

# TDF 15

## MICROPROCESSOR-BASED DIGITAL ELECTRONIC THERMOCONTROLLER



### OPERATING INSTRUCTIONS Vr. 01 (ENG) - cod.: ISTR 06095

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#### PREVIOUS STATEMENT

In this manual are contained all the necessary information for a correct installation and the instructions for the use and the maintenance of the product; we recommend, therefore, to read carefully the following instructions.

The maximum care has been used in the realisation of this document, anyway TECNOLOGIC S.p.A. does not assume any responsibility deriving from the use of itself.

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#### INDEX

<b>1</b>	<b>INSTRUMENT DESCRIPTION</b>
1.1	GENERAL DESCRIPTION
1.2	FRONT PANEL DESCRIPTION
<b>2</b>	<b>PROGRAMMING</b>
2.1	SET POINT PROGRAMMING
2.2	PARAMETERS PROGRAMMING
<b>3</b>	<b>INSTALLATION AND USE ADVICES</b>
3.1	USE ALLOWED
3.2	MECHANICAL MOUNTING
3.3	ELECTRICAL CONNECTIONS
3.4	ELECTRICAL CONNECTION DRAWING
<b>4</b>	<b>OPERATING MODE</b>
4.1	MEASURE AND VISUALIZATION
4.2	TEMPERATURE CONTROL
4.3	COMPRESSOR PROTECTION FUNCTION AND DELAY AT POWER-ON
4.4	ALLARM FUNCTIONS
4.5	DIGITAL INPUT
4.6	CONFIGURATION BY "TDF CONF"
<b>5</b>	<b>PROGRAMMABLE PARAMETERS</b>
5.1	PARAMETERS TABLE
5.2	PARAMETERS DESCRIPTION
<b>6</b>	<b>TROUBLES, MAINTENANCE, WARRANTY</b>
6.1	ERRORS SIGNALLING
6.2	CLEANING
6.3	WARRANTY AND REPAIRS
<b>7</b>	<b>TECHNICAL DATA</b>
7.1	ELECTRICAL DATA
7.2	MECHANICAL DATA
7.3	MECHANICAL DIMENSIONS, PANEL CUT OUT AND FIXING DEVICE
7.4	FUNCTIONAL DATA
7.5	INSTRUMENT CODE

#### 1 - INSTRUMENT DESCRIPTION

##### 1.1 - GENERAL DESCRIPTION

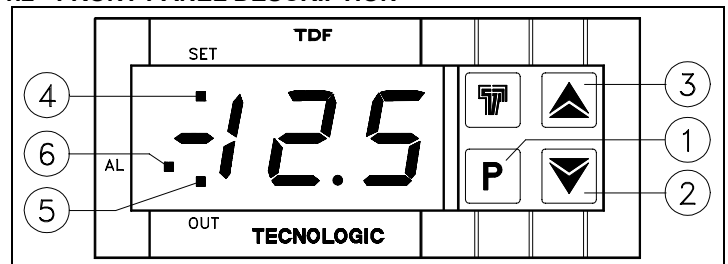
TDF 15 is a digital microprocessor based thermocontroller for Heating or Cooling applications and ON/OFF control mode.

The process temperature value is visualised on 3 red displays and the control output state is indicated by one led.

The instrument has one relay output for the control, one relay output for the alarm and one input for PTC or NTC temperature probes.

Furthermore it can be equipped with a digital input to control the alarm.

##### 1.2 - FRONT PANEL DESCRIPTION



**1 - Key P** : Used for the set point setting and to program the functioning parameters

**2 - Key DOWN** : Used to decrease the values or to select parameters

**3 - Key UP** : Used to increase the values or to select parameters

**4 - Led SET** : Signalize the set point programming mode (on) or the parameters programming mode (flashing)

**5 - Led OUT** : Signalize when the output is on (on), off (off) or inhibited (flashing)

**6 - Led AL** : Signalize the alarm state on, off or silenced (flashing)

## 2 - PROGRAMMING

### 2.1 – SET POINT PROGRAMMING

Press key P then release it, led SET will flash and the SET value will be shown on display.

To modify press key UP so as to increase value or DOWN so as to decrease it.

These keys count one digit at a time but if the keys are pressed for over one second the value increases or decreases fast and after two seconds the speed increases even more, so as to reach the desired value immediately.

The outgoing from the Set programming mode occurs automatically by not pressing any key for about 5 seconds, thus the temperature process value will again be displayed.

### 2.2 – PARAMETERS PROGRAMMING

To accede to the operating parameters it is necessary to press key P holding it down for about 5 seconds, after which the led SET will flash and the code of the first parameter will be visualized on the display.

At this point key P can be released and by pressing UP or DOWN the desired parameter can be selected.

Once the parameter on which we intended to operate has been selected to modify it press P, then released it, the set of the parameter will show up.

To modify this value press UP or DOWN so as to increase or decrease the value.

Once the desired value has been set press and then release P and the selected parameter code can be read on the display.

By pressing UP or DOWN it is therefore possible to choose another one and modify it as previously mentioned.

To outgoing from the programming mode no key is to be pressed for about 20 seconds, the instrument will automatically return to normal functioning mode, visualizing the temperature process value.

## 3 - INSTALLATION AND USE ADVICES



### 3.1 – USE ALLOWED

The instrument has been projected and manufactured as measuring and control device to be used according to EN61010-1 for the altitudes operation until 2000 ms.

The use of the instrument for applications not expressly allowed by the above mentioned rule has to adopt all the necessary protective measures.

The instrument CAN'T be used in ambient with dangerous atmosphere (flammable or explosive) without a proper protection.

The user has to take care that EMC rules are respected, also after the instrument installation, possibly using proper filters.

Whenever a failure or a wrong functioning of the device may cause dangerous situations for persons, things or animals we remind that the plant has to be equipped with additional electromagnetic devices in order to grant the safety.

### 3.2 – MECHANICAL MOUNTING

The instrument, into case 33 x 75 mm, is designed for panel mounting.

Make a hole 29 x 71 mm and insert the instrument fixing it with the provided proper bracket.

It's recommended to mount the proper gasket to obtain the declared front protection degree.

Avoid to place the internal part of the instrument into environments with high humidity or dirt, which may create condensation or contact with conductive substances.

It's advisable to assure an adequate ventilation to the instrument and to avoid the installation into box where are placed devices which may overheat the instrument and make it work at higher temperatures than what declared.

Install the instrument as far as possible from electromagnetic sources as motors, power relay, relays, electrovalves, etc.

## 3.3 – ELECTRICAL CONNECTIONS

Carry out the electrical wiring connecting one wire only for each terminal, according to the following diagram, checking that the power supply is the same as indicated on the instrument and the loads current is not higher than the maximum current admitted.

The instrument, being a built in equipment with permanent connection into a cabinet, is not equipped with internal devices protecting from overcurrent: the installation shall, therefore, employ a two-phase switch, placed as near as possible to the instrument, located in a position easily reachable by the user and marked as instrument disconnecting device.

Furthermore, it's recommended to properly protect all the electric circuits connected to the instrument, with devices (ex. fuses) proportionate to the circulating currents.

It's strongly recommended to use cables with proper insulation, according to the working voltages and temperatures.

Furthermore, the input cable of the probe has to be kept separate from line voltage wiring in order to avoid electromagnetic noises infiltration.

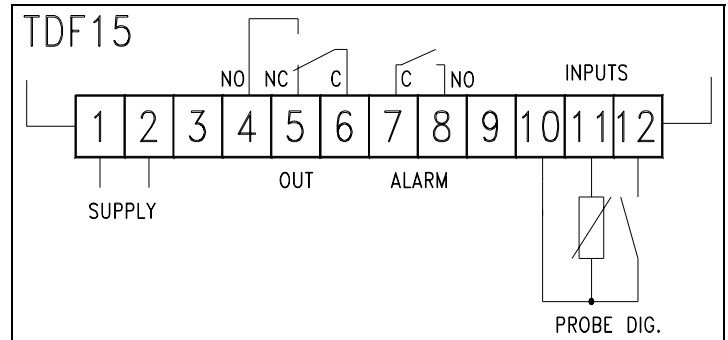
If the input cable of the probe is screened, it is advisable to connect it on the ground with one side only.

Whether the instrument is 12 V version it's recommended to use an external transformer TCTR, or with equivalent features, and to use only one transformer for each instrument because there is no insulation between supply and input.

Finally, it is advisable to check that the parameters are those desired before connecting the outputs to the actuators in order to avoid plant anomalies which may cause injuries to people, things or animals.

**Tecnologic S.p.A. and its legal representatives are not responsible for any eventual damages to people, things or animals deriving from the instrument violation, not proper or wrong use or in any case not in accordance with the instrument features.**

## 3.4 - ELECTRICAL CONNECTION DRAWING



## 4 - OPERATING MODE

### 4.1 – MEASURE AND VISUALIZATION

The instrument display the measured temperature in the programmed unit of measurement, which can be modified through par. "ru" as °C ("ru"=C) or °F ("ru"=F).

The modification of this parameter involves just the display visualization, but not the Set Point or the other parameters, which have to be modified manually (for example: if the Set Point was 50°C and the unit of measurement is changed, it will become 50°F).

The resolution of the measure is established through the parameter "dP" as 1° ("dP"=oF) or 0.1° in the range from -19.0 to 19.9 ("dP"=on).

The parameter "dP" it also establishes the insertion of the decimal point in the Set and in the differential, which have to be modified manually after the insertion of the decimal point (for example: if the Set was 20 and is inserted the decimal point the Set it will be 2.0).

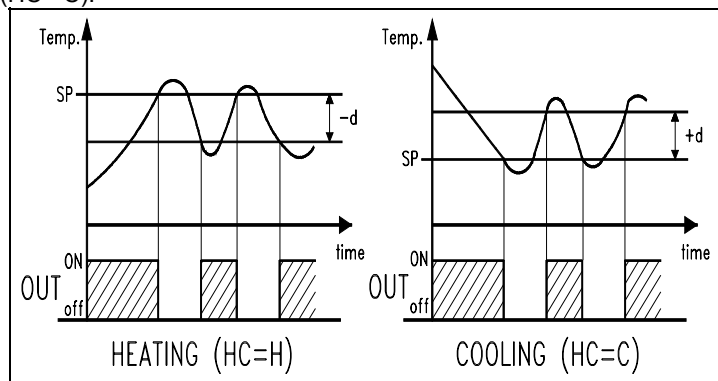
Additionally, through par. "CA" it's possible to program a positive or negative offset whose value is added to the value read by the probe from which is depending the control functioning.

This parameter can be used to recalibrate the instrument according to the application requirement.

## 4.2 – TEMPERATURE CONTROL

The instrument control is ON/OFF type and works on the output OUT depending on the probe measure, on the Set Point "SP", on the differential "d" and on the functioning mode "HC".

Depending on the functioning mode programmed on parameter "HC" the differential is automatically considered by the regulator as negative for Heating control (HC=H) or positive for Cooling control (HC=C).



In case of broken probe, it's possible to have the output on or off in order to par. "rP".

Programming "rP" = oF, in case of probe error, the output will remain always deactivated.

Programming "rP" = on, in case of probe error, the output will remain always activated.

The regulator functioning can be additionally modified through the "Compressor Protection" function, here following described.

## 4.3 - COMPRESSOR PROTECTION FUNCTION AND DELAY AT POWER-ON

The "Compressor Protection" function has the meaning to avoid compressor "short cycles" for refrigeration applications; this function is also active for heating applications ("HC"=H).

This function permits to control the output OUT activation on time, independently by the temperature controller request.

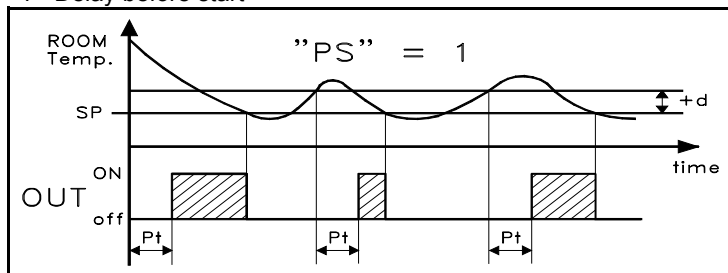
The protection consists in avoiding the output activation during the time programmed on parameter "Pt" (expressed in min.) and counted depending on what programmed on parameter "PS". The eventual activation will occur only at the elapsing of time "Pt".

If during the delay activation phase, because of the inhibition of the compressor protection function, the regulator request should stop, the activation of the output will obviously be erased.

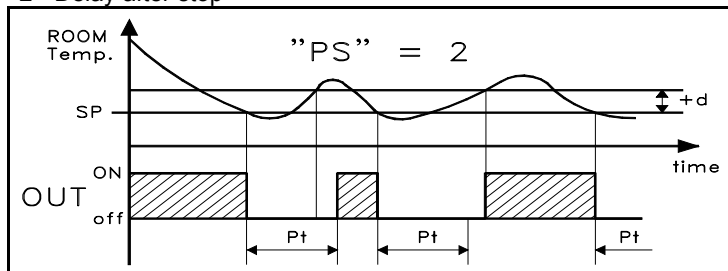
By means of parameter "PS" – compressor protection type, it's possible to define the compressor protection type i.e. from which moment the inhibition time has to start to be counted.

Parameter "PS" can be then programmed as :

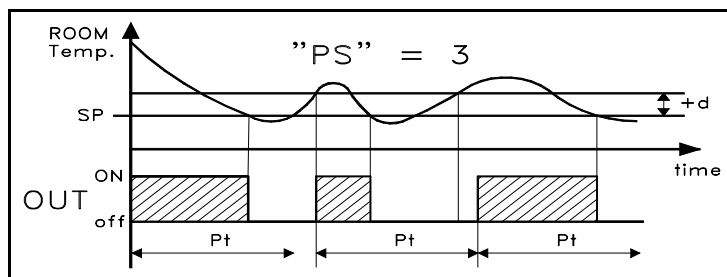
- 1 - Delay before start



- 2 - Delay after stop



- 3 - Delay between starts



The function is not active programming "Pt" = 0.

The stopping of the output activation can be determined also by the switch on delay function.

It's then possible to avoid the output activation after the instrument switch on for a time programmable on par. "od" (expressed in min.) although the regulator requires an intervention.

The function is not active programming "od" = 0.

The led OUT blinks during all the phases of output activation delay, caused by "Compressor Protection" function or switch on delay function.

## 4.4 - ALARM FUNCTIONS

The instrument is equipped with an relay output used as probe alarm signal, high and low temperature alarm or as external alarm transmitted by the digital input (if present).

The temperature alarm function works depending on the following parameters :

"HA" - High Alarm Set (relative to the Set Point)

"LA" - Low Alarm Set (relative to the Set Point)

"Ad" - Alarms differential

"PA" - Alarm delay at power on (in hrs.)

The alarm is operating at the end of the delay and will be on when the temperature goes upper than the value [SP + HA] or goes lower than the value [SP - LA].

The high and low temperature alarm can be deactivated setting the relative parameters "HA" or "LA" at 0.

It's possible to have 2 different behaviours of the alarm output, depending on par. "tA".

"tA" = oF : ALARM NOT AKNOWLEDGED: The alarm remains always active in the alarm conditions.

"tA" = on : ALARM AKNOWLEDGED: The alarm is active in alarm conditions and can be deactivated through any key also if the alarm conditions are still existing.

In the mean time of the alarm signaling, although the output is deactivated, the instrument signalize the alarm through the AL led and it visualize, during the normal functioning:

- Alternatively "HI" and the temperature measure by the probe in case of high temperature alarm.

- Alternatively "LO" and the temperature measure by the probe in case of low temperature alarm.

- Alternatively "AL" and the temperature measure by the probe in case of external alarm by digital input.

## 4.5 - DIGITAL INPUT

Furthermore the instrument can be equipped with a digital input (for free voltage contacts) for the alarm remote control.

The digital input works depending on the following parameters:

"FI" - Digital input function

which can be programmed only as:

0 - Not active

3 - External alarm signaling: when the input intervenes the internal buzzer (if present) is activated and the display shows alternatively "AL" and the temperature measured by the probe.

(note: the other mode don't have effect)

"LI" - Digital input logic mode

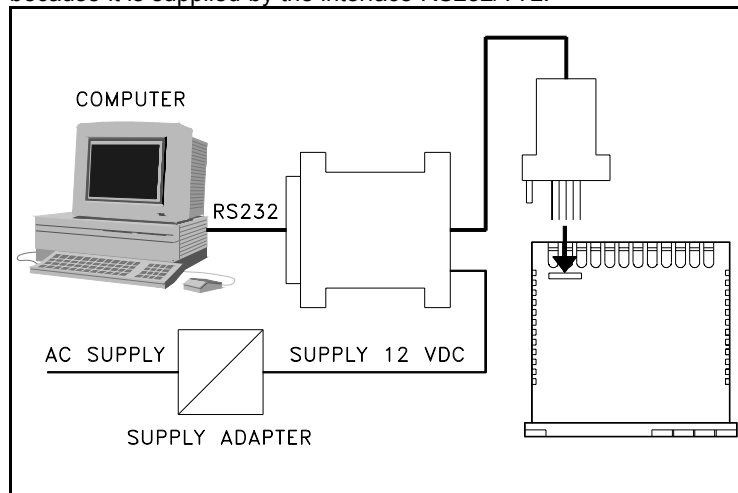
on - Contact normally opened: the programmed function of "FI" parameter works when the digital input contact is closed.

oF - Contact normally closed : the programmed function of "FI" parameter works when the digital input contact is opened.

## 4.6 - CONFIGURATION BY "TDF CONF"

The instrument is available on request with a connector that allows the configuration of the parameters by PC through the software and

the communication interface RS232/TTL contained in "TDF CONF." For the configuration it is not necessary to supply the instrument because it is supplied by the interface RS232/TTL.



Through the communication software "TDF CONF" for Microsoft WINDOWS™ (95 or superior) it is possible:

- To configure all the parameters
- To save and to load in files the configurations
- To monitor the connected instrument



WINDOWS™ is a trade mark of Microsoft Corporation

## 5 - PROGRAMMABLE PARAMETERS

Here following are described all the instrument parameters; pls. note that some of them could do not appear because are according to the kind of used instrument.

### 5.1 - PARAMETERS TABLE

Par.	Description	Range	Default	Note
1	CC	Fixed Parameter	-	-
<b>MEASURE AND VISUALIZATION</b>				
2	CA	Calibration	-15.0 .. +15.0 °C - °F	0.0
3	ru	Unit of measurement	C - F	C
4	dP	Decimal Point	on - oF	on
<b>TEMPERATURE CONTROL</b>				
5	d	Differential switching point	0.0 ... 15.0 (HC=C) 0.0 ... -15.0 (HC=H) °C - °F	2.0
6	LS	Minimum Set	-58 ... HS °C - °F	-50
7	HS	Maximum Set	LS ... 199 °C - °F	150

8	HC	Output operating mode	H - C	C	
9	rP	Relay status in case of error probe	oF - on	oF	
<b>COMPRESSOR PROTECTION AND DELAY AT SWITCH ON</b>					
9	PS	Compressor type protection	1 - 2 - 3	1	
10	Pt	Time delay compressor protection	0 ... 31 min.	0	
11	od	Output delay at power on	0 ... 99 min.	0	
<b>TEMPERATURE ALARMS</b>					
12	HA	High alarm	0 ... 50 °C - °F	10	
13	LA	Low alarm	0 ... 50 °C - °F	10	
14	Ad	Alarm differential	1 ... 31 °C - °F	1	
15	tA	Alarm Acknowledgement	on - oF	on	
16	PA	Alarm delay at power on	0 ... 99 hrs.	2	
<b>DIGITAL INPUT</b>					
17	FI	Digital input function	0 - 3	0	
18	LI	Digital input logic mode	on - oF	on	
<b>SET POINT</b>					
19	SP	Set Point	LS ... HS °C/°F	0	

### 5.2 - PARAMETERS DESCRIPTION

**MEASURE AND VISUALIZATION PARAMETERS:** They permit to define the visualization modalities of the temperature measured by the probe.

**CA - CALIBRATION:** Positive or negative offset whose value is added to the value read by the probe from which is depending the control functioning.

**ru - UNIT OF MEASUREMENT:** Determines the visualization of the temperature in Centigrade or Fahrenheit degree. It is to be remember that the change of this parameter modifies the visualization but not the Set and the Set limit ("LS" and "HS") programmed (eg. if the Set was 50°C and the unit changes, the Set will rest 50°F).

**dP - DECIMAL POINT :** Allows the insertion of the decimal point on the display and therefore to determine resolution of the reading value in the range from -19.9 to 19.9 (on= with decimal point, oF= without decimal point)

**SET LIMITS PARAMETERS:** They permit to limit the Set programming into a desired range, in order to avoid Set values which may damage the controlled plant.

**LS – MINIMUMSET:** Minimum value programmable as Set Point.

**HS – MAXIMUM SET:** Maximum value programmable as Set Point.

**TEMPERATURE CONTROL PARAMETERS:** They permit to define the temperature regulator functioning and the output control in case of probe error.

**SP - SET POINT :**Temperature control Set Point value.

**d - DIFFERENTIAL :** It's the output OUT activation and deactivation value respect to the Set Point.

**HC – OUTPUT FUNCTIONING MODE :** It defines whether the output OUT has to control and Heating or a Cooling process (H=Heating, C= Cooling).

**rP - OUTPUT RELAY STATE IN CASE OF ERROR PROBE:** Select output relay state in case of error probe (on = relay on, oF = relay off).

**COMPRESSOR PROTECTION AND DELAY AT SWITCH ON:** They permit to introduce eventual delays at the output OUT activation in order to avoid compressor short cycles in the refrigeration applications or at each instrument start. When the output has to be activated but it's inhibited by these functions the led OUT blink.

**PS - COMPRESSOR TYPE PROTECTION:** Select the type of protection for the compressor against "short cycle". The possible selections are:

- 1 = delay before start
- 2 = delay after stop
- 3 = delay between starts

**Pt - TIME DELAY COMPRESSOR PROTECTION:** Time delay setting for parameter "PS" intended in min. During this time the output will be off. The output will be turned on therefore when the regulator required it and this time has expired. The function is not active programming "Pt" =0.

**od - OUTPUT DELAY AT POWER ON:** Time delay of OUT relay activation after power on and expressed in min.

**ALARMS PARAMETERS:** They permit to program the temperature alarms modalities. The high and low temperature alarm can be deactivated setting the relative parameters "HA" or "LA" at 0. If you program "tA" = on when the alarm is on is possible to switch off the output ALARM push any of the programming key. In the mean time of the alarm signaling, although the output alarm is manually switch off, the instrument signalize the alarm through the AL led and it visualize, during the normal functioning alternatively "HI" (High Alarm) or "LO" (Low Alarm) and the temperature measure by the probe.

**HA - HIGH ALARM:** Temperature value in respect with Set point above at which the alarm will be on (The alarm will be on when the process temperature will be upper then the value SP + HA).

**LA - LOW ALARM:** Temperature value in respect with the Set point below at which the alarm will be on (The alarm will be on when the process temperature will be lower then the value SP - LA).

**Ad - ALARM DIFFERENTIAL:** Value between starting and stopping of alarm signal (par. HA and LA).

**tA - ALARM AKNOWLEDGED:** It's possible to have 2 different behaviours of the alarm output

= oF : ALARM NOT AKNOWLEDGED: The alarm remains always active in the alarm conditions.

= on : ALARM AKNOWLEDGED: The alarm is active in alarm conditions and can be deactivated through any key also if the alarm conditions are still existing.

**PA - ALARM DELAY AT POWER ON:** Time delay after power on during which the alarm will not be activated (expressed in hrs).

**DIGITAL INPUT PARAMETERS:** They permit to program the function modalities of digital input. When the digital input alarm is functioning to stop the buzzer push any of the programming key. In the mean time of the alarm signaling, although the buzzer is silenced, the instrument signalize the alarm through the AL led and it visualize alternatively "AL" and the temperature measure by the probe.

**FI - DIGITAL INPUT FUNCTION:** It establishes which function has to realize the digital input.

- 0 = No function
- 3 = External alarm

**LI - DIGITAL INPUT LOGIC MODE:** It establishes if the digital input causes the activation of the programmed function on par. "FI" when it's closed ("LI"=on) or when it's opened ("LI"=oF).

## 6 - PROBLEMS, MAINTENANCE AND WARRANTY

### 6.1 - ERRORS SIGNALLING

Error	Cause	Action
-- uu oo	The probe may be interrupted or in short-circuit or may read a value outside of the allowed range	Verify the correct connection between probe and instrument and finally verify the correct functioning of the probe itself
EE	Internal memory error	Verify and, if necessary, reprogram the parameters.

In probe error condition the output behaves itself as programmed on parameter "rP".

### 6.2 – CLEANING

It's recommended to clean the instrument only with a cloth wetted with water or with a detergent neither abrasive nor containing solvents.

### 6.3 – WARRANTY AND REPAIRS

The instrument is under warranty against construction vices or defected material, noticed within 12 months from delivery date.

The warranty is limited to the repairs or to the substitution of the instrument.

The eventual opening of the housing, the violation of the instrument or the wrong use and installation of the product means the automatic decay of the warranty.

In case of defected instrument, noticed in warranty period or out of warranty, do contact our sales department to obtain the shipment authorisation.

The defected product must be shipped to TECNOLOGIC with the detailed description of the failures found and without any fees or charge for Tecnologic, safe different agreements.

## 7 - TECHNICAL DATA

### 7.1 – ELECTRICAL DATA

**Power supply:** 12, 24 VAC/VDC, 110, 230 VAC+/- 10%

**AC Frequency:** 50/60 Hz

**Consumption:** 3 VA approx.

**Input/s:** 1 for temperature probes PTC type (KTY 81-121 990 Ω @ 25 °C) or NTC type (103AT-2; 10 KΩ @ 25 °C); 1digital input for free voltage contacts

**Output/s:** 2 Relay output. OUT = SPDT 8A-AC1 (3A-AC3) 250 VAC; ALARM = SPST-NO 5A-AC1 (2A-AC3) 250 VAC

**Electrical life for relay outputs:** 100000 oper.

**Installation Category (Overvoltage Cat.):** II

**Protection class against electrical shock:** Front panel Class II

**Insulation:** Reinforced insulation between the low voltage part (power supply 110 or 230 V and relay outputs) and front panel; Reinforced insulation between the low voltage section (Supply 110 or 230 V and relay outputs) and the extra low voltage section (input); Reinforced between power supply and relays; No insulation between supply 12 V and input.

### 7.2 – MECHANICAL DATA

**Housing:** Self-extinguishing plastic UL 94 V0

**Dimensions:** 33 x 75 mm, depth 64 mm

**Weight:** 160 g approx.

**Installation:** Flush in panel (thickness 29 mm max.) in hole 29 x 71 mm

**Connections:** 2,5 mm<sup>2</sup> screw terminal block

**Front panel protection :** IP 65 with gasket

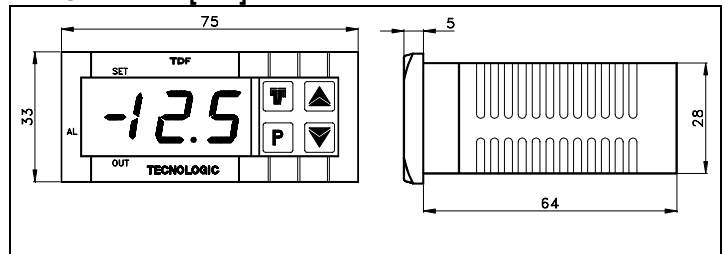
**Pollution degree:** 2

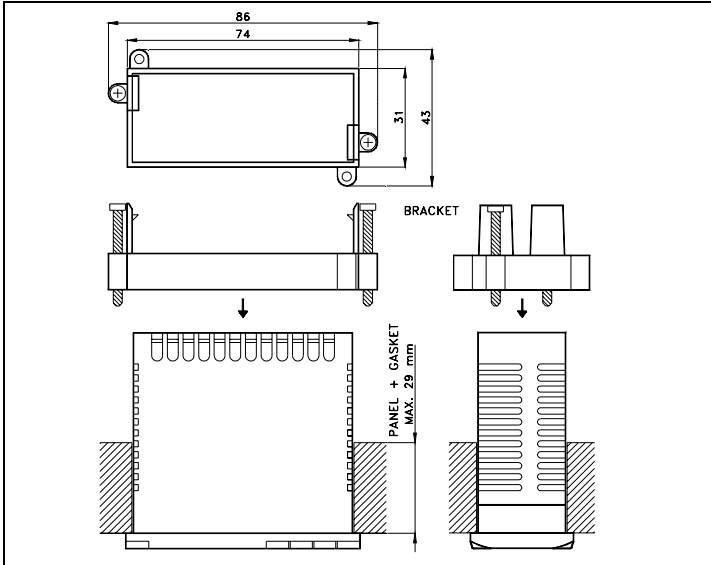
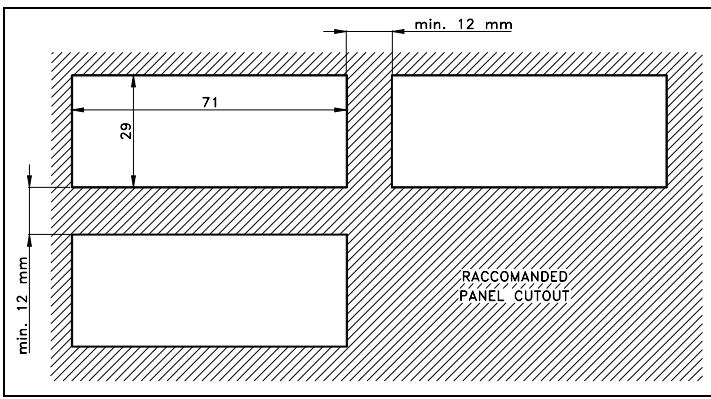
**Operating temperature:** 0 ... 55 °C

**Operating humidity:** 30 ... 95 RH% without condensation

**Storage temperature:** -10 ... +60 °C

### 7.3 – MECHANICAL DIMENSIONS, PANEL CUT OUT AND FIXING DEVICE [mm]





#### 7.4 – FUNCTIONAL DATA

Temperature control: ON/OFF

Measurement Range : PTC: -50...150 °C / -58 ... 199 °F; NTC: -50...50 °C / -58...122 °F

Display resolution: 1 ° in all range or 0.1 ° in range between -19.9 and 19.9

Overall accuracy: +/- 0,5 % fs

Sampling rate: 4 sample per second

Display: Red h 14 mm, 2 ½ Digit

Compliance: ECC directive EMC 89/336 (EN 61326), ECC directive LV 73/23 and 93/68 (EN 61010-1).

#### 7.5 – INSTRUMENT CODE

**TDF 15 a b c dd**

##### **a : INPUT**

**N** = For NTC probes (103AT-2)

**P** = For PTC probes (KTY81-121)

##### **b : SUPPLY**

**F** = 12 VAC/VDC

**A** = 24 VAC

**C** = 110 VAC

**D** = 230 VAC

##### **c : DIGITAL INPUT**

- = Digital Input not present

I = With Digital Input

##### **dd : SPECIAL CODES**