D 156
13.06.07 LB
REV. 01

DIFFERENTIAL CONTROLLER FOR TWO TEMPERATURES OR TWO 0…10 V– SIGNALS

C ←BUS

DDM 328 Eng.

- **Modulating or On-Off in two stages in relation to the difference between :**
  - **two 0…100 °C (NTC 10 KΩ) temperatures or**
  - **two 0…10 V– signals (e.g. : humidity, levels, pressures)**
- **Communication systems :**
  – C-Bus for telemanagement
- **Power supply 230 V a.c. (or 240 V a.c. for UK market), DIN rail mounting**

CE

1. APPLICATION

Examples of use :
– Control diffusors in relation to difference between flow /room temperatures.
– Control air dampers in relation to difference between outside/room humidity.
– Control circulation pumps in relation to difference between flow/return temperatures.
Via C-Bus DDM 328 can form part of a telemanagement system.

2. FUNCTIONS

DDM 328 obtains, in relation to the difference between two temperatures 0…100°C or between two 0…10 V– signals :
– One progressive 0…10 V– signal (always present)
and
– One 3-wire modulating signal or On-Off in two stages or On-Off for minimum and maximum limit.

3. TECHNICAL DATA

• Electrical

Power supply	230 V a.c. ± 10% or 240 V a.c. for UK market
Frequency	50...60 Hz
Consumption	3 VA
Protection	IP40
Radio disturbances	VDE0875/0871
Vibration test	with 2g (DIN 40 046)
Voltage-free output contacts:	
Maximum switched voltage	250 V~
Maximum switched current	5 (1) A
Construction standards	Italian Electrotech. Committee (CEI)
Software	Class A

• Mechanical

Enclosure	DIN 3E module
Mounting	on DIN 35 rail
Materials:	
Base	NYLON
Cover	ABS
Ambient temperature:	
Operating	0…45 °C
Storage	– 25…+ 60 °C
Ambient humidity	Class F DIN 40040
Weight	0.27 kg

• Measurement ranges

Temperature :	
range	0…99.9 °C
resolution	0.1 °C
Signals 0…10 V– :	
range	0…99.9 %
resolution	0.1 %

• Setting ranges

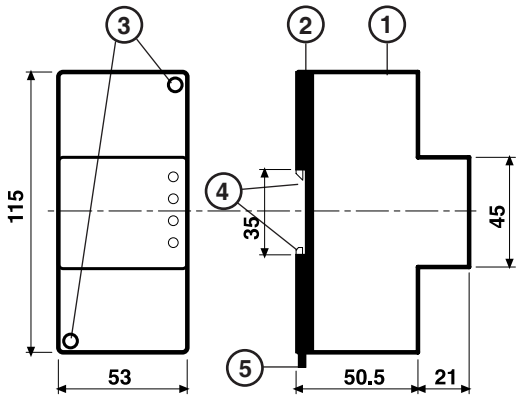
Set-point difference of :	
temperatures	0…**10**…99.9 °C
0…10 V– signals	0…**10**…99.9 %
On-Off setting limits :	
On Y_{min}	**0**…99.9 °C / %
Off Y_{min}	0…**5**…99.9 °C / %
On Y_{max}	0…**99.9** °C / %
Off Y_{max}	0…**95**…99.9 °C / %
Relay control output :	– **3-wire modulating** – On-Off in two stages – On-Off limits
0…10 V– control output :	always in operation
Type of action outputs :	– **Direct** – Reverse
Proportional Band	± 0,5…**2**…99 °C / %
integral time	- - -…**10**…255 min
Actuator run time	15…**90**…999 s
Neutral zone modulation	± 0…**3**…10 %
Dead zone for input signal	± 0…50 °C / %

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

4. DETECTORS AND ACCESSORIES

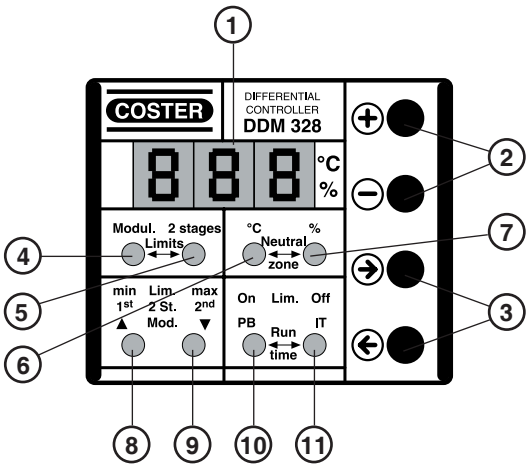
No.	Description	Type	Measurement ranges	Code	Data sheet
2	Immersion-type temperature detector	**SIH 010**	0…100 °C	B1-B2	N 140
	Room temperature detector	**SAB 010**	0…40 °C	B1-B2	N 111
	Duct-mounting temperature detector	**STA 010**	0…100 °C	B1-B2	N 150
	Duct-mounting relative humidity & temperature detector	**SUT 714**	10…90 RH %	B3-B4	N 222
	Duct-mounting relative humidity detector	**SUR 704**	20…80 RH %	B3-B4	N 221
	Room relative humidity detector	**SAU 012**	20…80 RH %	B3-B4	N 225

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 – Three-digit numerical display
2 – + and – keys
3 – ← and → keys

LEDs:

4 – Three-wire modulating control
5 – On-Off control in two stages
4+5 – On-Off limit control
6 – Measurements by 0…100°C temperature detectors
7 – Measurements by 0…10 V– detectors
6+7 – Value modulating neutral zone
8 – Modulation Opens or On 1st stage or On min. limit
9 – Modulation Closes or On 2nd stage or On max. limit
10 – Value Proportional Band or value of On limits
11 – Value Integral Time or value of Off limits
10+11 – Actuator run time

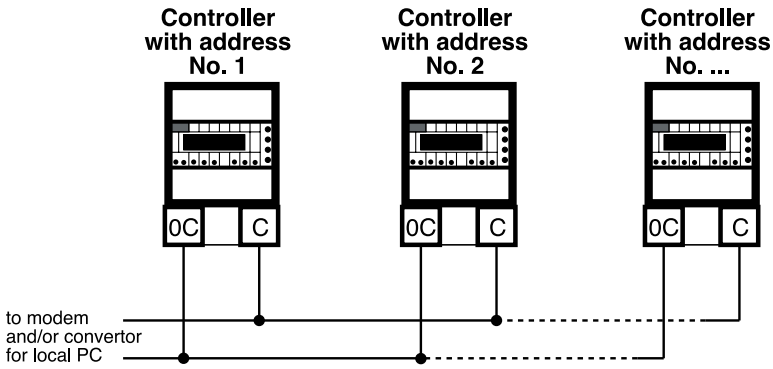
7. COMMUNICATION

7.1 C-Bus communication for telemanagement (for detailed information please see data sheet T 021)

Via C-Bus output DDM 328 can be telemanaged (two-way transmission of data) using one or more local PCs and/or a remote central station via telephone landlines.
From the PC(s) you can see and/or modify :

– the setting data of the controller and the value measured by the detector
– status of the control outputs

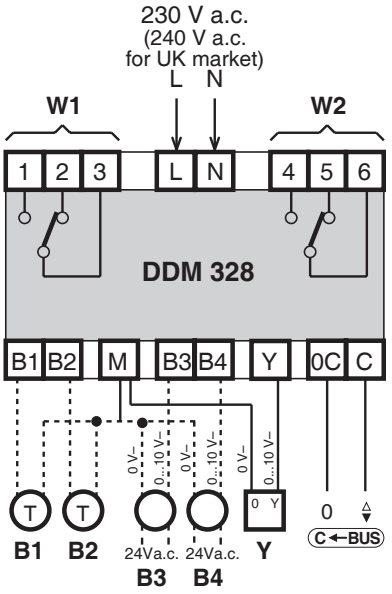
7.2 C-Bus electrical connections



7.3 Telemanagement address

Under telemanagement, in order for the controllers to be identified by the central PC and/or by the local PCs, they must be assigned progressive address numbers.
For setting the address, see sections 13.1 or 13.2.

8. SCHEMI ELETTRICI



B1 – NTC 10 kΩ temperature detector (high)
B2 – NTC 10 kΩ temperature detector (low)
B3 – 0...10 V– detector (high)
B4 – 0...10 V– detector (low)

The pair of detectors B1-B2 can be used as an alternative to the pair B3-B4 and vice versa.

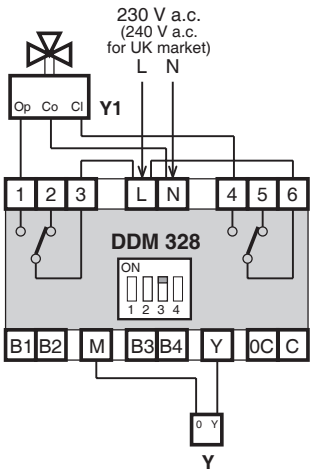
W1 – Output relay :
- modulating control opens (dip-switch 3 on On)
- 1st stage control (dip-switch 3 on Off and 4 on On)
- minimum limit control (dip-switch 3 on Off and 4 on Off)

W2 – Output relay :
- modulating control closes (dip-switch 3 on On)
- 2nd stage control (dip-switch 3 on Off and 4 on On)
- maximum limit control (dip-switch 3 on Off and 4 on Off)

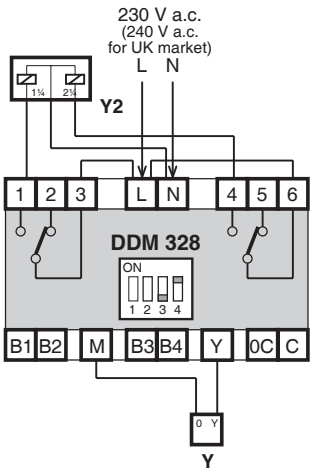
Y – Progressive actuator 0…10 V–
Y1 – 3-wire modulating actuator
Y2 – Electric load in two stages
Ymin – On-Off control for minimum limit
Ymax – On-Off control for maximum limit

8.1 Examples of control outputs (the progressive output M-Y 0…10V- is always present

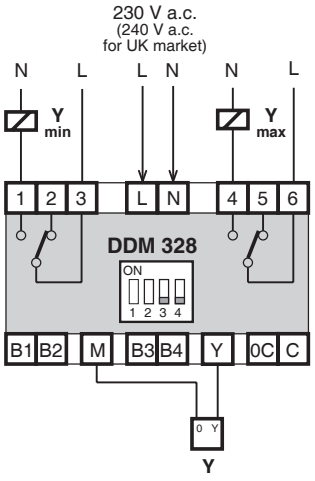
3-wire modulating



On-Off in two stages



On-Off limits



9. INSTALLATION

DDM 328 must be installed in a dry space that respects the relevant environmental conditions included under 3.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.

It can be mounted on a DIN rail or in a DIN modular enclosure.

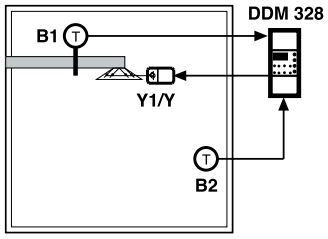
10. ELECTRICAL CONNECTIONS

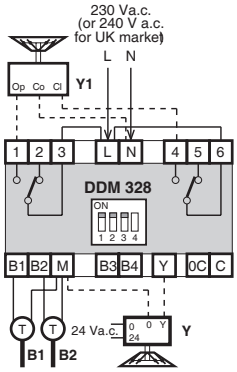
Proceed as follows :
- Separate base from cover after having loosened the securing screws
- Mount the base on the DIN rail and check that it is firmly anchored by the securing elements (5.4)
- Carry out the wiring according to the diagram and in compliance with current regulations and using :
  – 1.5 mm² wires for power supply and relay control outputs.
  – 1 mm² wires for the detectors.
  – 1 mm² for C-Bus. For length limits see data sheet T 021
- Apply power (230 V a.c.; or 240 V a.c. for UK market) and check its presence across terminals L and N.
- Remove power, replace cover on base/terminal block and secure it with the two screws supplied (5.3).

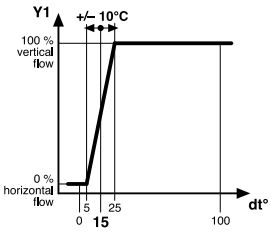
You are advised not to insert more than two cables in a single terminal of the controller and, if necessary, to use an external junction box

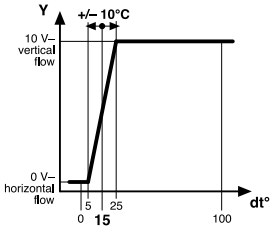
11. EXAMPLES OF INSTALLATIONS

11.1 Control flow from diffusors in relation to difference between temp. of flow (B1 high) and that of room (B2 low) in order to avoid air stratification during the heating period.
e.g. With dt° = 5°C : horizontal flow, with dt° = 25°C : vertical flow. Dt° = 15°C , PB = ± 10°C , IT = - - -



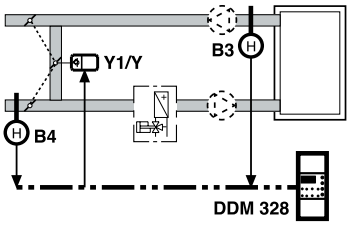


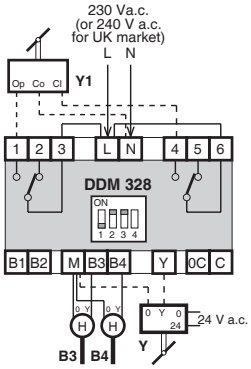


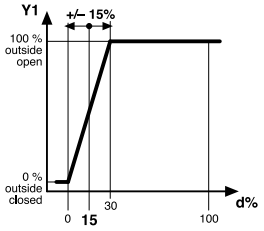


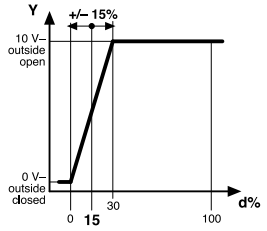
B1 – Flow temperature detector (high)
B2 – Room temperature detector (low)
Y1 – Diffusor actuator with 3-wire control
Y – Diffusor actuator with 0…10 V– control

11.2 Control outside air dampers in relation to difference between room humidity (B3 high) and outside humidity (B4 low) in order to avoid using outside air that is too humid..
e.g. With d% = 0% : closed outside air, with d% = 30% : outside air open. D% = 15% , PB = ± 15% , IT = - - -



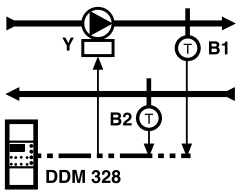


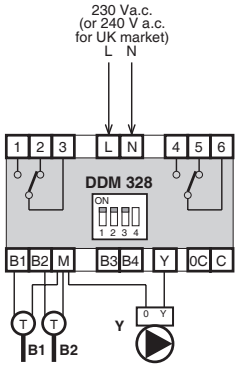


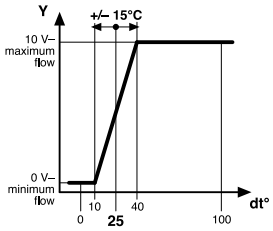


B3 – Room humidity detector (high)
B4 – Outside humidity detector (low))
Y1 – Damper actuator with 3-wire control
Y – Damper actuator with 0…10 V– control

11.3 Control speed pump in relation to difference between flow temp. (B1 high) and return temp. (B2 low) in order to adapt the flow of distribution plant to requirements of DHW/heating/etc circuits.
e.g. With dt° = 10°C : minimum speed , with dt° = 40°C : maximum speed. Dt° = 25°C , PB = ± 15°C , IT = 10 min.







B1 – Flow temperature detector (high)
B2 – Return temperature detector (low)
Y – Inverter pump with 0…10 V– control

12. OPERATION

DDM 328 measures the difference between:
– two temperatures measured by NTC 10 kΩ detectors: B1 higher temp, B2 lower temp.
or
– two 0…10 V- signals: B3 greater signal, B4 smaller signal.

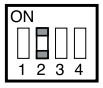
Compares the actual difference **dt°** or **d%** with desired value **Dt°** or **D%** and calculates with P or PI characteristic and with Direct action (dip-switch 2 on On) or reversed (dip-switch 2 on Off) the value of the control output in relation to the parameters set:

– Proportional Band PB
– Integral Time IT (to have operating characteristic P set - - .-)
– Actuator run time (only if relay control is 3-wire modulating (dip-switch 3 on On).

The control outputs can be :
– Progressive control with 0…10 V– signal (always present)
– Relay controls W1 and W2:
- 3-wire modulating (with dip 3 on On)
or
- On-Off in two stages (with dip 3 on Off and 4 on On)
or
- On-Off with minimum and maximum limit (with dip 3 on Off and 4 on Off)

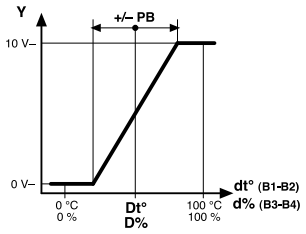
12.1 Progressive control 0…10 V– (always present)

Output Y-M : signal 0…10 V–

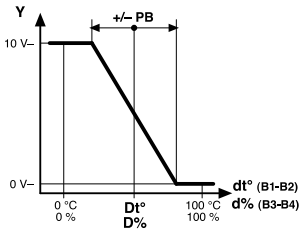


Dip-switch settings :
– Action outputs :
2 On = Direct
2 Off = Reverse

Direct action

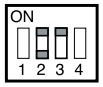


Reverse action



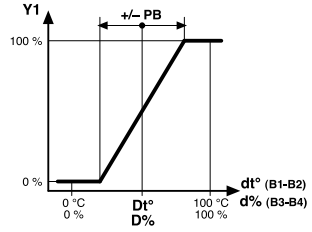
12.2 Modulating relay 3-wire control

Control opens = 1-3 closed, 2-3 open
Control closes = 4-6 closed, 5-6 open

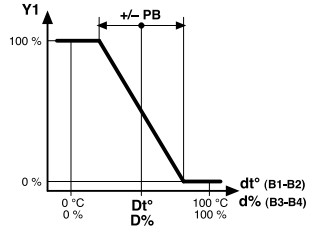


Dip-switch settings :
– Action outputs :
2 On = Direct
2 Off = Reverse
– Type control
3 On = 3-wire modulating

Direct action

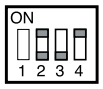


Reverse action



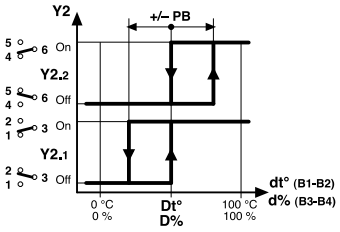
12.3 On-Off relay control in two stages

Control 1st stage = 1-3 closed, 2-3 open
Control 2nd stage = 4-6 closed, 5-6 open

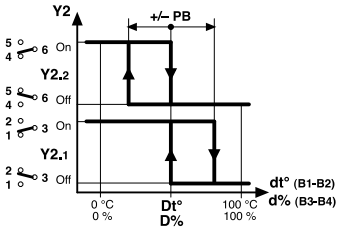


Dip-switch settings :
– Action outputs :
2 On = Direct
2 Off = Reverse
– Type control
3 Off = On-Off
– Type control On-Off
4 On = 2 stages

Direct action

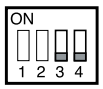


Reverse action

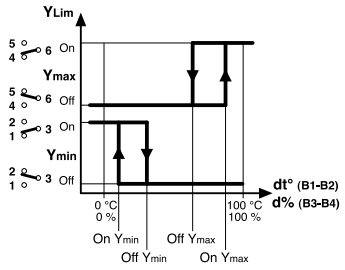


12.4 On-Off relay limit control

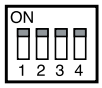
Control minimum limit = 1-3 closed, 2-3 open
Control maximum limit = 4-6 closed, 5-6 open



Dip-switch settings :
– Type control
3 Off = On-Off
– Type control On-Off
4 Off = limits

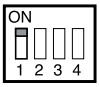
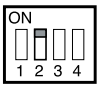
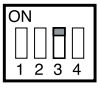
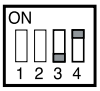


13. CONFIGURATION



At delivery it is programmed as follows:: – difference in temperature
– direct action
– three-wire modulating

It is essential to configure the controller in relation to its use by means of the dip-switch programmer on its base.
Black indicates the position of the dip-switch cursor (white on the actual controller).

Dip-switches	Functions	Description	Position of dip-swiches
	Type of measurement	**Temperature difference 0…100 °C** Difference of 0…10 V– signals	**1 On** 1 Off
	Type of action of outputs	**Direct** Reverse	**2 On** 2 Off
	Type of relay control	**3-wire modulating** On - Off	**3 On** 3 Off
	Type of On-Off control	**2 stages** Limits	**3 Off and 4 On** 3 Off and 4 Off

14. SETTING PARAMETERS

The setting parameters must be entered after having completed the electric wiring and configured the dip-switches (section **13**.).

The display normally shows :
– the temperature difference in °C between the measurement of B1 (greater) and the measurement of B2 (smaller) if dip-switch 1 is On and detectors B1 and B2 connected (LED 6.6 lit). When the value measured by a detector is off the scale (interrupted or short circuit), on the display will appear three dashes alternating with the letter A (high) or b (low).
or
– the difference in % of the 0…10V- signal between the value of B3 (greater) and the value of B4 (smaller) if dip-switch 1 is on Off and B3 and B4 detectors are connected (LED 6.7 lit).

The ◄ and ► keys permit viewing the setting parameters (display flashing)
The + and – keys permit adjusting the parameters shown on the display.

The type of parameter shown on the display is indicated by the lighting up or flashing of the relative LED.

If for 60 seconds no key is pressed, the display again shows the difference value in °C or in %

To revert to the default values (factory settings) switch off the power to the controller and then switch it on again whilst keeping pressed – and ► keys until on the display appears “ini” and the controller version (e.g. 001), and then release the keys.

14.1 Modulating relay control (dip-switch 3 on On; LED 6.4 lit)
or
On-Off in 2 stages (dip-switch 3 on Off and 4 on On; LED 6.5 lit)

Display fixed with actual difference **dt**° (dip-switch 1 on On; LED 6.6 lit) or **d%** (dip-switch 1 on Off; LED 6.7 lit).
Press ►: Display flashing with desired temperature difference **Dt**° or difference 0…10 V– signals desired **D%.**
Adjust with + or – (resolution 0.1 °C/%).
Press ►: Display with value measured by detector B1 or B3 alternating with the abbreviation “A” (high).
Press ►: Display with value measured by detector B2 or B4 alternating with the abbreviation “b” (low).
Keep pressed ► until display shows **– – –** , and release the key :
Display flashing with value of Proportional Band **PB**. (±°C)
LED "PB" (6.10) lit. Adjust with + or – (resolution 0.1 °C or %).

Press ⊛ : Display flashing with value of Integral Time **ti**.
LED "ti" (6.11) lit. Adjust with ⊕ o ⊖ (resolution 1 minute).
To have P characteristic enter – – –.

Press ⊛ : Display flashing with value of Dead Zone of input signal
LED 6.6 and 6.7 lit. Adjust with ⊕ o ⊖ (resolution 0.1 %).

Press ⊛ : Display flashing with value of run time of actuator (only if Modulating)
LED "PB" (6.10) and "ti" (6.11) lit. Adjust with ⊕ or ⊖ (resolution one second).

Press ⊛ : Display flashing with value of Neutral Zone (only if Modulating)
LED 6.6 and 6.7 flashing. Adjust with ⊕ or ⊖ (resolution 0.1 %).

Press ⊛ : Display flashing with telemanagement address
All LEDs flashing. Adjust with ⊕ or ⊖.

Press ⊛ : Display fixed with actual value of **dt**° or **d%**; appears, however, if for 60 seconds no key is pressed.

13.2 Control with On-Off limit relay (dip-switch 3 on Off and 4 on Off; LEDs 6.4 and 6.5 lit)

Display fixed with actual difference **dt**° (dip-switch 1 on On; LED 6.6 lit) or **d%** (dip-switch 1 on Off; LED 6.7 lit)

Press ⊛ : Display flashing with desired temperature difference **Dt**° or difference 0…10 V– signal desired **D%**.
Adjust with ⊕ or ⊖ (resolution 0,1 °C/%).

Press ⊛ : Display with value measured by detector B1alternating with abbreviation “b1” or with value of signal B3 alternating with abbreviation “b3”

Press ⊛ : Display with value measured by detector B2 alternating with abbreviation “b2” or with value of signal B4 alternating with abbreviation "b4"

Keep pressed ⊛ until the display shows – – – , and the release key :
Display flashing with value of Proportional Band **PB** of output **Y** 0…10 –V.
LED "PB" (6.10) lit. Adjust with ⊕ or ⊖ (resolution 0.1 °C or %).

Press ⊛ : Display flashing with value of Integral Time **ti** of output **Y** 0…10 V–.
LED "ti" (6.11) lit. Adjust with ⊕ or ⊖ (resolution 1 minute).
To have P characteristic enter – – –.

Press ⊛ : Display flashing with value of Dead Zone of input signal
LED 6.6 and 6.7 lit. Adjust with ⊕ or ⊖ (resolution 0.1 %).

Press ⊛ : Display flashing with desired value **On Ymin** for minimum On Limit.
LED "On" (6.10) lit and LED “min” (6.8) lit. Adjust with ⊕ or ⊖.

Press ⊛ : Display flashing with desired value **Off Ymin** for minimum Off Limit.
LED "Off" (6.11) lit and LED “min” (6.8) lit. Adjust with ⊕ or ⊖.

Press ⊛ : Display flashing with desired value **On Ymax** for maximum On Limit.
LED "On" (6.10) lit and LED “max” (6.9) lit. Adjust with ⊕ or ⊖.

Press ⊛ : Display flashing with desired value **Off Ymax** for maximum Off Limit.
LED "Off" (6.11) lit and LED “max” (6.9) lit. Adjust with ⊕ or ⊖.

Press ⊛ : Display flashing with telemanagement address
All LEDs flashing. Adjust with ⊕ or ⊖.

Press ⊛ : Display fixed with actual value of **dt**° or **d%**; appears, however, if for 60 seconds no key is pressed.

Amendment to data sheet

Date	Revision No.	Page	Section	Amendment description
13.06.07 AM	**01**	1	3. TECHNICAL DATA	Update "Frequency" data

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