Digital Temperature Controllers

CTY5XX

CE

Model	Output	Power supply V~	Input
CTY531	2 relays + 0÷10 V	230	PTC
CTY532	2 relays + 0÷10 V (with 4÷20 mA configurable)		Pt100 (4÷20 mA configurable)
CTY541	2 relays + 0÷10 V	24	PTC
CTY542			Pt100 (4÷20 mA configurable)

APPLICATION AND USE

CTY are temperature controllers with dual output, acting either dependently or independently, with ON/OFF, PD, PID action and SOFT START function adjustable on the main output. A series of parameters with alphanumeric indication allows configuring the controller according to the required application.

TECHNICAL CHARACTERISTICS

Front protection	IP54
Housing	PC+ABS plastic resin body PC+ABS UL94 V-0
Dimensions	front 72x72 mm, depth 80 mm
Mounting	panel with 67x67mm drilling template
Temperature	
- operating	-5T55°C
- storage	-20T85°C
Humidity	10...90% RH (non-condensing)
Display range	See sensor table (page 9)
Analogue input	1 input selectable by parameter H00
Serial	TTL
Accuracy	See sensor table (page 9)
Resolution	See sensor table (page 9)
Consumption	4W max
Power supply	2 switching power types:
- B (see page 10)	95...240 V ±10% 50/60Hz
- A (see page 10)	12...24 V / 12...36 Va ±10% 50/60Hz
Digital output (configurable)	
- OUT1 output	1 SPDT 8(3)A 250 Va
- OUT2 output	1 SPST 8(3)A 250 Va
Double visualisation display:	
Top part	PV - Used to display the process value, and the labels of parameters, alarms and functions.
Lower part	SV - Used to display the setpoints, parameter values, function statuses, other statuses.

Product conforms to EMC 2006/95/EU directive according to the European standard EN 60730-2-9.

Digital input	1 voltage-free digital input
Analogue output *	Output V-I:0-1V,0-5V,0-10V,0...20mA, 4...20mA - configurable by AOL parameter

* maximum loads controlled by the analogue output:

output type	maximum load
0-1 V	20mA with minimum load resistance 50 Ohm
0-5 V	20mA with minimum load resistance 250 Ohm
0-10 V	20mA with minimum load resistance 500 Ohm
0-20mA	350 Ohm
4-20mA	350 Ohm

SETPOINT ADJUSTMENT

This procedure is to be followed in order to set the 2 setpoint values in the device: **SEt1** and **SEt2**. When the initial page is displayed, press and release the Set key.
The **PV** display shows label **SEt1,** and the **SV** display shows the current Setpoint value. Press the Set key again to display the Setpoint 2 in the same way.
The UP and DOWN keys can be used to change the Setpoint value shown on the **SV** display.
When the Set or "fnc" key is pressed, or if the timeout has elapsed (15 sec), the new value appears and the initial page returns.

KEYS ON THE FRONT PANEL

SET	Accesses the Setpoint - Opens the Programming Menu - Activates functions - Confirms commands
UP ⌃	Scrolls through menu items - Increases values Programmable by parameter (see par. H31)
DOWN ⌄	Scrolls through menu items - Decreases values Programmable by parameter (see par. H32)
fnc	Opens QuickStart menu - ESC (exit) function

DISPLAY AND LED

S.Str	ON if the Soft Start function is active; OFF in all other cases;
out1 - out2	ON when output active; otherwise OFF; Flashes if there is a delay, a protection, or activation is blocked
aux	output not used
Alarm (((?)))	ON if there is an alarm; otherwise OFF; Flashes if an alarm is switched off;
°C/°F	Indicates whether the temperature display is in °C or °F; Off for other units of measure.

PROGRAMMING MENU

The programming menu contains all the parameters needed for setting the device functions, and it is divided into two levels **user level** and **installer level:**
When the Set is pressed on the main display for **3** seconds, the user can access the Parameter Programming menu; the **USEr** label appears, to indicate user level of the menu.

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Access to user level :

- When at the label **USEr** press and release the Set key to open the folders containing the user level parameters.

Installer level access (InSt):

- When at the label **USEr** the UP and DOWN keys can be used to display the **InSt** label, which indicates the access point to the folders containing the installer level parameters. When **InSt** is displayed, press and release the Set key.

How to change the parameter values (in both levels):

- Press the UP and DOWN keys to scroll through all the user level folders and, on the desired folder, press the Set key to access the parameters in the folder (for example, the **ALAr** folder).
- When the Set key is pressed on the **ALAr** folder, the first parameter in the folder is displayed, as follows:
  - PV display: parameter label (**PAO**)
  - SV display: current parameter value (**0**)

  The Set key can be used to scroll through all the parameters in the folder.
- To change the value of a displayed parameter, use the UP and DOWN keys. When the parameter has been set to the desired value, press "fnc", or allow the 15-second timeout to elapse, to save the new parameter setting.
- Now press and release the "fnc" key to return to the previous display levels.

At any level of any of the menus, press the "fnc" key, or allow the 15 second timeout to elapse, in order to return to the previous menu level. The last value shown on the display will then be stored in memory.

PARAMETER DESCRIPTION

SP1/SP2 Setpoint 1/2 Control Setpoint

CONTROLLER 1/2 (folder with label "rE1"/"rE2")

OS1/OS2 Offset Setpoint 1/2. Temperature value to be added algebraically to the Setpoint if a reduced set is enabled; it cannot have a 0 value.

db1/db2 Response band above Setpoint 1/2

dF1/dF2 Setpoint 1/2 differential band. With negative sign Heating operation; with positive sign, Cooling operation.
If dF1=0, it goes back to SP1/2, dF1=db1

HS1/HS2 Max. value that can be assigned to setpoint 1/2.

LS1/LS2 Minimum value that can be assigned to setpoint 1/2.

HA1/HA2 Maximum temperature alarm. Temperature limit (the relative or absolute status of this value is controlled by "Att", present in the installer menu, ALAr folder), beyond which the alarm is activated.

LA1/LA2 Minimum temperature alarm. Temperature limit (the relative or absolute status of this value is controlled by "Att", present in the installer menu, ALAr folder), below which the alarm is activated.

dn1/dn2 Delay after which controller 1/2 is started. The delay time indicated must elapse between the request for activation of the controller relay and the actual switch-on.

do1/do2 Delay time after switching off. The delay time indicated must elapse between deactivation of the controller relay and the next switch-on.

di1/di2 Delay between switch-ons. The delay time indicated must elapse between two consecutive switch-ons of the controller.

dE1/dE2 Switch-off delay. The delay time indicated must elapse between the request for deactivation of the controller relay and switch-off.

NOTE: for parameters dn1/2, do1/2, di1/2, dE1/2, 0= not active

On1/On2 Switch-on time for controller due to sensor fault. If set to "0" the controller is always off, if set to "1" with Of1/2 at "0", the controller is always on, and with Of1/2 >0, it operates in Duty Cycle mode. **See the Duty Cycle diagram.**

OF1/OF2 Controller switch-off time if due to sensor fault. If set to "1" with On1/2 at "0", the controller is always off, and with On1/2 >0 it operates in Duty Cycle mode. **See the Duty Cycle diagram.**

QUICKSTART MENU

In the main menu, the "fnc" key can be pressed to open the QuickStart menu and access the special functions, which are useful for setting and managing the device, for example the Functions Folder and the Alarm Folder (if at least one alarm is present).
After pressing the "fnc" key, the UP and DOWN keys can be used to scroll through the folders in the menu. Select a label and press the "set" key in order to access the corresponding folder.
The following is a description of the menu structure and the functions of the individual folders:

FUNCTION FOLDER

Press the **FnC** label to access the functions. The label will be displayed, with the current status of the function.
To scroll through the available functions, use the Set key.
To change the status of a function, use the UP and DOWN keys.

Function	Label function	Status of default	D.I.	Key	ON function indication
Soft start	SStr	ON	1	1	i
Stand-by	Stnb	OFF	5	5	/
Autotuning*	Auto		7	7	LED Tun flashing
Start work cycle sequences**	StEP		8	8	/
Reset work cycle sequences***	rStS		–	–	/
Reset PID*	rStP		–	–	/

* Function visible if H01=2-3-7-8-9-10-11
** If pressed during a work cycle, the device goes into STOP status. In this status, the cycle time must stop and restart at an eventual a START command.
*** Visible only if work cycles have been enabled. When pressed, the cycle is reset and the device is brought into the STOP position.

ALARM FOLDER *

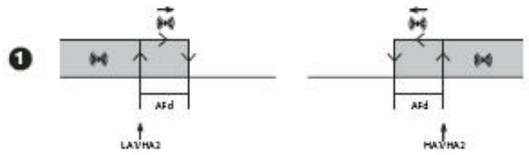
On the **ALAr** label, press Set to access the alarms folder.
This folder contains all the alarms managed by the device.
If no alarm is present, the folder does not appear in the menu. If any alarm is present, the UP and DOWN keys can be used to scroll through and display them

* Appears only if at least one alarm is present.

Label	Alarm	Cause	EFFECTS	Problem solving
E1	Probe 1 (regulation) faulty	• measured values are outside the nominal range • regulating probe faulty/short-circuited/open	Label **E1** shown on main display but not in the **ALAr folder**;	• check the probe wiring • replace probe
HA1	High temperature alarm	• value read by probe > HA1/2 after time "tAO". (see "ALARMS MIN MAX" diagram and description of parameters "HA1/2" and "Att" and "tAO")	Alarm created in the **ALAr folder** through label **HA1/HA2**	• Wait for the temperature value read by the probe to come back below **HA1/2-AFd**
LA1	Low temperature alarm	• value read by probe < LA1/2 after time "tAO". (see "ALARMS MIN MAX" diagram and parameters "LA1/2" and "Att" e "tAO")	Alarm created in the **ALAr folder** through label **LA1/LA2**	• Wait for the temperature value read by the probe to come back above **LA1/2-AFd**
EAL	External alarm	• alarm regulating with delay set by parameter **H14** from D.I. active if **H11**=9 or 10 (see **H11** and **H14**)	Alarm Led lit continuously; Alarm indicated in the **ALAr folder** through label **EAL**; If **H11**=10, the regulators are blocked.	• Stop the alarm manually by pressing a key • if **H11**=10, the regulators are activated again only after the digital input is disabled
tOA	Autotuning timeout	• Autotuning cycle aborted within AtO time out	Autotuning is blocked Label **tOA** shown on **SV** display	• Press 'set' button to restore the normal display
nOC	Autotuning failure	• Autotuning cycle failure before time out	Autotuning is blocked Label **nOC** shown on **SV** display	• Press 'set' button to restore the normal display

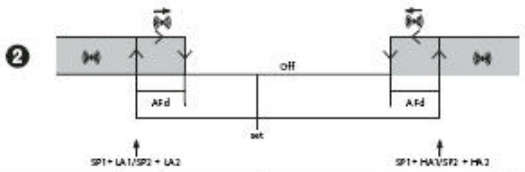
MAX-MIN ALARMS

Absolute temperature value (par "Att"=0) Abs(olute)



Minimum temperature alarm	Temperature less than or equal to LA1/2 (LA1/2 with sign)
Maximum temperature alarm	Temperature greater than or equal to HA1/2 (HA1/2 with sign)
Returning from minimum temperature alarm	Temperature greater than or equal to LA1/2+AFd
Returning from maximum temperature alarm	Temperature less than or equal to HA1/2-AFd

Temperature relative to Setpoint value (par "Att"=1) rEL(ative)



Minimum temperature alarm	Temperature less than or equal to set+LA1/2 (LA1/2 positive only)
Maximum temperature alarm	Temperature greater than or equal to set+HA1/2 (HA1/2 positive only)
Returning from minimum temperature alarm	Temperature greater than or equal to set + LA1/2 + AFd set -|LA1/2|+AFd
Returning from maximum temperature alarm	Temperature less than or equal to set+HA1/2-AFd

if Att=reL(ative) LA1/2 must be negative: therefore, set+LA1/2<set since set+(-|LA1/2|)=set-|LA1/2|

STEP FOLDER

The **StEP** folder is available only at installer level (**InSt**) and it can be used to store two working programmes, each consisting of up to 8 steps; 9 parameters must be set for each step. The operations for setting these parameters correctly are described below.

Press and release the Set key on the **STEP** folder label to access the folder:

- Use the UP and DOWN keys to select one of the two programmes available, and press Set on either **1** or **2**.
- The first parameter (01), corresponding to the first step (00) is then displayed; use the Set key to scroll through the parameters.
- To change the value of a parameter, use the UP and DOWN keys.

Each label is made up of 4 digits, which indicate the step and the number of the parameter it contains.

To exit from any level of the **STEP** folder, simply press the "fnc" key, or allow the 15 second timeout to elapse.

PARAMETER DESCRIPTION OF STEP TABLE

0x01 Step activation delay. Defines the delay at which the step is activated after starting.

If it is the first step in the programme, it is activated by the "Start process" key. During the delay time, the working set is the one defined by End Step mode.

0x02 Step duration. Defines the length of time of the step: expressed in hours/minutes; if set a - - - indicates that the step ends when the temperature is reached.

0x03 Length of time from start, or from when Setpoint is reached. Defines whether step duration is to be calculated from when the step started (value 0), or from when the Setpoint (value 1) is reached within the step.

0x04 Setpoint step. Defines the control set for the step.

0x05 Controller active. Indicates which controller is active in the step: On1=on/off1; On2=on/off2; Ne=neutral zone; Cyc=cyclic; PH=Pid heating; PC=Pid cooling; PHC=Pid heating/cooling;

0x06 Enable/disable Soft Start. Indicates whether the Soft Start function is enabled during the step.

0x07 not used.

0x08 Step end mode. Indicates the way in which the step ends; any of the following can be selected:

1= end programme; 2*=go to next step, maintaining the current setpoint;

3*=go to next step waiting for the new set point (uncontrolled);

4=go back to start of sequence;

5=go back to sequence No. xx; 6=infinite duration, maintaining the setpoint

0x09 Go back to sequence No.xx. indicates the sequence number to go back to. This parameter has a value only if parameter **0x08** is set to 5.

*** NOTE: The values 2 and 3 are disabled only for parameter 0708, therefore the setting of values 2 and 3 is not possible for this parameter.**

StEP Folder Parameters - Prog 1/2

Par.	Range	Default*	U.M.	Level
0x01	0...99:59	0	hours/mins	InSt
0x02	0...99:59	00:59	hours/mins	InSt
0x03	0...1	0	Flag	InSt
0x04	-328...2910	0	°C/°F	InSt
0x05	On1/On2/Ne/ Cyc/PH/PC/ PHC	On1	num	InSt
0x06	0...1	0	Flag	InSt
0x07	0...1	0	Flag	InSt
0x08	1...7	2	num	InSt
0x09	0...7	0	num	InSt

DYNAMIC PARAMETER FOLDER

The two folders **Pid** and **Aut** are visible only if the device has been set for PID control, i.e. if parameter **H01** is equal to 2-3-7-8-9-10-11. These folders can be navigated along with their subfolders, and there is a procedure for saving values when exiting from these subfolders. How to navigate inside the two **Pid** and **Aut** dynamic parameter folders is described below:

Press the Set key on the **Pid** label, the label of the first subfolder **PrH** is displayed. Scroll through the subfolders using the UP and DOWN keys.

Press the Set key on the desired subfolder to access the parameters. To scroll through the parameters, use the Set key, and to change a value, use the UP and DOWN keys.

When exiting the subfolders using the "fnc" key, or after the 15 second timeout has elapsed, the user will be asked whether to save the changes.

Use the UP and DOWN keys to select **y** (save changes) or **n** (not to save changes), then press Set to exit the folder.

PID CONTROLLER (folder with label "Pid")
(folder visible only if H01=2-3-7-8-9-10-11)
PID controller, common parameters heating/cooling (subfolder with label Pr)

run Manual or automatic mode selection:
0=manual; 1=automatic;
dut PID Duty Cycle in manual mode.

PID heating controller (subfolder with label PrH)/
PID cooling controller (subfolder with label PrC)

bp PID proportional band
ti Total PID time; OFF if =0
td derivative time
biA Static PID polarization
tt total time for antireset windup (OFF if =0)
tt value must be calculated according to the following formula:

$$tt = \sqrt{(td * ti)}$$

c derivative setpoint weighting
SLO minimum output saturation
SHi maximum output saturation
PEd period divided with Duty Cycle

AUTOTUNING (folder with label "AutO")
(folder visible only if H01=2-3-7-8-9-10-11)
Autotuning, common parameters heating/cooling (subfolder with label PA)

tun Hot/cold Autotuning selection; 0=hot, 1=cold;
IMPORTANT: parameter visible only if **H01**=7;
AtO Timeout for Autotuning
Adt Enable Autotuning of parameters
PrE Restore default parameters (pretuning) 0=no; 1=yes;
ASA Automatic saving of parameters after Autotuning 0=no; 1=yes

Heating Autotuning (subfolder with label PAH)/
Cooling Autotuning (subfolder with label PAC)
Fun PID controller selection:
P=Proportional;1=Proportional/integral; 2=Proportional/derivative; 3=Proportional/integral/derivative;
APL oscillation width in Autotuning
biAt relay polarization in Autotuning
APr relay range in Autotuning
AHr relay hysteresis in Autotuning

CONFIGURATION OF ANALOGUE OUTPUT (folder with label "AnOu")
AOL Analogue output mode: 020=0...mA; 420=4...20mA; 001=0...10V; 005=0...5V; 010=0...10V;
AOF Analogue output mode:
dis=output disabled;
ro=read out, output proportional to sensor reading, within the range set by parameters LAO and HAO;
Er=error, output proportional to error between setpoint 1 and the value read on the sensor, within the error range specified by the parameters LAO and HAO;
cPH= PID Heating control variable, output proportional to the percentage power output, if PID Hot is selected;
cPC= PID Cooling control variable, output proportional to the percentage power output, if PID Cold is selected.
AOS Analogue output mode due to sensor fault:
Aon=analogue output ON; **AoF**=analogue output OFF;
LAO Analogue output minimum limit;
HAO Analogue output maximum limit.

PROGRAMME 1/2 PARAMETERS FOLDER (folder with label "StEP")
Programme 1/2 parameters subfolder
Inside folder **STEP** there are 2 subfolders containing the parameters that make up the steps in each programme. It is possible to set 2 different programmes, each with 8 steps and each step made up of 9 parameters. **see "STEP Folder" on page 4.**

SOFT START CONTROLLER (folder with label "SFt") see "Soft Start", page 6
dSi Soft Start controller step value;
Std Duration of step for Soft Start controller (unit of measure defined by **unt**);
unt Unit of measure for step duration (defines the unit of measure for **Std**): 0=hours; 1=minutes; 2=seconds;
SEn Controller selection for Soft Start function. Determines the controller on which the Soft Start function is to be enabled. 0=disabled; 1=enabled on controller 1 and analogue output 1; 2=enabled on controller 2 3=enabled on controllers 1 and 2;
Sdi Automatic return band for Soft Start function.

CYCLIC CONTROLLER (folder with label "cLc")
see "Cyclic Controller", page 7
Con ON time for cyclic controller output;
CoF Off time for cyclic controller output.

ALARM CONTROLLER (folder with label "ALAr")
Att Modes for parameters HA1/HA2 and LA1/LA2:
Abs=absolute; rEL=relative;
Afd Alarm differential;
PAO Alarm timeout after the device is switched on following a power failure;
SAO Timeout for "set point not reached" alarm indication.
tAO Time delay for temperature alarm indication.
AOP Alarm output polarity: nc=normally closed; no=normally open;

COMMUNICATION (folder with label "Add")
Pts Protocol selection: t=Televis; d=Modbus
dEA index of the device within the family (valid values from 0 to 14)
FAA device family (valid values from 0 to 14) The pair of values FAA and dEA represents the network address of the device and is indicated in the format "FF.DD" (where FF=FAA and DD=dEA).
PtY Modbus parity bit: n=none; E=Even; o=odd;
StP Modbus stop bit: 1b=1 bit; 2b=2 bits;

DISPLAY (folder with label "diSP")
LOC Keyboard lock (set and keys). It is still possible to go into parameter programming and modify the parameters, including this one, in order to allow keyboard unlocking.
y = yes; n = no.
PA1 Password 1. When enabled (value other than 0), this is the access key to the user level parameters (**USEr**).
PA2 Password 2. When enabled (value other than 0), this is the access key to the installer level parameters (**inSt**).
ndt Format with decimal point. y = yes; n = no.
NOTE: For models with V/I/Pt100 analogue input it is possible to display up to 3 digit: 0=whole value; 1=1 digit; 2=2 digits; 3=3 digits.
CA1 Calibration 1. Positive or negative temperature value added to the value read from sensor 1, according to the setting of parameter "CA".
CAi Calibration operation:
0=sum with displayed temperature only;
1=sum with only the temperature used by the controllers; the display remains unchanged;
2=sum with the displayed temperature, which is also used by the controllers;
LdL Minimum value that can be displayed by the device.
HdL Maximum value that can be displayed by the device.
dro Selection of °C or °F for displaying the temperature read from the sensor. 0 = °C, 1 = °F.

WARNING: if °C is changed to °F or vice versa, the values for setpoint, differential, etc., remain unchanged (for example, set=10°C becomes 10°F).

CONFIGURATION PARAMETERS (folder with label "CnF")
H00 Selection of sensor type
CTY531/541 models
PTC selection
CTY532/542 models
selection of Pt1=Pt100; 020=0...20mA; 420=4...20mA; t01=0...1Vc; t05=0...5Vc; t10=0...10Vc;

H01 Configuration of controllers:

H01	Description	OUT1	OUT2
0	free	H21	H22
1	ON/OFF	H/C	H22
2	PID Heating	H	H22
3	PID Cooling	C	H22
4	two independent ON/OFFs	H/C	H/C
5	two related ON/OFFs	H/C	H/C
6	neutral zone	H/C	H/C
7	PID Heating-Cooling	H	C
8	PID Heating-O/OFF	H	H/C
9	PID Cooling-ON/OFF	C	H/C
10	PID Heating-Alarm	H	Alarm
11	PID Cooling-Alarm	C	Alarm

H02 Activation time for keyboard functions. For the ESC, UP and DOWN keys, which are configured with a second function, a time is set for activation of the second function.
H03 Current/voltage input lower limit (only for models V-I-Pt100, see parameter H00)
H04 Current/voltage input upper limit (only for models V-I-Pt100, see parameter H00)
H06 Key or aux/light digital input active with the device OFF: 0=n=not active; 1=y=active;
H08 Stand By mode: 0= Only display is switched off.
1= Display on, control devices and alarms are off.
2= Display off, control devices and alarms are off.
3= **PV** display with label **OFF** and control devices off.
H10 Delay for output activation after Power On; Minimum delay time for connection of utilities in the event of restart after a power failure;
H11 Configurability and polarity of digital input:
0=disabled; 1=activate/deactivate Soft Start;
2=activate/deactivate OSP; 3=activate/deactivate cyclic controller; 5=activate/deactivate Stand-by; 4=6=7=8 not used; 9=external alarm; 10=external alarm to lock controllers;
H13 Polarity and priority of digital inputs: no=normally open; nc=normally closed; noP=normally open with priority; ncP=normally closed with priority;
H14 Activation delay for digital inputs;
H21* Configurability of digital output 1: 0=disabled; 1=alarm; 2=cyclic; 3=not used; 4=stand-by;
H22* Configurability of digital output 2: Same as H21
*** see table of H01 parameter**

H31 Configurability of UP key: 0=disabled; 1=activates/deactivates soft start; 2=activates/deactivates OSP; 3=activates/deactivates cyclic controller; 4=activates/deactivates aux output; 5=activates/deactivates stand-by; 6=7=8=not used;
H32 Configurability of DOWN key: Same as H31
rEL Device version. Read-only parameter.
tAb Reserved. Read-only parameter.

SOFT START

NOTE: The SOFT START function can be selected by key, by D.I. or by a function.
The Soft Start controller can be used to set the temperature gradient, over which a given setpoint is reached within a preset time.
With this function, the control Setpoint is raised progressively and automatically from value Ta (ambient temperature when switched on) to the value actually set on the display; this allows the initial temperature rise to be slowed down, thus reducing the risk of "overshooting".

CONTROLLER DESCRIPTION

PID CONTROLLER

The PID controller is available as an alternative to the on/off controller, if greater control accuracy is required.

Enabling:
The PID controller is enabled if:

- **H01** = 2-3-7-8-9-10-11 (see Parameters, folder **CnF**)

This setting of parameter **H01** enables display of the **PId** and **Aut folders** in the parameter Programming Menu.

Parameter settings:
It is also necessary to set the **run** parameter. This parameter is used to select the control mode: manual* (Duty Cycle) or automatic (PID). The **run** parameter is therefore set to=1.
The device is now enabled for PID control; the **PId** folder is visible in the Programming Menu, and the parameters in it can be modified in order to improve controlling performance: these parameters can also be modified in automatic mode using the **Autotuning** function.
* if manual control is selected (**run**=0), the activation percentage **dut** must be set (see 'Parameters' on page 3). Then set the period divided with the Duty Cycle, using the **PEd** parameter (see 'Parameters on page 4)

Autotuning
The setting of the PID control parameters can be simplified using the Autotuning function, which can calculate the PID parameters automatically.
Autotuning is activated through a dedicated function in the Functions Folder (see QuickStart Menu on page 2), or by using a key if appropriately configured (see par. **H31**, **H32** in 'Parameters' on page 6).

The **Tun** Led on the device flashes to indicate when Autotuning is in progress.

Mode setting
If parameter **H07** is set to 7 (PID hot-cold control), Autotuning must be carried out twice: once for cooling and once for heating. In this mode, the **tun** parameter is also visible in the **PA** subfolder contained in the **Aut** folder; this parameter is used to select the Autotuning mode: heating(**tun**=0)/coooling (**tun**=1).
To carry out autotuning in PID heating-cooling mode (**H01**=7), therefore, proceed as follows:

- set **H01**=7
- set **tun**=0
- activate the Autotuning function in the Functions Folder
- wait for the Autotuning function to be performed
- set **tun**=1
- activate the Autotuning function in the Functions Folder

INSTALLATION

The device is designed for heating PID control and the alarm is set with the max allowable temperature range (-199...+900). In case of cooling PID control, it is necessary to change the **H01** parameter into **CnF** (10 to 11) folder at installer level. Then, it is necessary to change the **AOF** parameter into **AnOu** folder (**CpH** to **cpC**).

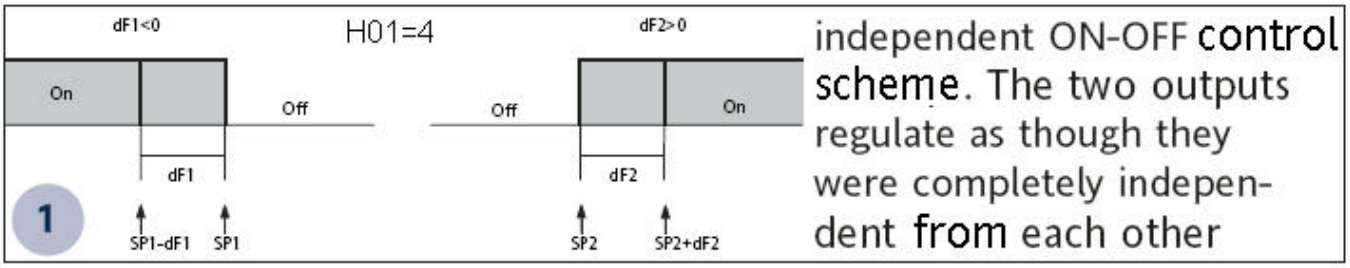
UnPower and power again the device, at the end of the installation.

ON/OFF MAIN CONTROLLER

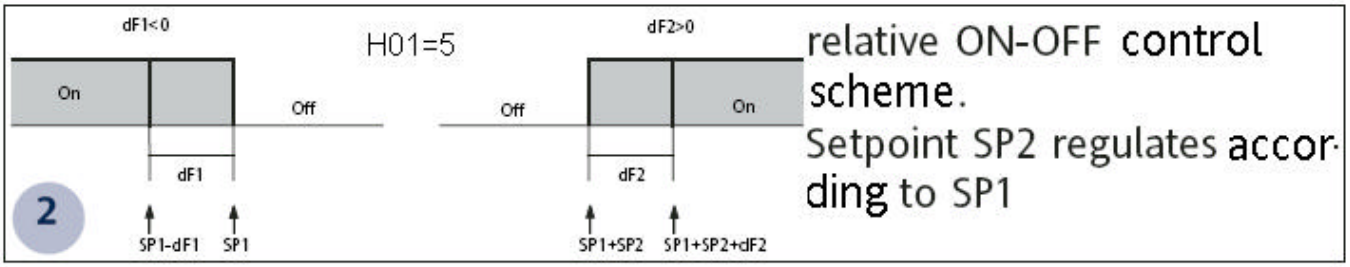
The device has two ON/OFF type controllers that can be configured by the user through the H01 parameter:
- **H01**=4, 5 threshold controller
- **H01**=6 window controller

dF1<0	dF2>0	H01	control type
hot	cold	4	independent setpoints
hot	cold	5	relative setpoints
-	-	6	Neutral Zone (or window)

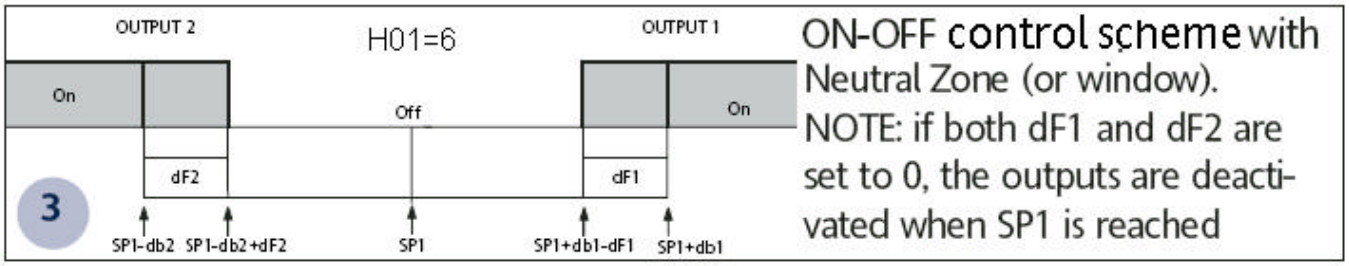
NOTE: examples with dF1<0 ((hot) and dF2>0 (cold)



independent ON-OFF control scheme. The two outputs regulate as though they were completely independent from each other



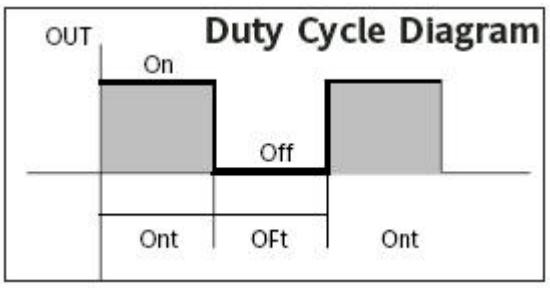
relative ON-OFF control scheme.
Setpoint SP2 regulates according to SP1



ON-OFF control scheme with Neutral Zone (or window).
NOTE: if both dF1 and dF2 are set to 0, the outputs are deactivated when SP1 is reached

OUTPUT PROTECTION

An error condition in the sensor causes one of the following actions:
- code E1 is shown on the display;
- the controller is activated as indicated by parameters On1/ On2 and OF1/OF2 if set for Duty Cycle.



On1/On2	OF1/OF2	Compressor output
0	0	OFF
0	>0	OFF
>0	0	ON
>0	>0	dc

parameters On1/On2, OF1/OF2 set for Duty Cycle

CYCLIC CONTROLLER

NOTE: The PERIODIC CYCLE function can be selected by key or by digital input

This function can be associated to both relay outputs (by setting parameters H21, H22 to 2), and can be used to carry out "Duty Cycle" control with the intervals set by parameters Con and CoF.

ACCESSORIES

ARAD9672 Hole adapter (96x96 to 72x72) for front panel mounting to replace analogue equipment having drilling template 96x96 (TX283-TX581-TX586 Controlli models and RX500 series).

MOUNTING

The device is designed for panel mounting. Make a 65x65 mm drill hole and insert the device; fix it with the special brackets provided. Do not mount the device in damp and/or dirt-laden areas. It is suitable for use in places with ordinary or normal levels of pollution.
Keep the area around the device cooling slots adequately ventilated.

PARAMETER TABLE

Par.	Range	Default*	U.M.	Level
SP1	LS1...HS1	0.0	°C/°F	
SP2	LS2...HS2	0.0	°C/°F	

Regolatore 1 - label rE1

OS1	-30.0...30.0	0	°C/°F	InSt
db1	0.0...30.0	1.0	°C/°F	USEr/InSt
dF1	-30.0...30.0	-1.0	°C/°F	USEr/InSt
HS1	LS1...HdL	999.9	°C/°F	USEr/InSt
LS1	LdL...HS1	-199.9	°C/°F	USEr/InSt
HA1	LA1...2910.0 LA1...9999(*)	999.9 999.9(*)	°C/°F	USEr/InSt
LA1	-328.0...HA1 -1999...HA1(*)	-328.0 -199.9(*)	°C/°F	USEr/InSt
dn1	0...255	0	sec	InSt
do1	0...255	0	min	InSt
di1	0...255	0	min	InSt
dE1	0...255	0	sec	InSt
On1	0...255	0	min	InSt
OF1	0...255	1	min	InSt

Regolatore 2 - label rE2

OS2	-30.0...30.0	0	°C/°F	InSt
db2	0.0...30.0	1.0	°C/°F	USEr/InSt
dF2	-30.0...30.0	-1.0	°C/°F	USEr/InSt
HS2	LS2...HdL	800.0	°C/°F	USEr/InSt
LS2	LdL...HS2	-200.0	°C/°F	USEr/InSt
HA2	LA2...2910.0 LA2...9999(*)	2910 300(*)	°C/°F	USEr/InSt
LA2	-328.0...HA2 -1999...HA2(*)	-328.0 -50.0(*)	°C/°F	USEr/InSt
dn2	0...255	0	sec	InSt
do2	0...255	0	min	InSt
di2	0...255	0	min	InSt
dE2	0...255	0	sec	InSt
On2	0...255	0	min	InSt
OF2	0...255	1	min	InSt

Reg. PID - Pid (1)

Regolatore PID - Pr				
run	0...1	1	Flag	InSt
dut	-100...100	0	%	InSt

Pid Heating - PrH**				
bP	0.1...999.9	10.0	°C/°F	USEr/InSt
ti	0...9999	100	sec	USEr/InSt
td	0...9999	25	sec	USEr/InSt
biA	-100...100	0	num	InSt
tt	0...9999	50	sec	USEr/InSt
c	0...100	0	num	InSt
SLO	0...100	0	num	InSt
SHI	0...100	100	num	InSt
PEd	20...1310	20	sec	USEr/InSt

Pid

Pid Cooling - PrC***				
bP	0.1...999.9	10.0	°C/°F	USEr/InSt
ti	0...9999	100	sec	USEr/InSt
td	0...9999	25	sec	USEr/InSt
biA	-100...100	0	num	InSt
tt	0...9999	50	sec	USEr/InSt
c	0...100	0	num	InSt
SLO	0...100	0	num	InSt
SHI	0...100	100	num	InSt
PEd	20...1310	20	sec	USEr/InSt

label AUtO(1)

Autotuning - PA**				
tun(2)	0...1	0	flag	USEr/InSt
AtO	1...100	10	ore	USEr/InSt
Adt	0...1	1	Flag	InSt
PrE	0...1	1	Flag	InSt
ASA	0...1	1	Flag	InSt

Autotuning Heating - PAH**				
Fun	P/Pi/Pd/Pid	Pid	num	InSt
APL	0...100	1	°C/°F	InSt
biAt	0...100	50	num	InSt
APr	0...100	50	num	InSt
AHr	0.0...100.0	0.3	°C/°F	InSt

Autotuning Cooling - PAC***				
Fun	P/Pi/Pd/Pid	Pid	num	InSt
APL	0...100	1	°C/°F	InSt
biAt	0...100	-50	num	InSt
APr	0...100	50	num	InSt
AHr	0.0...100.0	0.3	°C/°F	InSt

label AnOu **

AOL	020/420/001/ 005/010	020	num	USEr/InSt
AOF	diS/rO/Er/ cPH/cPc	cPH	num	USEr/InSt
AOS	Aon/AoF	AoF	Flag	USEr/InSt
LAO	LdL...HdL	0	num	USEr/InSt
HAO	LdL..HdL	100.0	num	USEr/InSt

STEP(3)

Pro 1	parametri programma 1	InSt
Pro 2	parametri programma 2	InSt

label SFt

dSi	0...25	0	°C/°F	InSt
Std	0...255	0	ore/min/sec	InSt
unt	0...2	1	num	InSt
SEn	0...3	1	num	InSt
Sdi	0...30	0	°C/°F	InSt

cLc

Con	0...255	0	min	InSt
CoF	0...255	0	min	InSt

label Alar

Att	AbS/rEL	AbS	flag	InSt
AFd	1...50	2	°C/°F	InSt
PAO	0...10	0	ore	USEr/InSt
SAO	0...24	0	ore	USEr/InSt
tAO	0...255	0	min	USEr/InSt
AOP	nC/nO	nC	Flag	InSt
tP	n/y	n	flag	InSt

label Add

PSt	t/d	t	flag	USEr/InSt
dEA	0...14	0	num	USEr/InSt
FAA	0...14	0	num	USEr/InSt
PtY	n/E/o	E	num	USEr/InSt
StP	1b/2b	1b	flag	USEr/InSt

label diSP

LOC	n/y	n	Flag	USEr/InSt
PA1	0...999	0	num	USEr/InSt
PA2	0...999	0	num	InSt
ndt	n/y 0...3(*)	y 1(*)	Flag num(*)	USEr/InSt
CA1	-30...30	0	°C/°F	USEr/InSt
CAi	0...2	2	num	InSt
LdL	-328...HdL -1999...HdL(*)	-328.0	°C/°F	InSt
HdL	LdL...2910.0 LdL...9999(*)	2910.0 999.9(*)	°C/°F	InSt
dro	0...1 0...6(*)	0 6(*)	Flag	USEr/InSt

label CnF

H00	ntc/Ptc Pt1/020/420/ t01/t05/t10(*)	Ptc (*****) Pt1 (*)	flag	USEr/InSt
H01	0...11	2	num	InSt
H02	0...15	5	sec	InSt
H03(*)	-1999...9999	20.0	num	USEr/InSt
H04(*)	-1999...9999	100.0	num	USEr/InSt
H06	n/y	y	flag	InSt
H08	0...3	3	num	InSt
H10	0...255	0	num	USEr/InSt
H11(4)	0...10	0	num	InSt
H13(4)	no/nc/ noP/ncP	no	num	InSt
H14(4)	0...255	0	min	InSt
H21	0...4	0	num	InSt
H22	0...4	0	num	InSt
H31	0...8	0	num	InSt
H32	0...8	0	num	InSt
rEL	/	/	num	USEr/InSt
tAb	/	/	num	USEr/InSt

label FPr

UL	/	/	/	USEr/InSt
dL	/	/	/	USEr/InSt
Fr	/	/	/	USEr/InSt

(*) Range and default values for CTY532/542

NOTES:

(1) Folder visible if **H01**= 2-3-7-8-9-10-11.
(2) Parameter visible if H01 = 7.
(3) See paragraph "STEP Folder" on page 4.
(4) These parameters are visible only in models equipped with a digital input.
(5) Not used.

** These subfolders are visible only if **H01**=2-7-8-10.
*** These subfolders are visible only if **H01**=3-7-9-11.
**** Folder **AnOu** is visible in models equipped with an analogue output.
***** Default and range values for CTY531/541.

PASSWORD

Passwords can be set to limit the access to each parameter management level. The two different passwords can be activated by setting parameters PA1 and PA2 in folders "diSP" (PA1 at **USEr** level and PA2 at **InSt** level). The password is enabled if the value of parameter PA1/PA2 is different from 0.

- To access the "Programming" menu, hold down the "set" key for more than 5 seconds. If it has been set, the PASSWORD will be requested; press Set again.
- If activated (value different from 0), password PA1 must be entered. Carry out this operation by selecting the correct value using the UP and DOWN keys, then confirm by pressing the Set key.

If the password entered is incorrect, the device displays label PAS1 again and the operation must be repeated.
Password PAS2, for the **InSt** level, works in the same way as password **PAS1**.

WIRE SENSORS

for CTY xx1 models (PTC)

SPTC-D PTC duct sensor (air).
Cable length: 1,5 m - sensor material: AISI 316 - range -55T150 °C

SPTC-C (*) PTC pipe sensor (water).
Cable length: 1,5 m - sensor material: AISI 316 - range -55T150 °C

for CTY xx2 models (PT100)

SPTX-U (*) PT100 universal sensor (3-wire connection).
Cable length: 3 m - sensor material: AISI 316 - range T350°C

SENSORS WITH STICK ENCLOSED

for CTYxx1 models

SPTC-CR(*) PTC pipe sensor (water) with stick enclosed - sensor material: brass - range -50T150°C

SPTC-V PTC duct sensor (air) with stick enclosed - sensor material: brass - range -20T65°C

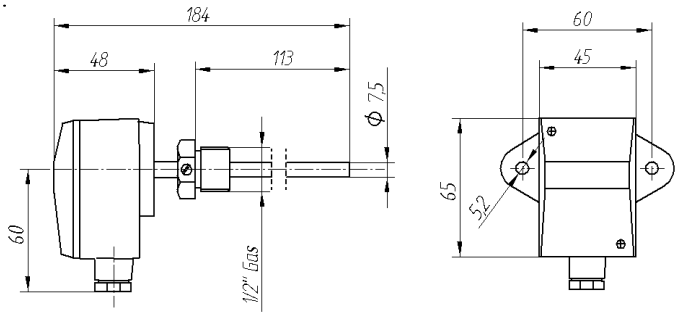
* It can be combined to 421 (AISI 306) - 422 (nickel-plated brass) pockets.
For mounting with pockets, it is necessary to use thermoconduction pulp, since they have a 7,5 mm hole.

It is always necessary to use 421 or 422 pockets for SPTC-C/CR sensors

For CTY xx2 models (PT100)

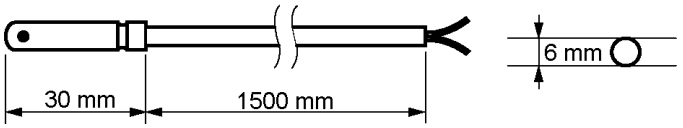
TPC PT100 sensor (water) - sensor material: platinum - range T500°C (connections: 2 terminals)

SPC PT100 sensor (water) - sensor material: platinum - range -10T150°C (connections: 2 terminals).

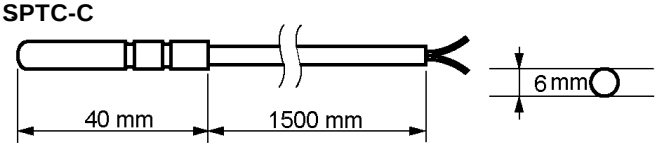


N4035 **SPC**

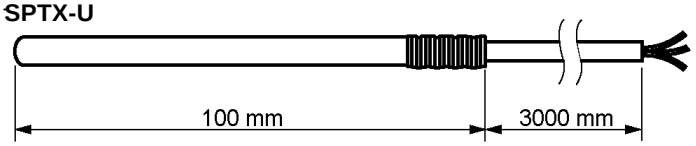
SPTC-D



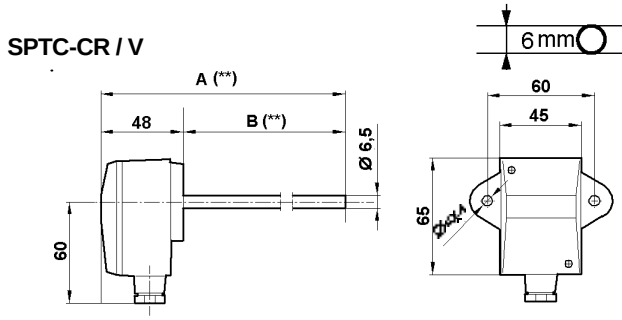
SPTC-C



SPTX-U

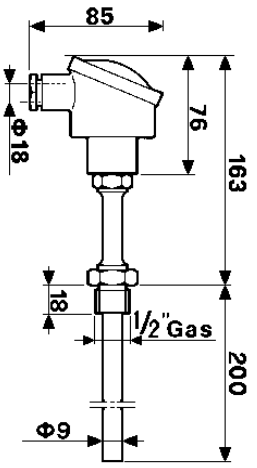


SPTC-CR / V



(**)

Model	A	B
SPTC-V	348	300
SPTC-CR	184	136



TPC

SENSOR INPUT TABLE

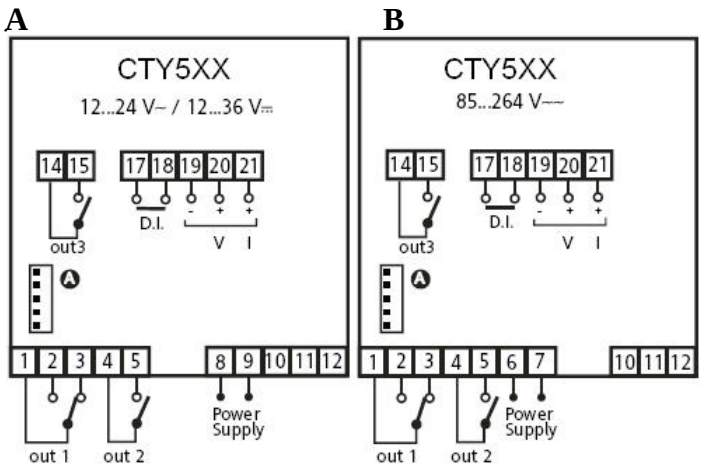
Probe*	Range	Probe error limits	Resolution	Accuracy**
Ptc	-55...150°C	-60...155°C	0,1°C (0,1°F)	0.5% end of scale + 1 digit
Pt100	-200...800°C	-210...810°C	0,1°C (0,2°F)	0.5% end of scale + 1 digit (over entire scale) 0.2% end of scale + 1 digit (-150...300°C)
V-I (1)	0...1 V 0...5 V 0...10 V 0...20 mA 4...20 mA	-1...10 % -0,20...10 % -0,10...3 % 0,05...5 % -6,25...6,25 %	1 digit if **ndt**=0 0,1 digit if **ndt**=1 0,01 digit if **ndt**=2 0,001 digit if **ndt**=3	0.5% end of scale + 1 digit

***** **Important!** Check the sensors and models available.
** **NOTE:** The accuracy values shown are valid for an ambient temperature of 25°C
(1)The maximum load present on the +12V feed of the sensor is 60mA.

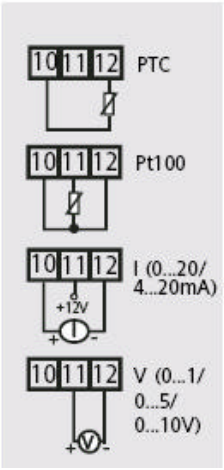
ELECTRICAL CONNECTIONS

Warning! Switch off the device before working on the electrical connections.

The device is equipped with screw terminals for connecting electric cables with 2.5 mm^2 maximum cross-section (one wire per terminal in the case of power connections): for the capacity of the terminals, see the label on the device. The relay outputs are voltage-free. Do not exceed the maximum permitted current; for higher loads, use a contactor with sufficient power capacity. Make sure that power supply is the correct voltage for the device. Note that the length of the analogue I/O cables can affect the EMC performance of the instrument, so that it is important to take all possible precautions with the cabling. We recommend keeping I/O cable runs under 3 metres. The sensor cables, power supply cables and the TTL serial cable should be kept separate from the power cables.



WIRING DIAGRAM



TERMINALS

1 - 3	N.C. out1 relay par. H21
2 - 3	N.A. out1 relay par. H21
4 - 5	N.A. out2 relay par. H22
10-11-12	Probe input
8 - 9	Power Supply (model A)
6 - 7	Power Supply (model B)
14-15	N.A. out3 relay par. H23
17-18	Digital Input - D.I.
19-20-21	Analog Output V-I
A	TTL input