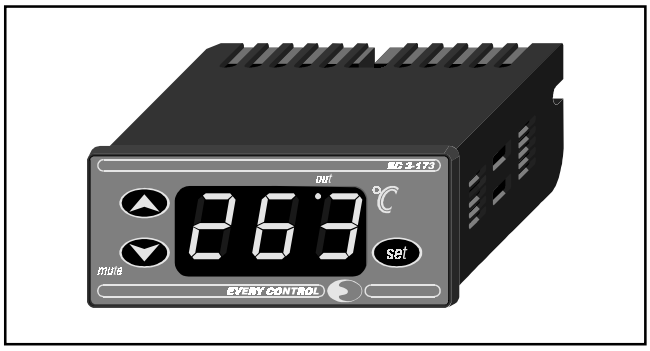


DIGITAL P.I.D. THERMOREGULATOR with one output

EC 3-173

GENERAL CHARACTERISTICS

* **Size: 74 x 32 mm.**
* **Power-supply: 12 or 12-24 Vac/dc.**
* **Alarm buzzer included.**
* **Configuration parameters accessible through Password.**
* **Custom configuration through keyboard or Personal Computer.**
* **Easy integration with remote-assistance or remote-managing.**
* **P.I.D. temperature control.**
* **"Auto Tuning" function to calculate the parameters used during the temperature regulation.**
* **Three digits display, height: 12,5 mm.**
* **One relay-output (8 A at 250 Vac).**
* **One widely configurable temperature-alarm.**

EC 3-173 is a digital one output **P.I.D. temperature controller**; the instrument is adapt to cover a temperature range from 0 to +999 °C, meeting the needs of a wide part of the applications of accuracy in heating field.

The instrument gets set to accept, at the input, "J" (Iron-Constantan) or "K" (Chromel-Alumel) thermocouples and is provided of a **"Auto Tuning" function** to calculate, when the process is in act, the optimal value of the parameters used during the temperature regulation.

The SPDT relay-output can manage (up to) loads from 8 A at 250 Vac and it is supplied in standard version; as option, it is possible to request an output with low-voltage signal, suitable to drive the SSR modules (solid state relay).

The acoustic alarm, normally mounted in this instrument and the flashing display, have been concepted in order to catch user' s attention in case of not proper functioning: defective probe, corrupted memory-data or temperature outside the limits permitted by the used probe.

The instrument is provided of **one temperature alarm**, that can be disabled, configurable in six different ways of working: the intervention of the alarm activates the acoustic alarm with intermittent beep, at the same time the display will show "AL1" alternated to the measured temperature value.

MOUNTING

For a proper mounting, take note of the attached indications.
Be sure that the conditions of use (voltage of power-supply, environment temperature, humidity) are inside the indicated limits.
Do not overload the relay-output, keep inside the indicated limits.
WARNING: the instrument is not protected from overloads: so it is necessary to give the output the suitable protections; besides that, according to the source of power-supply, find a protection able to limit the quantity of current absorbed by the instrument in case of failure.

CONFIGURATION

There are two Levels of configuration (Level 2 is protected by Password):

Level 1

Push		and				at the same time for 4 seconds at least: the symbol "PA" appear on the display.
Push		or				to select the parameter to modify at Level 1.
Push		and		or		to modify the selected parameter.

Level 2

From Level 1 push				or		to select the parameter "PA".
Push		and		or		to set "-19".
Push		and				at the same time for 4 seconds at least: the first parameter of Level 2 will appear on the display.
Push		or				to select the parameter to modify at Level 2.
Push		and		or		to modify the selected parameter.

How to leave "Configuration"

Push		and				at the same time for 4 seconds at least; or wait for 50 seconds at least without operating on the keyboard; or try to switch the power-supply off and then, switch it on.

PROGRAMMING OF THE WORKING TEMPERATURE

In normal operating conditions the instrument displays the value read by the probe.

Push and release the key  to display the actual setpoint value: the led "**out**" flashes to indicate that a procedure of setpoint programming is on run; to change the value, operate on the keys  or  within 4 seconds since the pressure on the key .

The exit from the procedure of programming of the working temperature can be obtained just not pushing any key for 4 seconds at least (exit for time-out) or pushing and releasing the key .

SIGNALS AND ALARMS

The led "**out**", when lighted, indicates that the output is activated; if it is flashing it indicates that a modify of the setpoint value is running.
"**E0**" flashing on the display and buzzer beeping intermittent means one of the following defects: not proper kind of probe, defective probe, wrong connection or temperature outside the limits permitted by the used probe; check the value given to the parameter /0, the connection between instrument and probe and its functioning (the output is deactivated).
"**E2**" flashing on the display and buzzer beeping intermittent: failure of memorised configuration-data; try to switch the power-supply off and then, switch it on (the output is deactivated).
"**EOC**" flashing on the display and buzzer beeping intermittent indicates a cold junction compensation failure (the output is deactivated).
"**tun**" flashing on the display alternated to the measured temperature value indicates that a "Auto Tuning" function is on run.
"**---**" flashing on the display and buzzer beeping intermittent indicates that the "Auto Tuning" function is failed (the output is deactivated).
If the display indicates a proper value alternated to the signal "**AL1**" and the buzzer beeps intermittent, it means that the temperature read by the probe is off the limits previously set in parameter "**A1**".

"AUTO TUNING" FUNCTION

With the "Auto Tuning" function is possible to calculate, when the process is in act, the optimal value of the parameters Pb, PI and Pd used during the temperature regulation.

To start "Auto Tuning"

Before starting the function is possible to establish the desired kind of regulation:

P.I.D. (if PI and Pd > 0)

P.I. (if PI > 0 and Pd = 0)

P.D. (if PI = 0 and Pd > 0)

P. (if PI and Pd = 0).

If the P2 parameter (enable Auto Tuning) has value 1 is possible to start the "Auto Tuning" function pushing the key ▲ for 4 seconds at least: the display show the label "**tun**" alternated to the measured temperature value; the instrument keyboard is locked except the key ▲.

The function is divided in two phases:

- in the first phase the instrument reaches an initial set, lower than the setpoint and dependent on the start temperature and the final setpoint, with the previous value of the P.I.D. parameters
- after the reaching of the intermediate set the instrument gives maximum power to the load and measures the feature of the controlled system to determinate the P.I.D. parameters (Pb always, PI and Pd only if requested); such parameters are stored to keep the value after a power-down.

The "Auto Tuning" function automatically finishes before the reaching of the setpoint and if there are valid parameters, the P.I.D. regulation continues with the new calculated parameters: the "**tun**" label disappear and the display shows the measured temperature value.

To stop "Auto Tuning":

It is possible to terminate the function as follows:

- automatically if the instrument is able to measure all the data necessary to calculate the parameters
- automatically if the instrument is not able to measure the data (because the start temperature was close to the setpoint and there wasn't enough time to calculate valid data, or because during the "Auto Tuning" there were some trouble or noise: the output is disconnected, the buzzer beeping intermittently and on the display lamps the label "---"; pushing the key ▲ for 4 seconds at least is possible to continue the regulation with the older parameters or try to switch off the power-supply and then switch it on
- manually pushing the key ▲ for 4 seconds at least: also in this case the regulation continues with the older set of parameters.

CONFIGURATION PARAMETERS

	CODE	PARAMETER	DESCRIPTION	MIN	MAX	U.M.	ST.
(1)	PA	Password		-99	100	----	----
	/	**PROBE**					
	/0	kind of probe	10="J" TC; 11="K" TC	10	11	----	*
(1)	/1	calibration (measure offset)		-10	+10	°C	0
	/2	digital filter (speed response)	0=0s; 1=0.4s; 2=1.2s; 3=2.8s; 4=6.0s; 5=12.4s; 6=25.2s	0	6	----	3
	r	**TEMPERATURE REGULATOR**					
	r1	minimum setpoint admitted		0	+999	°C	0
	r2	maximum setpoint admitted		0	+999	°C	(2)
	P	**P.I.D. REGULATOR**					
	P0	offset band		-99	+99	°C	0
	PI	integral time		0	999	sec.	100
	P2	enable Auto Tuning	0=NO; 1=YES	0	1	----	1
	Pb	proportional band		+1	+250	°C	+30
	Pc	P.I.D. cycle time		1	120	sec.	30
	Pd	derivative time		0	250	sec.	35
	A	**ALARM**					
	A0	alarm hysteresis (differential)		+1	+99	°C	+1
	A1	alarm setpoint		-99	+999	°C	0
	A3	alarm disabling time since instrument power-on		0	999	min	0
	A4	alarm mode		see table			1
	L	**NETWORK CONNECTION**					
	L1	instrument address		1	15	----	1
	L2	instrument group		0	7	----	0
	L3	time-out link		2	250	sec.	7
	L4	baud rate		0	3	baud	1

Notes

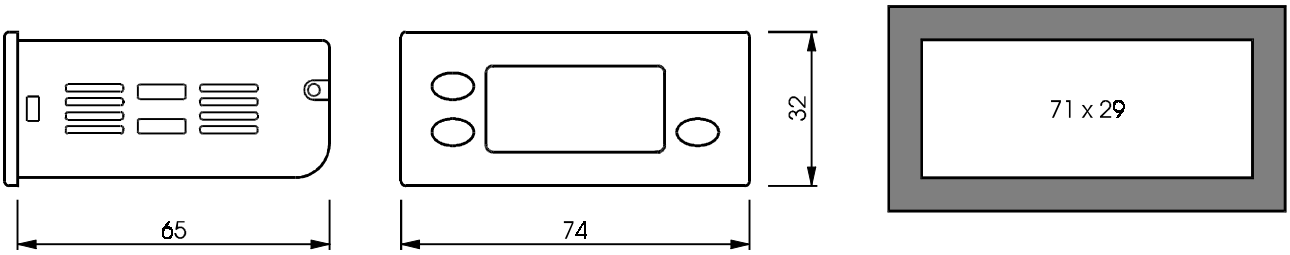
(*) = depends on the kind of probe.
(1) = configuration parameter present on Level 1.
(2) = for "J" thermocouples r2 = 600 °C; for "K" thermocouples r2 = 999 °C.

TABLE

parameter A4	alarm mode
1	disabled
2	absolute minimum alarm
3	absolute maximum alarm
4	minimum alarm relative to setpoint
5	maximum alarm relative to setpoint
6	minimum alarm relative to setpoint with automatic enabling and recompute
7	maximum alarm relative to setpoint with automatic enabling and recompute

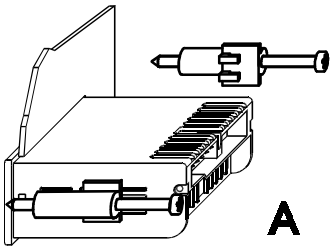
SIZE AND PIERCING TEMPLATE

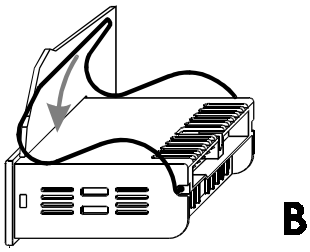
Measure in mm.



OPTIONS OF MOUNTING

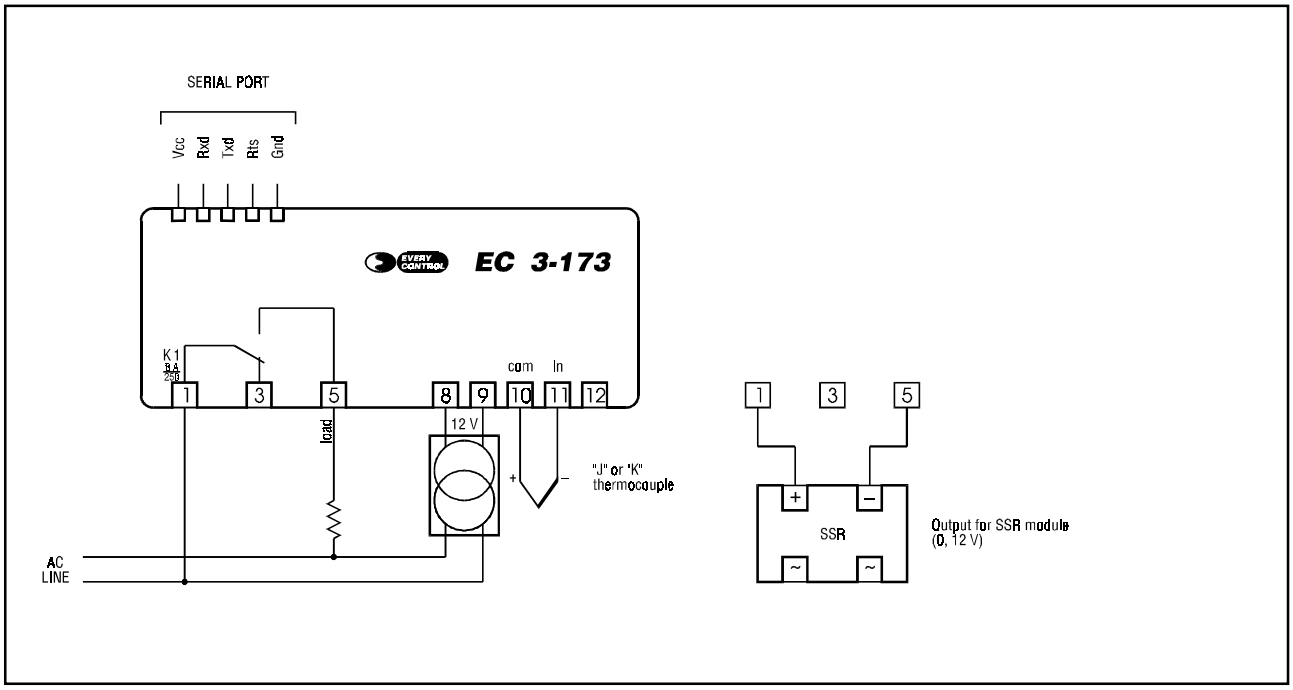
With screw-brackets (A);
With spring-bracket (B).
The panel thickness will be between 1 and 5 mm.





ELECTRICAL CONNECTIONS

Example of typical application.



ELECTRO-MECHANICAL CHARACTERISTICS

Box: self-extinguishing plastic (PC-ABS) according to UL94 V-0.
Size: 74 x 32 x 65 mm.
Mounting: panel-mounting through fixing brackets.
Environment temperature: from 0 to +60 °C.
Humidity: 10 ... 90% not condensing.
Connections: screw connectors.
Power-supply: 12 Vac/dc (standard) or 12-24 Vac/dc (on request); 1,5 W.
Insulation-class: II (with transformer, according to EN 60742).
Inputs for measure: 1 configurable for "J" or "K" thermocouples.
Range of measure: from -99 to +700 °C ("J" thermocouple); from -99 to +999 °C ("K" thermocouple).
Resolution: 1 °C.
Range of thermoregulator programming: from 0 to +999 °C.
Display: 3 digits display; output-status indicator.
Alarm buzzer: included.
Output: one SPDT 8 A/250 Vac relay (output K1).
Serial port for data exchange: TTL with EVCOBUS standard protocol.

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