

# TEMPERATURE CONTROLLER WITH 3 OUTPUTS

**C ← BUS**

## ATD 673 C1 Eng.



- Control of room temperature or discharge air (hot or cold) with modulating PI control or On-Off in two stages
- Optimisation dampers according to temperature
- Summer outside compensation of room temperature
- C-Bus compatible
- DIN rail compatible

### 1. APPLICATION

ATD 673 is designed for temperature control in air handling plants :

- Control of winter room temperature (B1) with option of minimum and maximum limits of discharge air (B2).
- Control of summer room temperature (B1) with option of outside compensation (B3).
- Control of winter or summer discharge air temperature (B2) with option outside compensation (B3).

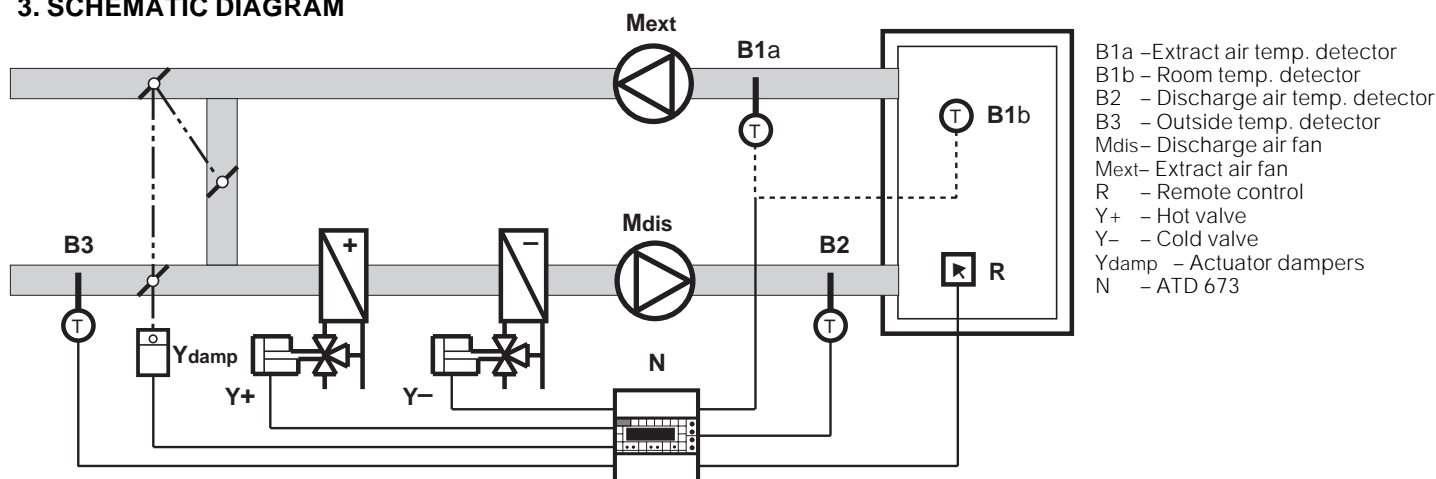
ATD 673 can control :

- Reversible actuators with 3-wire electric control for regulation of :
  - Valves for heating batteries (hot water or vapour).
  - Valves for cooling batteries with refrigerated water.
  - Dampers for mixing hot and cold air.
- Electrical devices with On-Off control in 1 or 2 stages :
  - Electric batteries
  - Refrigerator compressors.

### 2. ACCESSORIES

No.	Description	Typo	Sensing element	Use	Code	Data sheet
1	Discharge or extract air temp. detector or room temp. detector	<b>STA 010</b> <b>SAB 010</b>	NTC 10 kΩ	0 to 110 °C	B1a	N 150
1	Discharge air limit temp. detector	<b>STA 010</b>	NTC 10 kΩ	0 to 40 °C	B1b	N 111
1	Discharge air temp. detector	<b>STA 010</b>	NTC 10 kΩ	0 to 110 °C	B2	N 150
1	Outside air temp. detector	<b>STA 001</b>	NTC 1 kΩ	- 30 to +30 °C	B3	N 150
1	Remote control	<b>CDB 517</b>	-	- 5 to + 5 °C	R	N 711

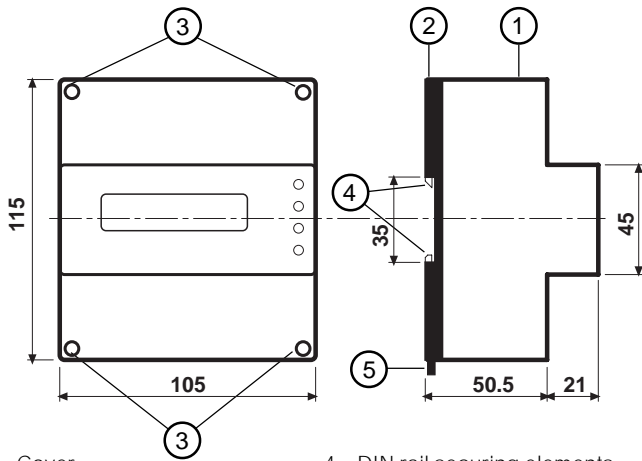
### 3. SCHEMATIC DIAGRAM



### 4. TECHNICAL DATA

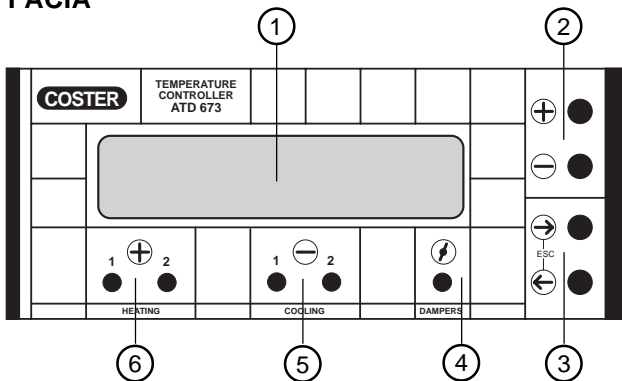
Power supply	24 V ac ± 10%	Construction standards	It. Electrotechnical Committee (CEI)
Frequency	50 to 60 Hz.	Electromagnetic compatibility	EEC 93/68
Consumption	5 VA	Room humidity	Class F (DIN 40040)
Output heating and cooling	Modulating or 2-stage On-Off	Protection	IP 40
Output dampers	0 to 10 V dc	Weight	1 Kg
Voltage-free output contacts:		Setting ranges :	
- maximum switched voltage	250 V ac	- desired temp. (room or discharge air)	0.1 to 60 °C
- maximum switched current	5 (1) A	- limit temp. discharge air (minimum or maximum)	0.1 to 60 °C
Case	DIN 6E module	- adjustment by remote control	± 5 °C
Base	NYLON	- proportional band or differential	± 0.1 to ± 60 °C
Cover	ABS	- integral time	1 to 99 min.
Room temperature :		- summer difference	0 to 20 °C
- operating	0 to 45 °C	- summer compensation	0 to 1 °C
- storage	- 25 to + 60 °C	- actuator speed	1 to 900 s

**5. OVERALL DIMENSIONS**



- 1 - Cover
- 2 - Base
- 3 - Screws for securing cover to base
- 4 - DIN rail securing elements
- 5 - DIN rail release lever

**6. FACIA**



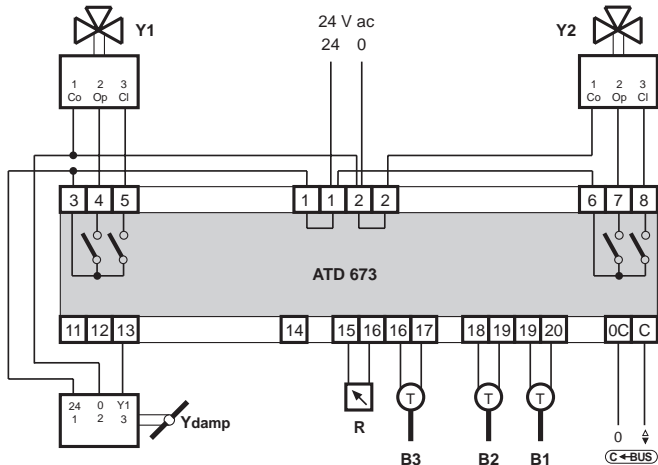
- 1 - Two-line backlit alphanumeric display
- 2 - + and - keys for entering data
- 3 - ← and → page-scrolling keys
- 4 - Dampers output LED
- 5 - Cooling output LED
- 6 - Heating output LED : Modulating : Opens - Closes  
On-Off : 1st - 2nd stage

**7. WIRING**

It is recommended not to insert more than two cables in a single terminal of ATD 673 and if necessary to use external terminals.

- Power supply 24 V ac : Cables of 1.5 mm<sup>2</sup>.
- Power supply valve actuator : Cables of 1.5 mm<sup>2</sup>.
- Connections detectors and remote controls : Cables of 1 mm<sup>2</sup> min.
- Connections C-Bus : Telephone cables having two wires of different colours. Maximum wiring length 2 km or 4 km if closed ring. **Warning ! Pay careful attention to polarities.**

**8. WIRING DIAGRAM**



- B1 - Room or extract air detector
- B2 - Discharge air duct detector
- B3 - Outside detector
- R - Remote control CDB 517
- Y1 - Hot valve
- Y2 - Cold valve
- Ydamp - Dampers

**9. C-BUS : TELEMANAGEMENT COMMUNICATION**

ATD 673 is provided with a C-Bus parallel output which allows two-way communication with one or more **Local computers** and/or a **Telemangement central computer**.

It is possible to transmit :

- Programming and setting data of the controllers;
- Programming and setting data for telemangement;
- Operational status of all electrical devices controlled;
- Values of parameters measured by detectors.

It is possible to connect up to a maximum of **239** Coster controllers bearing the C-Bus badge; so that they can be identified by the computer they must be individually **addressed** (1 to 239) on page **32** of display .

**9.1 C-Bus wiring diagram**

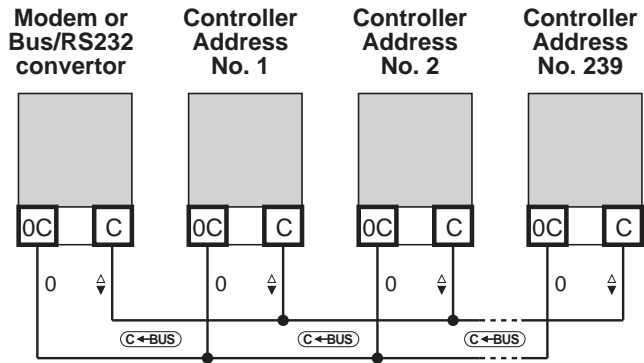
The **parallel** electrical connection between all the controllers must be made using **twin-wire telephone cable** (low capacity) and observing strictly the polarity 0C - C.

The wiring can be:

- closed ring having a maximum wiring length of 4 km
- in line or with stubs having a maximum wiring length of 2 km.

For greater distances **signal amplifiers** can be used. Connection to local computers must be made using C-Bus-RS232 convertors and connection to the telemangement central computer using a Coster modem with C-Bus.

**9.2 C-Bus wiring diagram**



**10. INSTALLATION**

**ATD 673 must be installed in a dry location with a temperature not above 35 °C, and away from any water leakages or sprays. If installed in locations classified as "dangerous" it must be mounted inside a cabinet for electrical appliances constructed according to the regulations in force for the type of danger involved.** In any event, the electrical connections must be made strictly according to the wiring diagram (8) and in observance of the safety regulations in force.

**10.1 Room detector SAB 010 (B1b)**

This must be installed at a point which represents the average temperature of the room, at a height of 1.5 to 1.6 meters from the floor, on an internal wall, and, if possible, opposite the air emission vents. It should be as far as possible from windows, doors and sources of heat, and corners, shelving and curtains should be avoided.

In particularly large rooms it is advisable to use two SAB 020 detectors connected in parallel or four SAB 010 detectors connected in series-parallel in order to measure the average temperature of the room.

**10.2 Extract air detector STA 010 (B1a)**

If the configuration of the plant allows, to measure room temperature it is preferable to use a detector installed in the extract air duct because at that point the temperature undoubtedly represents the room average.

It must be installed upstream of the extractor fan and as near as possible to the extract air vents.

**10.3 Discharge air detector STA 010 (B2)**

This must be installed downstream of the discharge fan and as near as possible to the air diffusers.

**10.4 Outside air detector STA 001 (B3)**

This must be installed upstream of the outside air damper and as near as possible to the air intake.

11. OPERATION

11.1 Setting data

All the parameters controlled and the setting data of ATD 673 can be read on the display and modified by means of the + and - keys. The "pages" of the display are divided into three parts:  
 1st part (from page 1 to page 7) : data modifiable by the user.  
 2nd part (from page 9 to page 24) : setting data modifiable by the engineer during the commissioning stage of the plant.  
 3rd part (from page 26 to page 33) : pages for testing the outputs and data for linking to a telemanagement system.

The desired value  $T^{\circ}$  (display pages 2 and 3), the proportional band  $Pb$  (display pages 11 and 18) and the integral time  $It$  (display pages 12 and 19) can be set separately for the Heating stage and the Cooling stage.

When the desired values  $T^{\circ}Heat$  and  $T^{\circ}Cool$  are too close ( $\leq 1^{\circ}C$ ) on pages 2 and 3 of the display will appear the word ERROR; the controller will shift automatically the desired value  $T^{\circ}Cool$  to prevent the simultaneous action of the two outputs. When  $It$  is set to the maximum value (99 minutes), the integral control action is eliminated.

11.2 Outputs

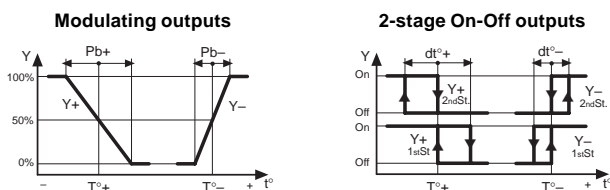
The output signals can be used in two different ways (display pages 9 and 16):

- Modulating for reversible actuators with 3-wire control (Common, Opens, Closes) or priority selectors. It is indispensable to set the run time of the actuator (display pages 10 and 17).
- On-Off for control of electrical devices with 1 or 2 stages (electric batteries, compressors, etc). The proportional bands  $Pb$  are converted into temperature differentials  $dt^{\circ}$ .

11.3 Control room or discharge air temp. (detector B1 or B2)

ADT 673 compares the value of the actual temperature  $t^{\circ}$ , measured by detector B1a in the extract air duct or B1b in the room or B2 in the discharge air duct, with the desired values  $T^{\circ}+$  and  $T^{\circ}-$ . In the event of a difference, it produces two modulating signals, proportional to the differences themselves and to the proportional bands  $Pb+$  and  $Pb-$ , for the control in sequence of the valves  $Y+$  and  $Y-$ .

To achieve fine adjustment, ATD 673 corrects the position of the valve in relation to the integral times  $It+$  and  $It-$ .



11.4 Control room temperature with reference to discharge air (detectors B1 and B2)

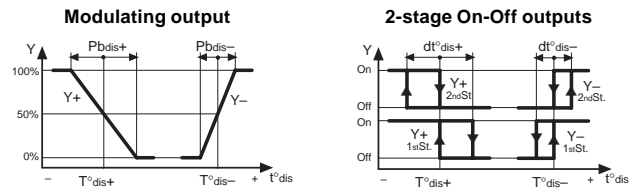
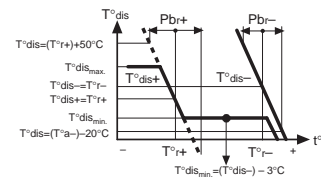
The temperature to be controlled is measured by detector B1a in extract air duct or B1b in room and the reference temperature by detector B2 in the discharge air duct.

ADT 673 compares the value of the actual room temperature  $t^{\circ}r$  with the desired values  $T^{\circ}r+$  and  $T^{\circ}r-$  and establishes two values for the desired discharge air temperature  $T^{\circ}dis+$  and  $T^{\circ}dis-$  in relation to the differences measured and to the  $Pbr$  and  $It_r$  set. In the event of a difference from the actual discharge air temperature  $t^{\circ}dis$ , ATD 673 produces two modulating signals, proportional to the differences themselves and to the proportional bands  $Pbdis+$  and  $Pbdis-$  set, for the control in sequence of valves  $Y+$  and  $Y-$ .

11.5 Limits of discharge air temperature (detector B2)

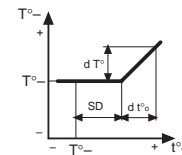
When the desired discharge air temperature for cooling  $T^{\circ}dis-$ , calculated by the controller, falls below the minimum limit  $T^{\circ}min$ , this is automatically reduced by  $3^{\circ}C$  so as to prevent simultaneous heating and cooling. If the request for cooling derives from an external controller (dehumidification), ATD 673 maintains, by means of the control of post-heating, the discharge air temperature at the value  $T^{\circ}min$  in order to limit the cooling of the room and to help the dehumidification effect.

Control room with reference discharge air



11.6 Outside summer compensation of desired temperature (detectors B1 or B2 and B3)

To avoid excessive differences between room and outside temperatures during summer cooling it is possible to compensate the desired temperature  $T^{\circ}Cool$  in relation to the outside temperature  $t^{\circ}o$ . The temperature remains constant at the desired value (display page 3) until  $t^{\circ}o$  exceeds the value  $T^{\circ}Cool + SD$  (Summer Difference). When  $t^{\circ}o$  exceeds the value  $T^{\circ}Cool + SD$ , the temperature  $T^{\circ}Cool$  has to increase as the outside temperature  $t^{\circ}o$  increases. The summer compensation  $SC$  establishes the increase of  $T^{\circ}Cool$  in  $^{\circ}C$  for each  $^{\circ}C$  increase in  $t^{\circ}o$ .

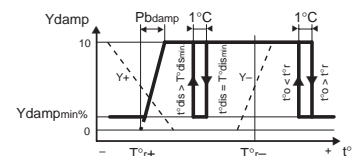


11.7 3rd Output  $Y_{damp}$  (detectors B1, B2 and B3)

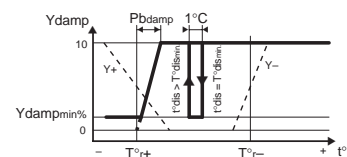
With the third output (0 to 10 V dc) the controller is able to optimise the mixing dampers or to control a system of heat recovery. The outside air can be maintained at a minimum value  $Y_{damp,min}$  % by means of a positioner.

There is a choice of 3 types of operation :

- Dampers with  $dt^{\circ}$  - Optimisation of dampers according to temperature. When the actual room temperature  $t^{\circ}r$  exceeds the value requested by heating  $T^{\circ}r+$ , the controller opens the outside air in relation to the  $Pbdamp$  set. When  $t^{\circ}r$  is below the value requested by cooling  $T^{\circ}r-$ , if the discharge air temperature  $t^{\circ}dis$  falls below the limit  $T^{\circ}dis,min$  set, the controller, with On-Off action closes the outside air. If the outside temperature  $t^{\circ}o$  exceeds the value of  $T^{\circ}r$ , the controller closes the dampers, with On-Off action, because the outside air does not contribute to the aeration of the room.

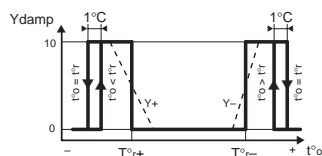


- Dampers without  $dt^{\circ}$  - Optimisation of dampers without comparing temperature. The controller does not close the dampers according to the comparison outside temp. - room temp. It is used when ATD 673 is connected to a controller with enthalpic comparison, which interrupts the signal  $Y_{damp}$  when the value of the outside enthalpy exceeds that of the room.



- Recuperator - Control heat recuperators : For dynamic recuperators it is necessary to use an auxiliary device which converts the signal 0 to 10 V dc in On-Off. - With outside temperature  $t^{\circ}o$  below  $T^{\circ}r+$  the recuperator is switched on. When  $t^{\circ}o$  is equal to or above  $t^{\circ}r$  the recuperator is switched off.

- With  $t_o$  above  $T^{\circ}r+$  and below  $T^{\circ}r-$  the recuperator is always switched off.
- With outside temperature  $t_o$  above  $T^{\circ}r+$  the controller switches on the recuperator. When  $t_o$  is equal to or below  $T^{\circ}r$  the recuperator is switched off.



## 12. SETTING

All the data are displayed in a system of pages which can be scrolled on the two-line backlighted alphanumeric display (fig. 6.1) by means of the ← and → keys (fig. 6.3).

The data are preset and can be adjusted using the + and - keys (fig. 6.2).

Whichever page is displayed, every half hour the 1st page returns to the display.

To return quickly to the 1st page, press keys ← and → simultaneously.

Page	Display	Description
1	<b>ROOM TEMP. (1)</b> <b>ACTUAL : 21.0°</b>	Indicates principal temperature measured.
2	<b>T. HEATING ROOM (1)</b> <b>DESIRED (2) : 20.0°</b>	Desired temperature. Range : 0.1 to 60 °C.
3	<b>T. COOLING ROOM (1)</b> <b>DESIRED (2) : 25.0°</b>	Desired temperature. Range : 0.1 to 60 °C.
	(1) Room : if detector B1 connected; Disch. air : if only detector B2 connected.	
	(2) Error : if difference between T. Heating and T. Cooling not above 1 °C.	
4	<b>ADJUSTMENT T.</b> <b>REMOTE C. : 0.0°</b>	Appears only if remote control R connected. Indicates increase or decrease of desired temperature by means of remote control. Range : - 5 to + 5 °C.
5	<b>T. DISCH. AIR</b> <b>ACTUAL : 30.0°</b>	Appears only if detectors B1-B2 connected.
6	<b>OUTSIDE TEMP.</b> <b>ACTUAL : 12.0°</b>	Appears only if detector B3 connected.
7	<b>ATD 673 c1 Eng.</b> <b>Version . . . .</b>	Identity card of controller
8	<b>TO CONTINUE</b> <b>PRESS + KEY</b>	By pressing + key for 3 seconds pages for technical setting of ADT 973 appear.
9	<b>TYPE OF OUTPUT</b> <b>HEATING : MODULAT. (3)</b>	Type of output.
	(3) MODULATING: for electric actuators with 3-wire control; IN 2 STAGES : for electrical devices with 1 or 2 stages.	
10	<b>TIME ACTUATOR</b> <b>HEATING : SEC. 60</b>	Appears only if on page 9 "MODULATING" has been chosen. Run time of actuator. Range : 1 to 900 seconds.
11	<b>PROPORT. BAND</b> <b>HEATING : +- 4.0°</b>	Appears if on page 9 "MODULANTE" has been chosen. Proportional band in ± °C. Range : ± 0.1 to ± 60 °C.
	<b>DIFFERENTIAL</b> <b>HEATING : +- 4.0°</b>	Appears if on page 9 "IN 2 STAGES" has been chosen. Differential in ± °C. Range : ± 0.1 to ± 60 °C.
12	<b>INTEGRAL TIME</b> <b>HEATING : MIN. 10.0</b>	Integral time. Range : 1 to 99 min.
13	<b>DISCH. AIR LIMIT T.</b> <b>MINIMUM : 0.1°</b>	Appears only if detector B2 connected and valid only for HEATING. Minimum limit temperature of discharge air. Range : 0.1 to 60 °C.

14	<b>DISCH. AIR LIMIT T.</b> <b>MAXIMUM : 60.0°</b>	Appears only if detector B2 connected and valid only for HEATING. Maximum limit temperature of discharge air. Range : 0.1 to 60 °C.
15	<b>PB T. DISH. AIR RISC. : +- 10.0°</b>	Appears only if detectors B1-B2 connected. Proportional band related to reference temperature of discharge air in ± °C. Range : ± 0.1 to ± 60 °C.
16	<b>TYPE OF OUTPUT</b> <b>COOLING : MODUL. (4)</b>	Type of output
	(4) MODULATING: for electric actuators with 3-wire control; IN 2 STAGES : for electrical devices with 1 or 2 stages.	
17	<b>ACTUATOR TIME</b> <b>COOLING : SEC. 60</b>	Appears only if on page 16 "MODULATING" has been chosen. Run time of actuator. Range : 1 to 900 seconds.
18	<b>PROPORT. BAND</b> <b>COOLING : +- 2.0°</b>	Appears if on page 16 "MODULATING" has been chosen. Proportional band in ± °C. Range : ± 0.1 to ± 60 °C.
	<b>DIFFERENTIAL</b> <b>COOLING : +- 2.0°</b>	Appears if on page 16 "IN 2-STAGE" has been chosen. Differential in ± °C. Range : ± 0.1 to ± 60 °C.
19	<b>INTEGRAL TIME</b> <b>COOLING : MIN 10.0</b>	Integral time. Range : 1 to 99 min.
20	<b>Pb T. DISCHG. AIR</b> <b>COOLING : +- 5.0°</b>	Appears only if detectors B1-B2 connected. Proportional band related to reference time of discharge air in ± °C. Range : ± 0.1 to ± 60 °C.
21	<b>SUMMER DIFF.</b> <b>To - Tr (5) Max : 6.0°</b>	Appears only if detectors B1-B3 or B2-B3 connected. Maximum desired difference between outside temperature and desired temperature, beyond which desired temperature is increased as outside temperature increases according to "Summer Compensation" on page 22. Range : 0 to 20 °C.
22	<b>SUMMER COMPENS.</b> <b>dTr (5) / dTo : 0.00°</b>	Appears only if detectors B1-B3 or B2-B3 connected. Increase in desired temperature in relation to increase in outside temperature. Range : 0 to 1.
	(5) $T^{\circ}r$ : room temperature when B1 connected. $T^{\circ}dis$ : discharge air temperature when only B2 connected.	
23	<b>3rd OUTPUT</b> <b>DAMPER WITH <math>\Delta t^{\circ}</math> (6)</b>	Appears only if detectors B1-B3 connected. Type of operation of 3rd output.
	(6) Dampers with $\Delta t^{\circ}$ : Dampers with temperature comparison Dampers without $\Delta t^{\circ}$ : Dampers without temperature comparison Recuperator : Control of recuperator	
24	<b>PROPORT. BAND</b> <b>DAMPERS : 2.0°</b>	Appears only if detectors B1-B3 connected. Proportional band in °C. Range : ± 0.1 to ± 60 °C.
25	<b>TO CONTINUE</b> <b>KEEP + PRESSED</b>	By pressing + key for 3 seconds the pages for checking outputs and setting of telemanagement data will appear.
26	<b>HEATING OUTPUT</b> <b>ALWAYS OPEN</b>	Modulating: Heating valve closed. In 2 stages : 1st heating stage On.
27	<b>HEATING OUTPUT</b> <b>ALWAYS CLOSED</b>	Modulating: Heating valve closed. In 2 stages : 2nd heating stage On.
28	<b>COOLING OUTPUT</b> <b>ALWAYS OPEN</b>	Modulating: Cooling valve open. In 2 stages : 1st cooling stage On.
29	<b>COOLING OUTPUT</b> <b>ALWAYS CLOSED</b>	Modulating: Cooling valve closed. In 2 stages : 2nd stage cooling On.
30	<b>DAMPER</b> <b>ALWAYS OPEN</b>	Outside air damper open. Output signal 10 V dc.
31	<b>DAMPER</b> <b>ALWAYS CLOSED</b>	Outside air damper closed. Output signal 0 V dc.
32	<b>ADDRESS</b> <b>CONTROLLER : 01</b>	Address for C-Bus connection. Range : 1 to 239.
33	<b>CONTROLLER</b> <b>GROUP : 1</b>	Group to which ADT 973 belongs. Range : 1 to 9.