P_b , Integral time I_t and actuator speed are all adjustable.

- On-Off outputs with PI control action:

The controller calculates the output value using the same criteria as modulating controllers (PI control action) and converts it into On and Off output signals. When the output is 0% the signal is always Off; when it is 100% the signal is always On; when it is 50% the duration of the On signal is equal to the duration of the Off signal and the total time is "the half-load operating cycle" (e.g. 16 min. = 8 min. On and 8 min. Off).

With this system the effective hysteresis proves to be much narrower than the proportional band P_b set and the ambient temperature much more stable.

- Auxiliary On-Off output (only RTS 041-141):

Voltage-free contact suitable for control of fan coil fans or circulation pumps. When the output is 0% the signal is always Off; when it is 100% it is always On. The response of the contact is not immediate but there is a delay of four minutes between the On and Off status.

9.3 SEASON SWITCHING

In controllers with one output it is possible to invert the output action, in order to pass from winter to summer operation, in three different ways:

- Single switching by means of the incorporated season switch.
- Centralized switching using a central switch which energises in parallel at 24 V~ the terminals 10-11 of all the controllers. Without power it is "Heating" and with power "Cooling". With this type of switching all the controllers must remain in the "Winter" position.
- Centralized switching from the CDU.

9.4 OPEN WINDOW SWITCH

An electric switch, of the burglar alarm type, installed on the window of the space controlled and connected to terminals 15 -16, permits switching the heating to Frost Protection mode and excluding Cooling, when the window is opened.

9.5 + 1 HOUR KEY

Ambient detectors SAB 210 and SCB 210 incorporate a key which allows user in a zone to prolong by one hour the heating period at the desired Day temperature.

It does not function in Cooling periods.

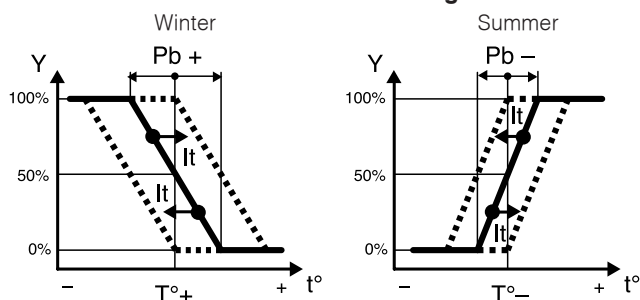
9.6 TIMED EVENTS SWITCH

RTB 040 controller, if connected via CosterBus to a CDU, can operate as a switch for running a timed events programme.

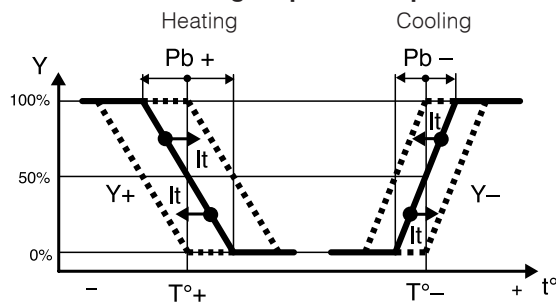
The ambient detector must be disabled by removing the jumper between terminals 12 and 13.

10. OPERATING DIAGRAMS

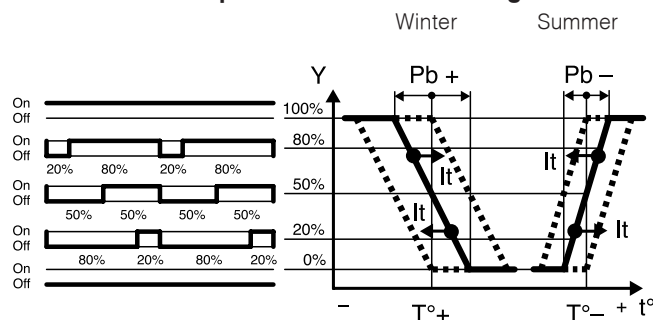
RTB 041-141
1 modulating output & 1 On-Off with season switching



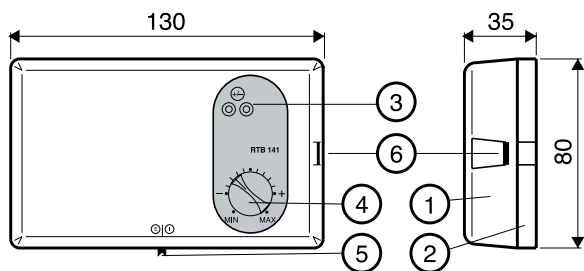
RTB 042-142
2 modulating outputs in sequence



RTB 041-141
On-Off output with season switching



11. OVERALL DIMENSIONS



- 1 - Cover
- 2 - Base
- 3 - Output LEDs
- 4 - Setpoint adjuster ± 15 °C
- 5 - Sum.-Win. switch (RTB 1 output)
- 6 - Cover/base securing elements

12. INSTALLATION

Controllers RTB 04. and 14., if using the incorporated ambient detector, must be installed at a height of 1.5 ... 1.6 meters from the floor, on an internal wall of the space and at a point which represents the average temperature. They must be as far as possible from windows, doors and sources of heat and corners and curtains must be avoided. If a remote detector is used the controller can be installed anywhere convenient.

- Separate base and cover by releasing the cover/ securing elements.
- Fix the base to the wall or to the panel-mounting patress using the pre-drilled holes.
- Make the electrical connections strictly in accordance with the wiring diagram (14) and in observance of the safety regulations in force.
- Replace the cover on the base and close the two parts carefully until they snap into place.

Warning:

If the controller is installed on a panel-mounting patress it could happen that the sensing element becomes cooled by cold air from the cable ducting. In this event the rear of the base must be thermally insulated.

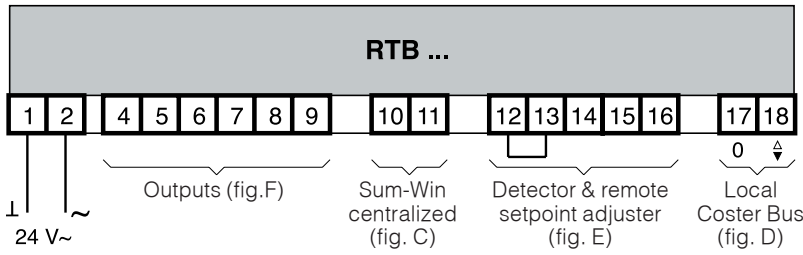
13. WIRING DIAGRAMS

It is advisable not to insert more than two cables in a single terminal of the controller and if necessary to use external junction boxes.

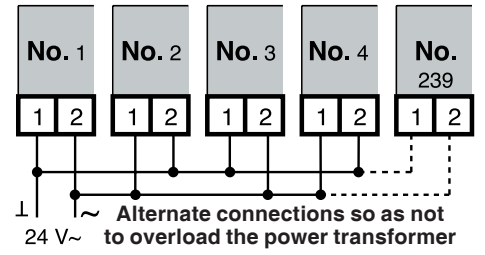
- Power supply 24 V~ : Cables with 1.5 mm² cross section
 - Power supply actuators: Cables with 1.5 mm² cross section .
 - Detectors: Cables with min. 1mm² cross section .
 - **C-Bus wiring: Cables, of different colours, with 1.5 mm² cross section; maximum length five km.**
- Bus polarity must be strictly observed.**

14. WIRING DIAGRAMS

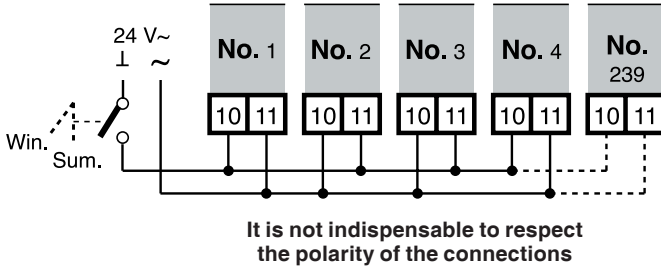
General (fig. A)



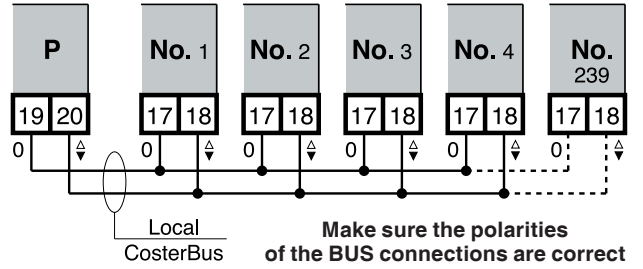
Centralized power supply (fig. B)



Centralized Sum. - Win. switching (fig. C)

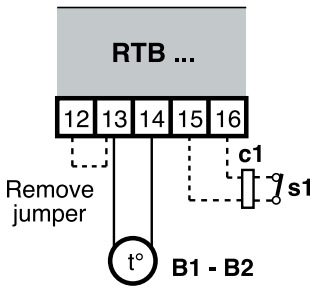


Bus connection with CDU (fig. D)

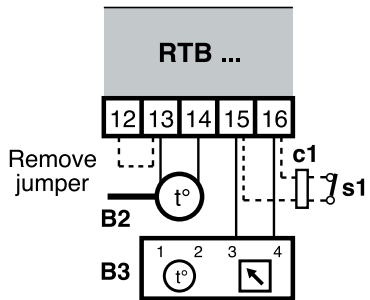


DETECTORS & REMOTE SETPOINT ADJUSTER (fig. E)

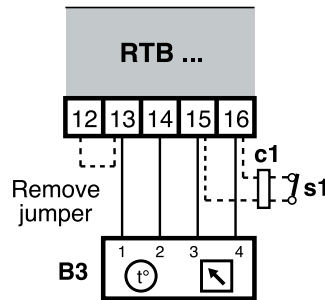
Ambient detector or fan coil extract air



Detector fan coil extract air & remote setpoint adjuster



Ambient detector & remote setpoint adjuster



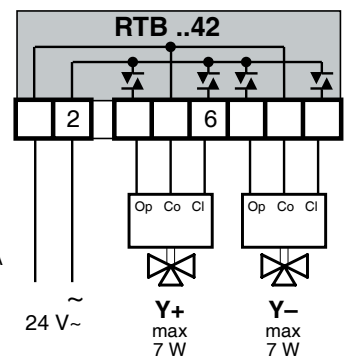
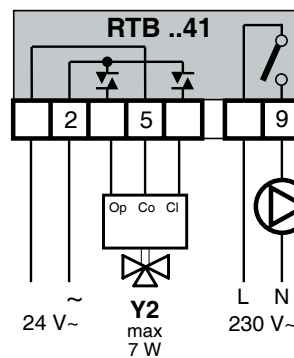
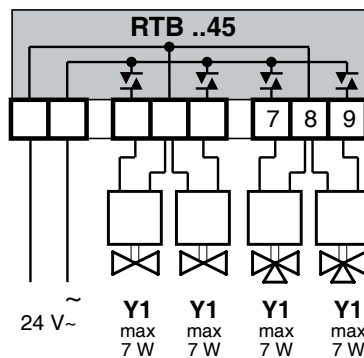
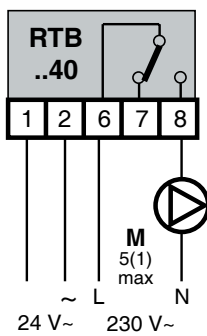
To use internal detector leave jumper 12-13

With remote sensor remove jumper 12-13 (Terminal 14 = M = 0 V)

c1 = AIC 240 window switch reversal cable
Warning: For electrical connection see Technical Data Sheet D 615 - AIC 240

s1 = Window switch
Window open = switch open controller on frost protection

OUTPUTS (fig. F)



- B1 – SAB 010 ambient detector
- B2 – STT 010 fan coil extract air detector or SCB 110 air duct detector
- B3 – Ambient detector with SCB 110 setpoint adjuster
- M – Fan coil fan
- N – RTB ... controllers
- P – Central display unit (CDU)

- c1 – AIC 240 window switch inversion cable
- s1 – Window switch
- Y1 – Electrothermal valve
- Y2 – Valve with 3-wire control
- Y+ – Heating valve with 3-wire control
- Y- – Cooling valve with 3-wire control

Amendments to data sheet

Date	Revision No.	Page	Section	Details of amendments	Firmware version	Software Version
30.03.06 MZ		Variuos	Various	Updated switching current		
13.07.06 MZ		3	9.1 Temperature monitoring	Note included regarding use of remote sensor.		
16.10.06 MC		2 5	5. Technical Data 14. Functional diagrams (fig. E)	Amended consumption with insertion of explanatory note for RTB with Triac output Added note: for connection window switch cable (AIC 240)		
25.09.07 MC	01	5	14 Wiring diagram (fig. F)	The numbers of the terminals shown in the actuators have been eliminated	07	≥ 0.98.2295



Head Office & Sales

Via San G.B. De La Salle, 4/a Tel. +39 022722121
20132 - Milano Fax +39 022593645
Orders Fax +39 0227221239

Reg. Off. Central & Southern

Via S. Longanesi, 14 Tel. +39 065573330
00146 - Roma Fax +39 065566517

Shipping

Via Gen. Treboldi, 190/192 Tel. +39 0364773200
25048 - Edolo (BS) Tel. +39 0364773202

E-mail: info@coster.eu Web: www.coster.eu



D 33150