

FIXED POINT CONTROLLER FOR DISTRICT HEATING

C ←BUS

DTT 318 C1 Eng.



- Control of secondary circuit temperature at fixed point
- Control of minimum or maximum limits of primary return temperature
- Communication: C-Bus for telemanagement
- Power supply 230 V a.c. (or 240 V a.c. for UK market); DIN rail mounting

1. APPLICATION

DTT 318 controller is designed for use in district heating sub-stations for the regulation of secondary flow temperature at fixed point (hot or cold) with control of minimum or maximum limit temperature of primary return.

By means of C-Bus connection DTT 318 can be inserted in a telemanagement system.

2. FUNCTIONS

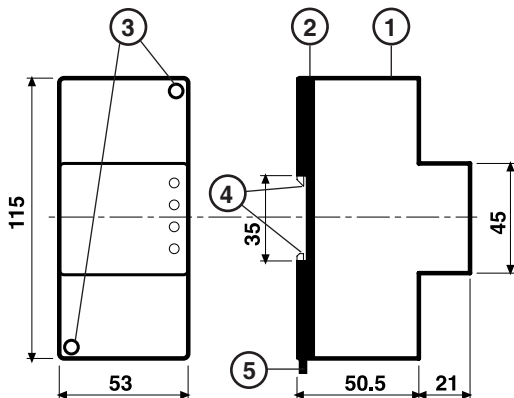
The principal functions of DTT 318 are :

- Control of temperature at fixed point (B1; 0...99 °C).
- Control of minimum or maximum limit temperature (B2; 0...99 °C).
- Control output :
 - 3-wire modulating;
 - On-Off in 1 or 2 stages;
 - On-Off Proportional in one stage.
- Adjustment of desired value by means of remote set-point adjuster.

3. DETECTORS AND REMOTE CONTROLS

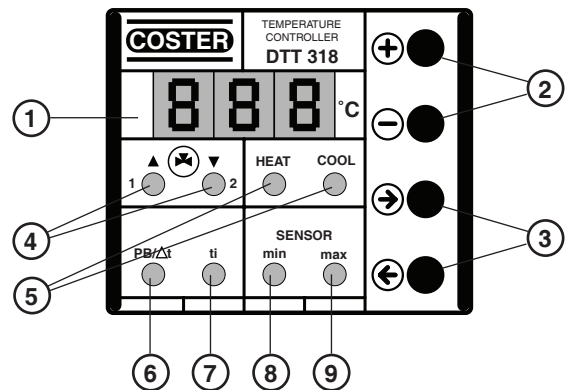
| No. | Description | Model | Setting range | Sensing element | Code | Data sheet |
|--------|--|----------------------------------|----------------------|-----------------|--------------|----------------|
| 1 or 2 | Temperature detector immersion or Cable-type | SIH 010 | 0...99 °C | NTC 10 kΩ | B1-B2 | N 140 |
| 1 | Set-point adjuster | SAF 010 CDB 100 | 0...99 °C ± 20 °C | NTC 10 kΩ – | B1-B2 Rt° | N 145 N 710 |

4. 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

5. FACIA



- 1 - Three-digit display
- 2 - + and - keys for adjusting parameters
- 3 - → and ← keys for displaying parameters
- 4 - LEDs for control output
- 5 - LEDs for Heating/Cooling:
LEDs for data shown on display
- 6 - Proportional Band or Differential
- 7 - Integral Time
- 8 - Minimum limit
- 9 - Maximum limit

6. TECHNICAL DATA (default values in bold type)

• **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 switching voltage | 250 V~ |
| Maximum switching 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 |

| | |
|---------------------------------|-------------------|
| Permitted ambient temperature : | |
| Operation | 0...45 °C |
| Storage | - 25...+ 60 °C |
| Permitted ambient humidity | Class F DIN 40040 |
| Weight | 0.27 kg |

| | |
|---|------------------------------------|
| • Setting ranges (..) = cooling | |
| Desired temperature (B1 detector) | 0... 50(20) ...99 °C |
| Set-point adjuster | ± 20 °C |
| Min and max temperature limit (B2 detector) | 0... 70 ...99 °C |
| Control output : | - 3 wire Modulating |
| | - On-Off in 1 or 2 stages |
| | - On-Off proportional in one stage |
| Actuator run time | 60 ; 90 ; 120 ; 180 s |
| Proportional Bands : | |
| For desired temperature (B1 detector) | ± 0.5... 2(1) ...99 °C |
| For Min and Max temperature (B2 detector) | ± 0.5... 2(1) ...99 °C |
| Integral time | ---... 20(20) ...255 min |
| On-Off differential | ± 0.5... 2(1) ...99 °C |
| Time of On-Off proportional cycle | 5 ; 10 ; 20 ; 30 min. |

7. INSTALLATION

DTT 318 must be installed in a dry location that respects the relevant ambiental conditions given under 6.TECHNICAL DATA. If sited 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.

8. ELECTRICAL CONNECTIONS

Proceed as follows:

- Separate base and cover (first remove the securing screws)
- Mount the base on the DIN rail and check that the securing elements (4.4) anchor it securely
- Make the electrical connections according to the diagram and in observance of the safety regulations in force using the following cables :
 - 1.5 mm² for power supply and relay control outputs.
 - 1 mm² for detectors and remote control
 - 1 mm² for C-Bus. For length limits see Technical Data Sheet T 021.
- Switch on power (230 V a.c.; or 240 V a.c. for UK market) and check its presence at terminals L and N.
- Switch off power, replace cover on the base/terminal block and secure it with the two screws supplied (4.3).

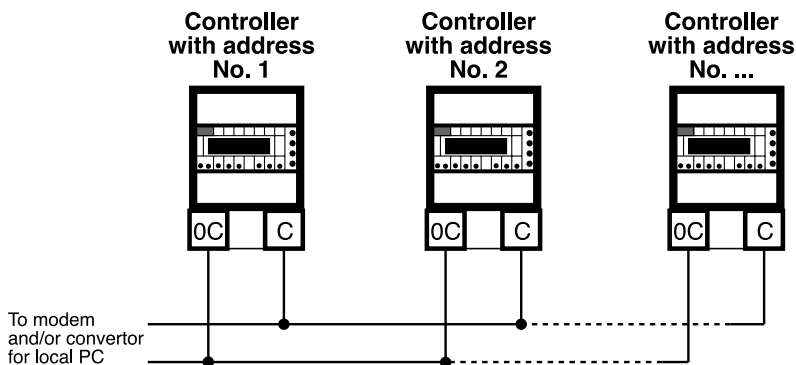
You are advised not to insert more than two cables in a single terminal and, if necessary, to use an external junction box

9. COMMUNICATION

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

Via C-Bus output DTT 318 can be telemanaged (two-way transmission of data) using one or more local PCs and/or a central PC via telephone landlines. From the PC(s) you can see and/or modify the data set on the controller.

9.2 C-Bus electrical connections

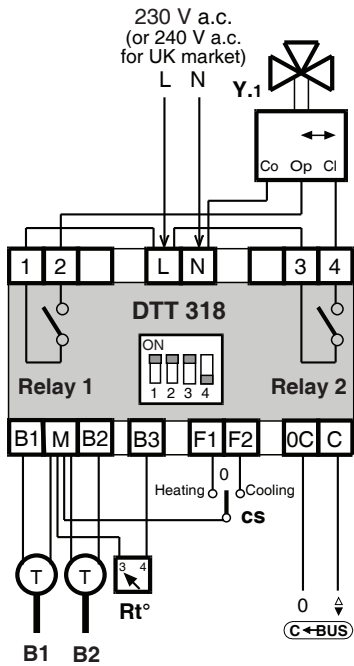


9.3 Telemanagement address

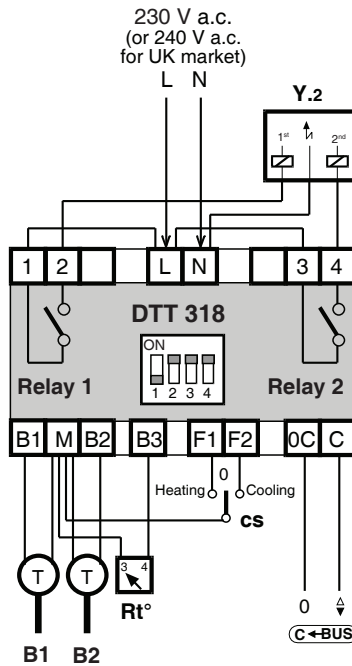
In telemanagement, in order for the controllers to be identified by the central PC and/or by the local PCs, they must be assigned progressive address numbers. For setting see section 13.

10. WIRING DIAGRAMS

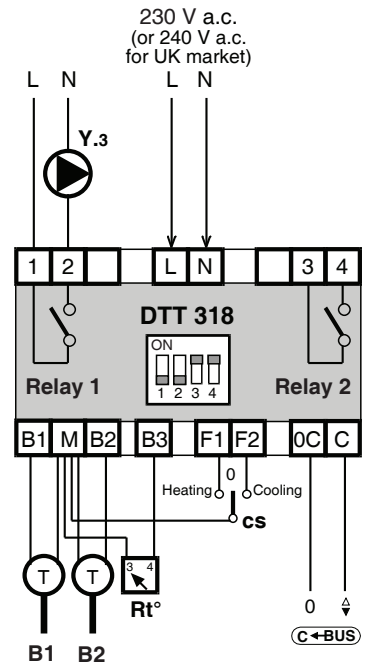
10.1 With 3-wire modulating output e.g. with run time of 120 seconds



10.2 With On-Off output in two stages



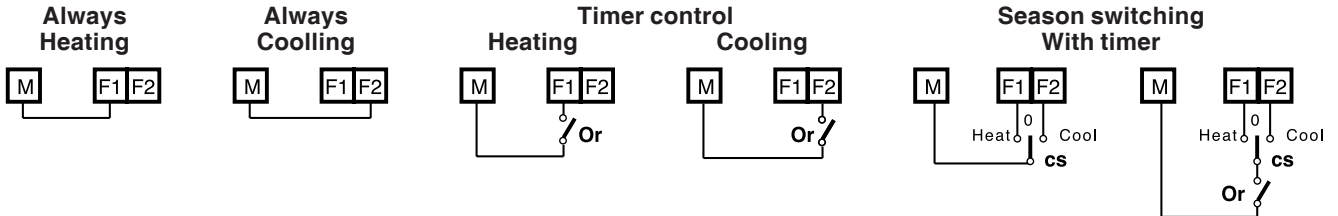
10.3 With Proportional On-Off output e.g. with 5-minute time cycle



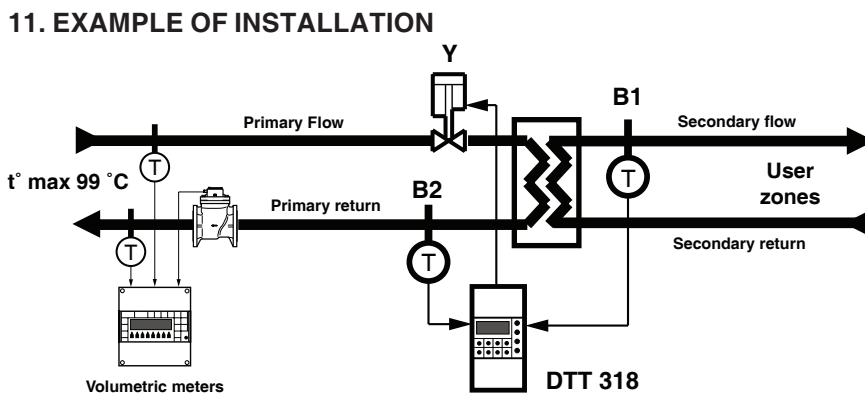
B1 – Desired temp. detector NTC kΩ (0...99 °C)
 B2 – Limit temp. detector NTC 10 kΩ (0...99 °C)
 Rt° – Set-point adjuster (0 ...± 20 °C)
 cs – Remote season changer
 0 = control excluded with valve closing

Or – Remote timer switch
 Y.1 – 3-wire modulating control
 Y.2 – On-Off control in two stages
 Y.3 – Proportional On-Off control in one stage
 C-Bus – Transmission telemanagement data

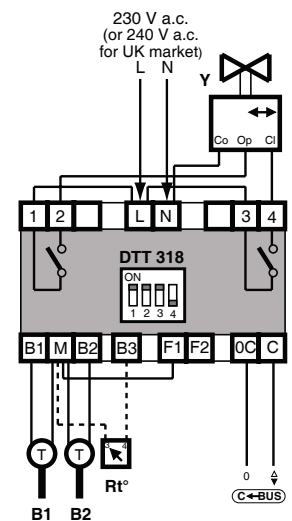
10.4 Remote control



11. EXAMPLE OF INSTALLATION



B1 – Secondary flow control detector (0...99 °C)
 B2 – Primary return maximum limit detector (0...99 °C)
 Y – Control valve
 Rt° – Set-point adjuster (optional)



Control of secondary flow temperature for district heating exchanger with maximum limit for primary return temperature.

The controller maintains the secondary flow temperature (B1) at the desired value by modulating control of Y valve; at the same time it ensures that temperature of the primary return (B2) is not higher than the maximum desired limit. When the temperature of the primary return tends to exceed the desired maximum limit, the controller regulates the valve Y so it does not exceed this value, ignoring the temperature of the B1 detector. In fact, two controllers operate at the same time, regulating the same valve: the modulating control of the valve is the lowest of the controls of the two controllers.

12. OPERATION

DTT 318 is a digital microprocessor-based controller for regulating temperature measured by:

- **Only detector B1 or B2** (0...99 °C).

The controller acts in relation to the difference measured by detector B1 or B2.

If detector B1 or B2 develops a fault (short or open circuit), the controller signals the fault on the display (running line) and closes the valve or switches off the On-Off controls.

or

- **B1 detector** (0...99 °C) and **B2 detector** (0...99 °C).

B1 detector measures the primary control temperature (e.g. secondary flow circuit) and B2 detector measures a minimum or maximum limit temperature (e.g. primary return circuit).

The two temperatures (different points of the site) are influenced by the same actuator (valve or other).

The controller acts in relation to the difference measured by B1 detector until the temperature measured by B2 detector reaches the limit set; at this point the controller acts in relation to the difference measured by B2 detector.

If B1 detector is develops a fault (short or open circuit) the controller operates automatically as if B2 detector were B1, with the set-point of B1; it is an emergency function to avoid a crisis with the primary temperature.

If B2 detector develops a fault (short or open circuit) the controller operates without the limit function.

If both detectors break down, the controller closes the valve or switches off the On-Off control organs.

The type of action can be: **Heating** if: **M** **F1** **F2** or **Cooling** if: **M** **F1** **F2**

Without jumpers, the controller is off (valve closed, On-Off controls off)

- The control type can be :
- **3-wire modulating**
 - **On-Off in 1 or 2 stages**
 - **On-Off proportional in 1 stage**

12.1 Configuration

It is essential to configure the controller in accordance with its use by means of the dipswitches on its base. Bold type indicates the position of the cursor (white on the actual controller) of the dipswitches



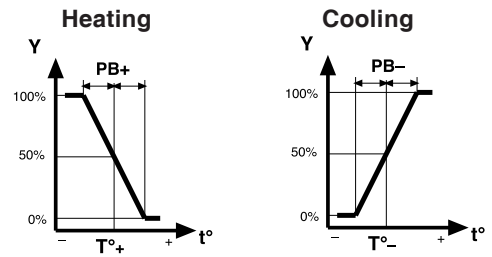
Factory setting : programmed for **3-wire modulating control** with **run time of 60 seconds**
To change the type of control, position only the dipswitches concerned, as indicated in the table.

| Dipswitch | Function | Description | Position of dipswitch |
|-----------|---|---|--|
| | Type control output | 3-wire modulating control On-Off control | 1 On 1 Off |
| | Type On-Off control (only if 1 is on Off) | On-Off in 1 or 2 stages On-Off proportional | 2 On 2 Off |
| | Valve run time (only if 1 on On) | 60 seconds 90 seconds 120 seconds 180 seconds | 3 and 4 On 3 and 4 Off 3 On and 4 Off 3 Off and 4 On |
| | Time of half-load cycle (only if 1 & 2 are on Off) | 5 minutes 10 minutes 20 minutes 30 minutes | 3 and 4 On 3 and 4 Off 3 On and 4 Off 3 Off and 4 On |

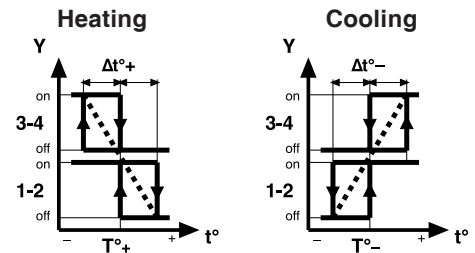
12.2 Control with one detector (B1 or B2)

The controller compares desired temperature $T^{\circ+}$ (Heating) or $T^{\circ-}$ (Cooling) with temperature t° measured by B1 detector and calculates the value of control output Y (Controller Output 0...100%) in relation to the difference and the parameters set.

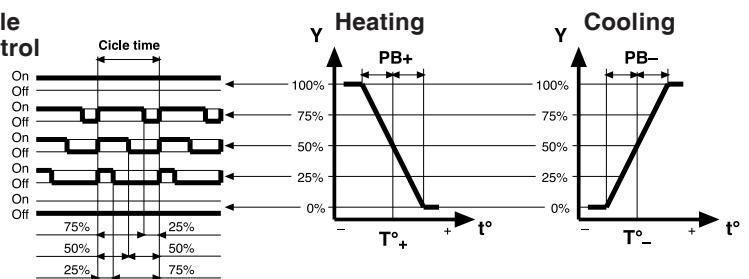
- **3-wire modulating output with PI action**
 Output terminals 1-2 (Relay 1) = valve opening
 Output terminals 3-4 (Relay 2) = valve closing



- **On-Off output in 1 or 2 stages with PI action**
 For P action (pure differential),
 set Integral Time = --- . -
 Output terminals 1-2 (Relay 1) = 1st stage
 Output terminals 3-4 (Relay 2) = 2nd stage



- **On-Off output with Proportional cycle**
 Output terminals 1-2 (Relay 1) = control



12.3 Control with two detectors (B1 control & B2 limit)

The control parameters are equal for both controllers (B1 and B2 detectors). The **two controller outputs Y1 and Y2 (from 0...100%)** are treated in the following way.

- **B2 detector as maximum limit:** the **minimum (heating) or the maximum (cooling) between the two controller outputs** is chosen and illustrated by the same diagrams shown above; the controller operates with B1 detector as long as B2 detector remains below the minimum limit; otherwise functions with B2 detector. During the control of Maximum Limit (B2), if the secondary flow temperature (B1) drops in respect of the desired temperature, by the value set in:

“**Maximum reduction of secondary flow temperature**” the controller suspends the Maximum Limit function and returns to normal operation until the temperature measured by B1 sensor returns to the desired value.

- **B2 detector as minimum limit:** the **maximum (heating) or the minimum (cooling) between the two controller outputs** is chosen and illustrated by the same diagrams shown above; the controller operates with B1 detector as long as B2 detector remains above the minimum limit; otherwise functions with B2 detector.

The concept is the same even if the controller is used for cooling.

13. SETTING PARAMETERS

The setting parameters must be entered after having completed the electrical wiring and configured the dipswitches (section 12.1).

At start-up the controller version (e.g.: 102) is displayed for 3 seconds

The display normally shows the temperature measured by B1 detector.

If B1 detector develops a fault and B2 detector is installed the temperature measured by B2 detector is displayed.

If B1 detector develops a fault and B2 detector is not installed, the fault is indicated by dashes.

The \leftarrow and \rightarrow keys permit displaying the setting parameters

The \oplus and \ominus 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 LED concerned.

If for 60 seconds no key is pressed the temperature measured returns to the display.

To display the default values (factory settings), switch off power to the controller and then switch on again while keeping pressed \ominus and \rightarrow keys until the sign “ini” and the measured temperature appear on the display, and then release the keys.

13.1 Control with detector B1 or B2 only

The parameters for **Heating** and **Cooling** are separate and must be entered separately:




With   "HEAT" LED lit. Enter data for **Heating**.

With   "COOL" LED lit. Enter data for **Cooling**.




Measurement of temperature controlled (B1 or B2 detector)

Display stationary with temperature measured by B1




Entering desired temperature

Press : Display flashing with desired temperature T° .
Adjust with  or  (resolution 0.5°C).
If **Rt** remote control connected and a variation greater than $\pm 0.5^{\circ}\text{C}$ has been entered, the T° value includes the remote control adjustment value and the "HEAT" or "COOL" LED flashes




Proportional Band or Differential

Keep pressed  until display shows --- : release key :
Display flashing with Proportional Band **PB**. ($\pm^{\circ}\text{C}$)
"PB/ Δt " LED lit.
Adjust with  or  (resolution 0.5°C).


Integral Time

Press : Display flashing with Integral Time **IT**, only if Modulating or On-Off in 1 or 2 stages.
"IT" LED lit. Entering "---", controller becomes pure Differential
Adjust with  or  (resolution 1 minute).

Telemangement address

Press : Display flashing with telemangement address.
All LEDs flashing.
To adjust use  or .

Return to temperature measurement

Press : Display stationary with temperature measured by B1: appears, however, if for 60 seconds no key is pressed.

From any position you can turn back using  key

13.2 Control with detector B1 and B2 limit (Min or Max)

The parameters for **Heating** and **Cooling** are separate and must be entered separately.:




With   "HEAT" LED lit. Enter **Heating** data.

With   "COOL" LED lit. Enter **Cooling** data.


Measurement of temperature controlled (B1 detector)

Display stationary with temperature measured by B1.




Entering desired temperature

Press : Display flashing with desired temperature T° .
Adjust with  or  (resolution 0.5°C).
If **Rt** remote control connected and a variation greater than $\pm 0.5^{\circ}\text{C}$ has been entered, the T° value includes the remote control adjustment value and "HEAT" or "COOL" LED flashes.




Measurement of Min or Max limit temperature (B2 limit detector)

Press : Display stationary with temperature measured by B2.
"min" LED flashing if minimum limit. "max" LED flashing if maximum limit..




Entering Min or Max limit temperature (B2 limit detector)

Press  : Display flashing with desired limit temperature T°. Adjust with  or  (resolution 0.5 °C). "min" LED flashing if minimum limit. "max" LED flashing if maximum limit..




Proportional Band or Differential for control temperature (B1 detector)

Keep pressed  until the display shows --- : release key: Display flashing with Proportional Band PB (±°C). "PB/Δt" LED lit. Adjust with  or  (resolution 0.5 °C).




Integral Time for control temperatre (B1 detector)

Press  : Display flashing with Integral Time IT, only if Modulating or On-Off in 1 or 2 stages. "IT" LED lit. By entering "---", controller becomes pure Differential. Adjust with  or  (resolution 1 minute).




Proportional Band or Differential for Min or Max limit temperature (B2 limit detector)

Press  : Display flashing with Proportional Band PB (±°C). "PB/Δt" LED lit. Adjust with  or  (resolution 0.5 °C). "min" LED flashing if minimum limit. "max" LED flashing if maximum limit.

Integral Time for Min or Max limit temperature (B2 limit detector)


Press  : Display flashing with Integral Time IT, only if Modulating or On-Off in 1 or 2 stages. "IT" LED lit. By entering "---", controller becomes pure Differential. Adjust with  or  (resolution 1 minute). "min" LED flashing if minimum limit. "max" LED flashing if maximum limit..

Entering type of limit: Min or Max




Press  : With  or  choose to display either :
Li o = minimum limit. "min" LED flashes.
Li o= = maximum limit. "max" LED flashes.

Maximum reduction in secondary flow temperature (with maximum return limit On)


This page appears only if "Heating" has been set and the limit is "Maximum.

Press  : Display flashing
 LED BP/dt and LED "Max" flashing with temperature reduction value (B1)+
 Adjust with + or - (resolution 0.5°C)
 This function is On only when Maximum Limit of Primary Return is functioning.
 If the temperature measured by the secondary flow sensor (B1) falls below the value set, the Maximum Limit action is excluded.
 To exclude this function, enter: "- - -" on display.

Telemanagement address

Press  : Display flashing with telemanagement address. All LEDs flashing.
 To adjust use  or .

Return to temperature measurement

Press  : Display fixed with temperature measured by B1: appears, however, if for 60 seconds no key is pressed.

From any position you can turn back using  key

Amendment to data sheet

| Date | Revision No. | Page | Section | Amendment description |
|-------------|--------------|-------|---|--|
| 18.04.07 LB | 01 | 5 - 7 | 12.3. Control with two detectors.. 13.2. Control with detector B1... | Add function "Maximum reduction of secondary flow temperature" |



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