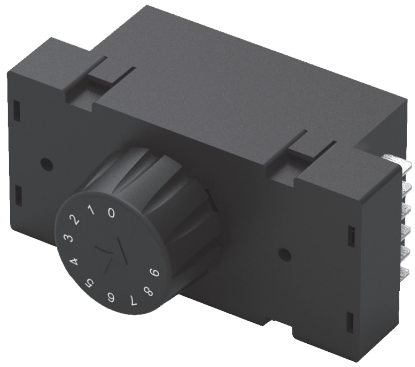
# ET3-

## ELECTRONIC CONTROLLER FOR REFRIGERANT UNITS



## OPERATING INSTRUCTIONS

**23/07 - Code: ISTR_M_ET3-_E_03_--**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## PREFACE

This manual contains the information necessary for the product to be installed correctly and also instructions for its maintenance and use; we therefore recommend that the utmost attention is paid to the following instructions and to save it.



Whenever a failure or a malfunction of the device may cause dangerous situations for persons, thing or animals, please remember that the plant has to be equipped with additional electromechanical devices which will guarantee safety.

## 1. INSTRUMENT DESCRIPTION

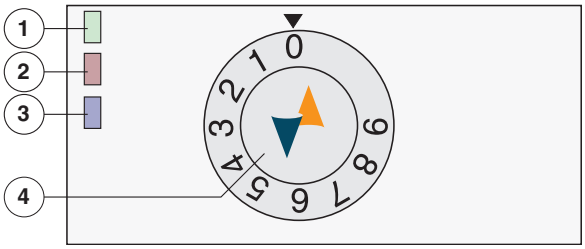
### 1.1 General description

Model **ET3** is a **digital electronic microprocessor temperature controller** that is typically used in **cooling applications**. It has **temperature control** with **ON/OFF action** and **defrosts control** at **time intervals**, at **reaching temperature** or for **continuous compressor operation** through **compressor stopping**, **electric heating** or **hot gas/cycle inversion.**

The instrument has up to **3 relay outputs**, and up to **2 NTC temperature probe inputs one of which** can be **configured as digital input**.

The **temperature Set Point** is set using the **knob** while the **operating parameters** can be programmed **via the A01 device** connected to the TTL port (standard) or via **NFC communication** (optional).

## 1.2 Front panel pescription




1 **Led 1 (GREEN)**: Shows the instrument status:
***ON*** = Instrument in Eco mode;
***Flashing*** = Instrument in Normal mode.

2 **Led 2 (RED)**: Indicates the status Alarm/Standby:
***ON*** = Powered, but in standby status;
***Flashing*** = Alarm active.

3 **Led 3 (BLUE)**: Specifies the control status:
***ON*** = Control actuator (compressor) ON;
***Flashing*** = Defrost in progress.

4 **Set Point setting knob**: The knob is used to manage the control Set Point. The knob acts on a trimmer with 10 snap positions. Position **0** matches the higher Set Point value (SHS) when Eur = **oF**; while, when Eur = **1**, it matches the Standby status. Position **9** matches the lower Set Point value (SLS).

# 2. PROGRAMMING

## 2.1 Fast Set point programming

The Set Point is set using the instrument knob.

Setting parameter Eur = **oF**, position **0** corrisponds to the higher Set Point value (SHS) while position **9** corrisponds to the lower Set Point value (SLS). In this way, the Set Point values are calculated (with approximation) as follows:

| Position | Set Point value | Example |
|---|---|---|
| 0 | = SHS | 14 |
| 1 | $SLS + \left[\frac{\lvert S.HS - S.LS \rvert}{9}\right] \cdot 8$ | 12 |
| 2 | $SLS + \left[\frac{\lvert S.HS - S.LS \rvert}{9}\right] \cdot 7$ | 10 |
| 3 | $SLS + \left[\frac{\lvert S.HS - S.LS \rvert}{9}\right] \cdot 6$ | 8 |
| 4 | $SLS + \left[\frac{\lvert S.HS - S.LS \rvert}{9}\right] \cdot 5$ | 6 |
| 5 | $SLS + \left[\frac{\lvert S.HS - S.LS \rvert}{9}\right] \cdot 4$ | 4 |
| 6 | $SLS + \left[\frac{\lvert S.HS - S.LS \rvert}{9}\right] \cdot 3$ | 2 |
| 7 | $SLS + \left[\frac{\lvert S.HS - S.LS \rvert}{9}\right] \cdot 2$ | 0 |
| 8 | $SLS + \left[\frac{\lvert S.HS - S.LS \rvert}{9}\right]$ | -2 |
| 9 | = SLS | -4 |

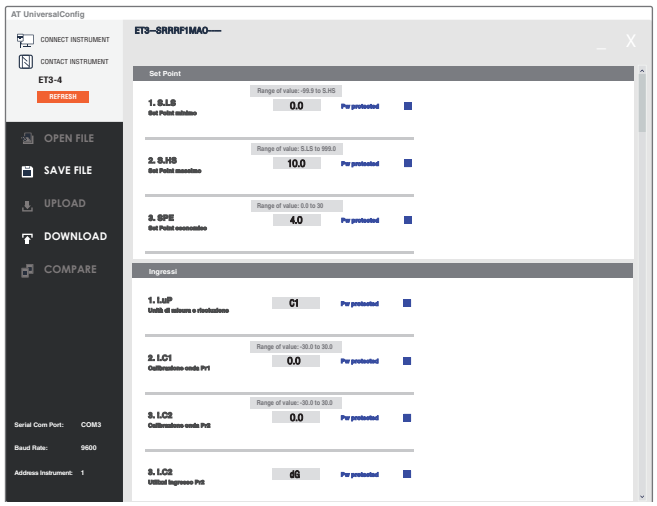
When instead Eur = **1**, position **0** corrisponds to the **Stand-by** status (control disabled), position **1** corrisponds tho the **higher Set Point** (SHS) while position **9** corrisponds to the lower Set Point value (SLS).

In this way, the Set Point values are calculated (with approximation) as follows:

| Position | Set Point value | Example |
|---|---|---|
| 0 | Stand-By condition (control disabled) | - |
| 1 | = SHS | 14 |
| 2 | $SLS + \left[\frac{\lvert S.HS - S.LS \rvert}{8}\right] \cdot 7$ | 11.8 |
| 3 | $SLS + \left[\frac{\lvert S.HS - S.LS \rvert}{8}\right] \cdot 6$ | 9.5 |
| 4 | $SLS + \left[\frac{\lvert S.HS - S.LS \rvert}{8}\right] \cdot 5$ | 7.3 |
| 5 | $SLS + \left[\frac{\lvert S.HS - S.LS \rvert}{8}\right] \cdot 4$ | 5 |
| 6 | $SLS + \left[\frac{\lvert S.HS - S.LS \rvert}{8}\right] \cdot 3$ | 2.8 |
| 7 | $SLS + \left[\frac{\lvert S.HS - S.LS \rvert}{8}\right] \cdot 2$ | 0.5 |
| 8 | $SLS + \left[\frac{\lvert S.HS - S.LS \rvert}{8}\right]$ | -1.8 |
| 9 | = SLS | -4 |

## 2.2 Standard parameter programming

Parameters are programmed using a Personal Computer and the **AT Universal Config** program.




The transmission of the parameter configuration to the instrument can take place via the **TTL communication port** and the **A01 device** or, if the instrument is equipped with the **optional NFC communication**, by means of the **AFC1 device**.

The A01 and AFC1 devices are connected to the PC via a common **USB port**.

More information on how to **install** and **use** the *AT Universal Config* program can be found in the *AT Universal Config User manual*.

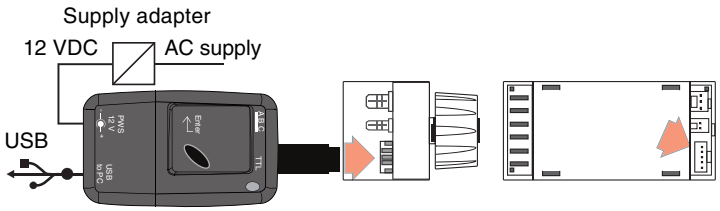
### 2.2.1 Programming the instrument with A01 device

The **A01** device it is mainly usable for the serial programming of some instruments which need to have the same parameters configuration or to keep a copy of the parameters setting of an instrument and allow its rapid retransmission.

The same device allows to connect a PC via USB with which, through the appropriate configuration software for "*AT UniversalConf tools*", the operating parameters can be configured.

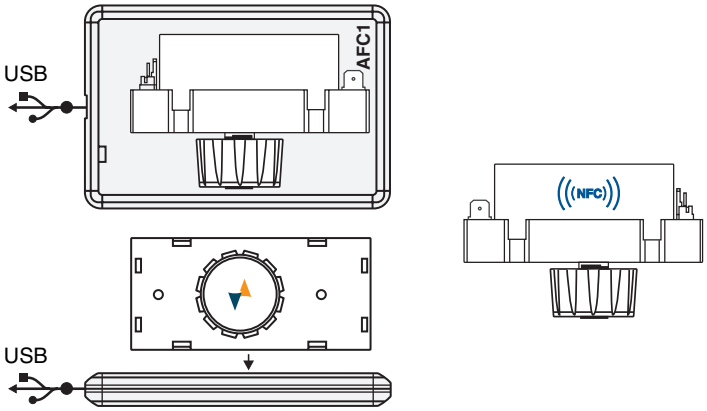
⚠ For the instrument configuration with the A01 device it is necessary that the A01 is powered with the specific power supply and that **the instrument is disconnected from the mains** as **there is no insulation between**

**power supply and TTL connector.**




### 2.2.2 Programming the instrument with AFC1 device

To configure the instrument with the **AFC1** device, the instrument must be placed on the side indicated with the NFC symbol ((( ))) on the AFC1 device, which is powered directly by the USB port connected to the PC.




## 3. USAGE WARNINGS

### 3.1 Admitted use

The instrument has been projected and manufactured as a measuring and control device to be used according to EN60730-1 at altitudes operation below 2000 m.

Using the instrument for applications not expressly permitted by the above mentioned rule must adopt all the necessary protective measures.

This instrument uses sealed relays conforming to IEC/EN 60079-15, tested for use in refrigerators and freezers that are using flammable refrigerant gases.

The instrument **MUST NOT BE USED** in dangerous environments (flammable or explosive) without adequate protections.

**There is NO INSULATION between power supply and inputs, therefore, if the probes and/or the digital input are accessible, they must be of the double insulation type (Class II insulation).**

The installer must ensure that the EMC rules are respected, also after the instrument installation, if necessary using proper filters.

## 4. INSTALLATION WARNINGS

### 4.1 Mechanical mounting

The instrument is designed for panel mounting within an enclosure.

Drill a Ø10.5 mm hole and fix the instrument with the given M10 nut or drill 2 holes at the indicated distance and use two Ø3.2 self-threading screws having the correct length.

The instrument is equipped with an anti-rotation pin. To mount the instrument to the panel, either drill a hole for the pin (min. ø1.6 x 1.9 mm depth) or cut it away from the instrument with a blade.

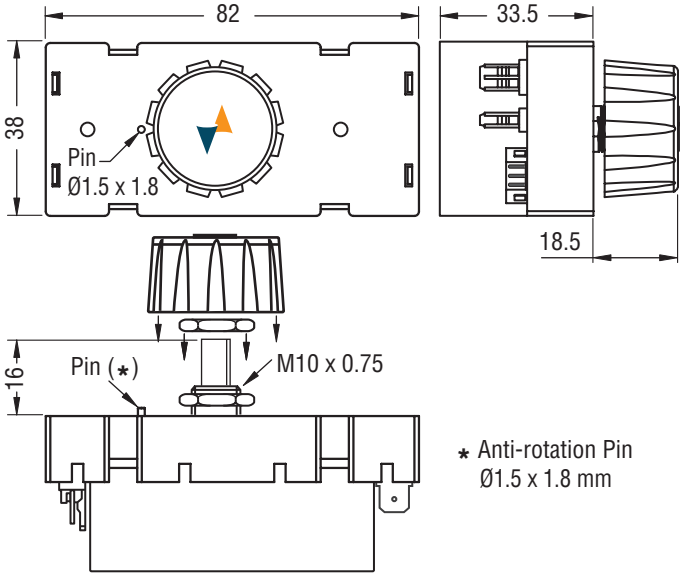
Avoid placing the instrument in environments with very high humidity levels or dirt that may create condensation or introduction of conductive substances into the instrument

Ensure adequate ventilation to the instrument and avoid installation in containers that house devices which may overheat or which may cause the instrument to function at a higher temperature than the one permitted and declared.

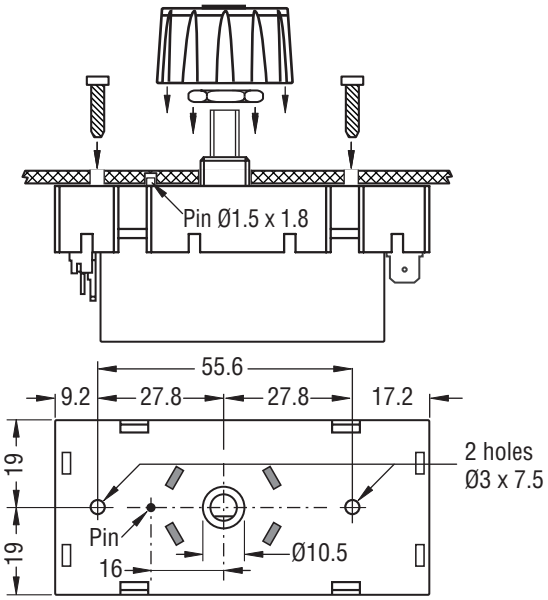
Connect the instrument as far away as possible from sources of electromagnetic disturbances such as motors, power relays, relays, solenoid valves, etc..

### 4.2 Dimensions [mm]

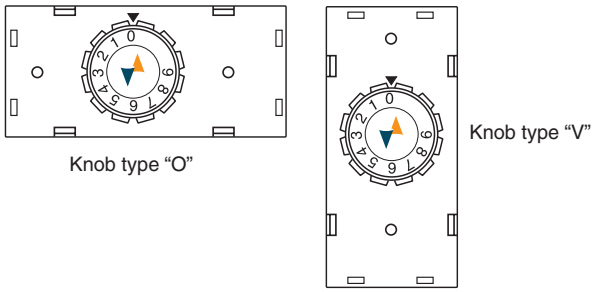
#### 4.2.1 Mechanical dimensions




#### 4.2.2 Holes dimensions and fixing




#### 4.2.3 Knob position



## 4.3 Electrical connections

Carry out the electrical wiring by connecting only one wire to each terminal, according to the following diagram, checking that the power supply is the same as that indicated on the instrument and that the load current absorption is no higher than the maximum electricity current permitted.

As the instrument is built-in equipment with permanent connection inside housing, it is not equipped with either switches or internal devices to protect against current overloads: the installation will include an overload protection and a two-phase circuit-breaker, placed as near as possible to the instrument and located in a position that can easily be reached by the user and marked as instrument disconnecting device which interrupts the power supply to the equipment

It is also recommended that the supply of all the electrical circuits connected to the instrument must be protect properly, using devices (ex. fuses) proportionate to the circulating currents.

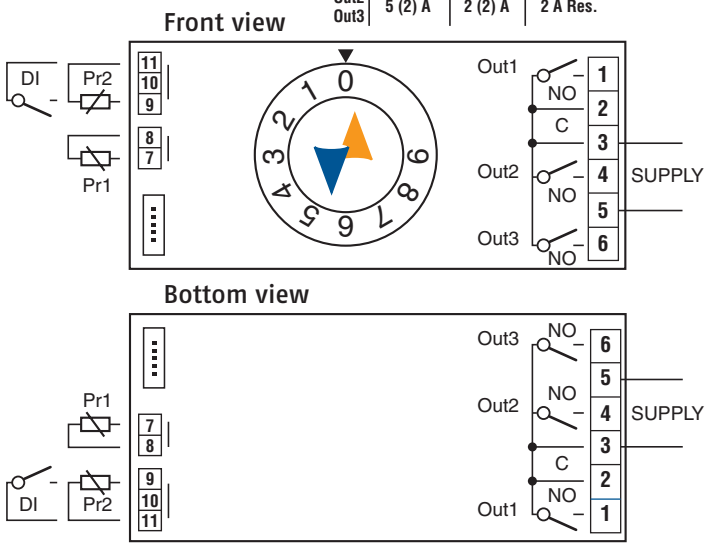
It is strongly recommended that cables with proper insulation, according to the working voltages and temperatures, be used.

Furthermore, the input cable of the probe has to be kept separate from line voltage wiring. If the input cable of the probe is screened, it has to be connected to the ground at only one side.

We strongly recommend that a check should be made that the parameters are those desired and that the application functions correctly **before connecting the outputs to the actuators** so as to avoid malfunctioning that may cause irregularities in the plant that could cause damage to people, things or animals.

### 4.3.1 Electrical wiring diagram

| | 61810 EN | 60730 EN | 60730 UL |
|---|---|---|---|
| Out | 16 (9) A | 10 (4) A | 10 A Res.<br>60 LRA<br>10 FLA |
| Out2<br>Out3 | 5 (2) A | 2 (2) A | 2 A Res. |




# 5. FUNCTIONS

## 5.1 ON/Stand-y function

Setting parameter t.UF = **1** it is possible to force the instrument in Standby mode when the knob in position **0**.

When in Standby mode the instrument implements no control function, the status is signalled by the green LED ON.

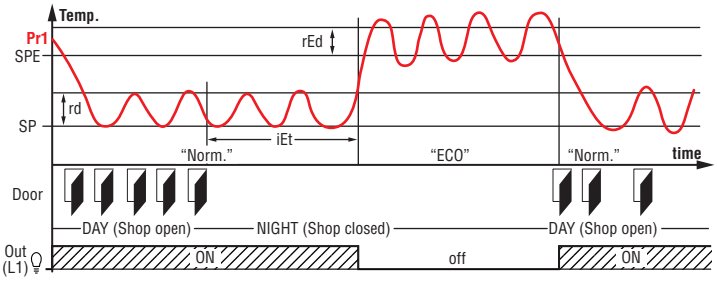
When t.UF = **oF** (or **t.UF** = **1** but with the knob is in a position different than **0**), the instrument is in **ON** state and applies all the control functions. The ON status is signaled by the flashing green LED.

## 5.2 Normal and Economic operation

The instrument normally operates the control according to the temperature set by the knob and as a function of the differential of intervention (hysteresis) set at parameter rd.

However, using the properly configured digital input, it is possible to increase the operating Set Point by the value set at parameter SPE parameter and to operate with the differential of intervention set at rEd.

Switching between the two modes [defined *Normal* and *Economic* (*Eco*)] can be automatic or manual and can be used when is necessary to switch between 2 operating temperatures (e.g. day/night or weekday/holiday).




The *Normal*/*Economic* mode can be selected automatically or manually via the digital input when iF_ = **6**:

– After the time iEt has elapsed after the door has been closed (switching from *Normal* to *Eco*);
– When opening the door if the Eco mode is active (switching from *Eco* to *Normal*);
– After the time iEt has elapsed from closing the door and the activation of the Eco mode (switching from *Normal* to *Eco*);

To enable this function is necessary to set the digital input as iF_ = **1**, **2** or **3**.

If iEt = **oF** the switching between *Normal*/*Eco* mode through the digital input configured as *door* is **disabled**.

If itt = **oF** the switching between *Normal*/*Eco* mode through a *time-out* is **disabled**.

The *Eco* mode selection is always combined with the turn OFF the Auxiliary output function when the Auxiliary output used as a showcase light (oFo = **3**).

## 5.3 Measure inputs configuration

With uP it is possible to select the temperature engineering unit (**C0**, **C1** = °C/; **F0, F1** = °F).

The instrument allows the measures calibration, which can be used to recalibrate the instrument according to application needs. The calibrations are made with parameter C1 (Pr1 input) and C2 (Pr2 input).

Parameter P2 allows to select the input 2 usage by the controller. The selections are:

**oF** Unused input;
**EP** Evaporator Probe: the probe performs the functions described below in order to control defrosts and evaporator fans;
**Au** Auxiliary Probe;
**dG** Digital Input (see Digital Input Functions).

## 5.4 Digital input configuration

The digital input function is defined using the iF parameter and the action is delayed for the time programmed with parameter it. The iF parameter can be configured for the following functions:

**0** **Digital input not active**;
**1** **Cell door opening with NO contact**: at input closure (and after the it) the instrument senses the door opening, activates the time set with parameter AoA elapsed which the alarm is activated to warn that the door has been left open. In addition, at door opening, the instrument returns to Normal operation if it was in Eco mode (Eco mode enabled through parameter Et);
**2** **Cell door opening with NO contact**: Similar to iF = **1** but with evaporator fans stop. In addition, at open door alarm intervention (AoA), the fans are restarted;
**3** **Cell door opening with compressor and fans lock and NO contact**: similar to iF = **2** but with compressor and fans lock. At open door alarm intervention (AoA) the compressor and the fans are re-activated;
**4** **External alarm signal with NO contact**: at input closing (and after the it time) the instrument activates an alarm;
**5** **External alarm signal with control output disabled and NO contact**: at input closing (and after the it time) the control output is is disabled and the alarm is activated;
**6** ***Normal/Economic* mode selection with NO contact**: at input Closing (and after the it time) the instrument switches to *Eco* operation mode. Opening the digital input, the instrument returns in *Normal* operation mode;
**7** **Instrument On/Off (stand-by) selection with NO contact**: at input Closing (and after the it time) the instrument is switched ON. Opening the digital input, the instrument is placed in Stand-by mode;
**8** Do not use;
**-1, -2, -3, etc.** - Features identical to the above but obtained through a NC contact and a reversed logic operation.

## 5.5 Outputs configuration

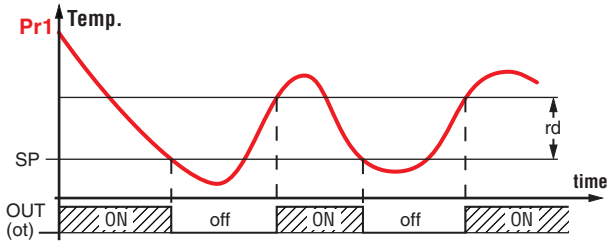
The instrument outputs can be configured by the relative parameters o1, o2 and o3.

The outputs can be configured for the following functions:

**ot** To control the temperature control device (e.g. Compressor);
**dF** To control the defrost device;
**Fn** To control the evaporator fans;
**Au** To control an auxiliary output operating in cyclical ON/OFF according to the times set at parameters dP and dP;
**At, AL, An** To control an alarm device through a contact that is NO in normal operation then closed when in alarm;
**-t, -L, -n** To control an alarm device through a contact that is NC in normal operation then open when in alarm;
**on** To command a device that must be turned ON when the instrument is ON. The output is therefore deactivated when the instrument is not powered or is in standby mode. This mode of operation can be used to control the Showcase light, anti-fogging resistors or other utilities;
**HE** Not used;
**L1** Showcase light connected to *Normal*/*Eco* mode. The output turns on when the *Normal* mode is active while it is turned off when the *Eco* mode is active.
**L2** Cell internal light. The output is always OFF, is activated by digital input when configured as open door (iF = **1**, **2**, **3**).
**oF** Output disabled.

## 5.6 Temperature control

The instrument control is **ON/OFF** and acts on the output set as **ot** depending on the **PR1** probe measuring, the Set Point SP (or SPE) and the Histeresys rd (or rEd).




In the event of a probe error, it is possible to set the instrument so that that the output continues working in cycles according to the times programmed with parameter t1 (activation time) and t2 (deactivation time).

If an error occurs on the probe the instrument activates the output for the time t1, then deactivates it for the time t2 and so on whilst the error remains.

Programming t1 = **oF** the output in probe error condition remains switched OFF.

Programming instead t1 to any value and t2 = **oF** the output in probe error condition remains switched ON.

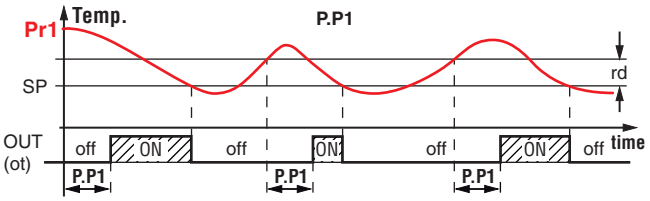
Remember that the temperature control function can be conditioned by the *Compressor Protections and Delay at power ON*, *Defrost functions*, *Door open* and *External Alarm with outputs Lock* through the Digital Input.

## 5.7 Compressor protection function and power-ON delay

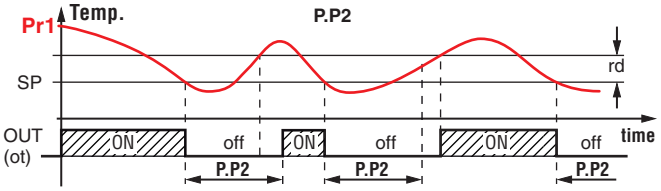
The "**Compressor Protection**" function aims to avoid repeated compressor start-ups controlled by the instrument in cooling applications or otherwise can be used to add a timed control on the actuator control output. This function foresees 3 time controls on the switching ON the **ot** output associated with the temperature control request.

The protection consists of preventing the output being switched ON during the times set with parameters PP1, PP2 and PP3 and therefore that any activation occurs only after all protection times are elapsed.

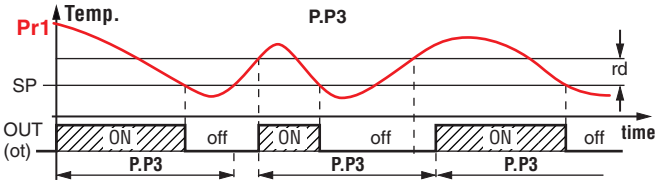
**1** First control (parameter PP1) foresees a delay to output activation (switching-ON delay).




**2** Second control (parameter PP2) foresees an inhibition to the activation of the **ot** output by a delay that starts when the output is turned OFF (delay after switching-OFF or minimum power OFF time).




**3** Third control (parameter PP3) foresees an inhibition to **ot** output activation by a delay that starts when the output was turned ON last time (delay between two switching-ON).




It is also possible to prevent the outputs activation after the instrument is turned ON, for the time set at parameter Pod.

All these functions are disabled if the relative parameters are set to **OFF** (oF).

## 5.8 Defrost control

The defrost control acts on the outputs configured as **ot** and **dF**.

The type of defrost is set by the parameter ddt:

**EL** **With electrical heating (or by stopping compressor)**: while defrosting, the output **ot** is deactivated while the output **dF** is enabled. The defrost will be by Compressor stop if not using the **dF** output;

**in** **With hot gas or Cycle inversion**: while defrosting both the **ot** and **dF** outputs are enabled;

**no** **Without compressor output conditioning:** while defrosting, the output **ot** continues to operate in order to control the temperature, also the output **dF** is enabled;

**Et** **With electrical heating and defrost temperature control:** during a defrost, the **ot** output is deactivated while the **dF** output operates as evaporator temperature control. Using this selection the defrost lenght is by time-out (time ddE). During the defrost, the **dF** output behaves as an temperature control with Set Point = dtE, differential fixed at 1°C and operates with the values of the **EP** evaporator probe.

In this mode, if the evaporator probe is not enabled or is in error, the defrost behaves as with selection **EL** (therefore the output **dF** during the defrost operation must always remain activated).

### 5.8.1 Starting automatic defrosts

The automatic control of defrost occours:

– By interval times;

– By Evaporator temperature;

– By continuous compressor running time.

In order to avoid unnecessary defrosts when the evaporator temperature is high, parameter dt5 allows to set the temperature related to the evaporator probe (probe configured as **EP**) under which defrosts are possible.

Therefore, in the modes indicated, if the temperature measured by the evaporator probe is higher than the one set at parameter dt5 defrosts are inhibited.

#### *Defrost by interval times*

Set at doF the parameter the time that must elapse between the end of a defrost and the beginning of the next one to enable automatic defrosting at intervals.

In these modes, the first defrost from switching ON the instrument can be established with parameter d5d.

This allows the first defrost to be performed at a different interval from the one set in parameter dd1.

When a defrost cicle must be done all the times the controller si switched ON (provided that the conditions established by the paragraphs dtE and dt5 are found in the cases indicated and described below), program the parameter d5d = **oF**. This allows the evaporator to always be defrosted even when frequent power failures occur which could cause several defrost cycles to be canceled.

To perform all defrosts are at the same interval, set d5d = dd1.

Setting dd1 = **oF** the interval defrosts are disabled (including the first one, regardless of the time set at d5d parameter.

#### *Defrost by evaporator temperature*

The instrument starts a defrost cycle when the evaporator temperature (**EP** probe) goes below the one set at dtF for the time set at d5t

This system can be used to guarantee a defrost also when the evaporator reaches very low temperatures, symptomatic of a bad thermal exchange in comparison to the normal working conditions of the evaporator.

When dtF = **-99.9** the function is disabled.

#### *Defrost by continuous compressor running time*

The instrument start a defrost cycle when the compressor is turned ON continuously for the time dcd.

This function is used because a compressor continuous operation for an extended period of time is usually means that there is a bad thermal exchange caused by frost on the evaporator.

When dcd = **oF** the function is disabled.

### 5.8.2 End of defrosts

The defrost cycle duration can be time based, or, using the evaporator probe (configured as **EP**) when a specific temperature is reached.

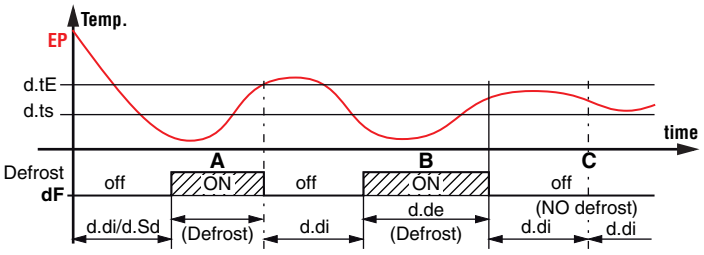
If the evaporator probe is not used or the thermostated defrost mode is used (*ddY* = **Et**), the cycle length is set by parameter *ddE*.

If the Evaporator Probe (**EP**) is used and the thermostated electric defrost is not selected (*ddY* = **EL**, **in**, **no**), the defrost time occurs when the temperature measured by **EP** probe exceeds the temperature at parameter *dtE*.

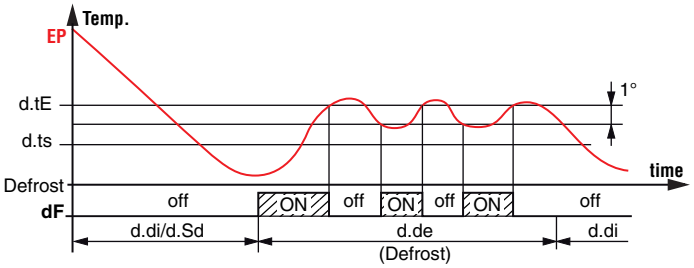
If this temperature is not reached in the time set at parameter *ddE*, defrost cycle is interrupted.

To avoid unnecessary defrosting when the evaporator temperature is high in modes *ddC* = **rt**, **ct**, **cS** parameter *dt5* allows to set the temperature related to the **EP** probe under which defrosts are possible.

Therefore, in the indicated modes, if the temperature measured by the **EP** probe is higher than the one set at parameters *dt5* and also *dtE* the defrosting is inhibited.




*Defrost end example: Defrost* **A** *ends due to reaching of temperature dtE, defrost* **B** *ends at the end of the ddE time as the temperature dtE is not reached, defrosting* **C** *does not take place as the temperature is higher than dt5.*




*Example of electric defrost with evaporator temperature control: the defrost end after the ddE programmed time. During defrost the* ***dF*** *output switches ON/OFF to control evaporator temperature in heating mode with set point dtE and 1° differential (Hysteresis) to maintain the temperature close to dtE.*

*At defrost end of, it is possible to delay the new compressor-start up (**ot** output) at the time set at parameter dtd to allow the evaporator to drain.*

### 5.8.3 Intervals and defrosts duration in case of evaporator probe error

In event of evaporator probe (**EP**) error the defrosts occur at intervals *dE* , and duration *dEE*.

In case an error occurs when the time remaining to the start or the end of defrost is lower than the one normally set with the parameters related to error probe conditions, the start or the end takes place with the shortest time.

These functions are provided because when the **EP** evaporator probe is used, the set defrost endurance time is usually longer than necessary because it operates in a gurantted band (the temperature value of EP probe ends the defrost earlier).

## 5.9 Evaporator fans control

The control of the evaporator fans on the output configured as **Fn** depends on some specific control statuses of the instrument and the temperature measured by the evaporator probe (**EP**). In the case that the evaporator probe is not used or in error, the **Fn** output is activated only depending on parameters *FEn*, *FEF* and *FFE*.

Parameters *FEn* and *FEF* can be used to determine the behavior of the evaporator fans when the **ot** outupt (compressor) is OFF.

When **ot** output is OFF, it is possible to set the instrument so that the **Fn** output continues working in cycles according to the times programmed at parameters *FEn* (fan activation time with compressor OFF) and *FEF* (fan deactivation time with compressor OFF).

When output **ot** is switched OFF the instrument activates the output **Fn** for the time *FEn*, then deactivates it for the time *FEF* and so on whilst the **ot** otuput remains OFF.

Programming *FEn* = **oF**, the **Fn** output is disabled when **ot output** is disabled (evaporator fans OFF when the compressor is OFF or fans functioning connected to the compressor).

Programming instead *FEn* to **any value** and *FEF* = **oF** the **Fn** output remains switched ON when **ot** in OFF condition (evaporator fans ON when the compressor is OFF).

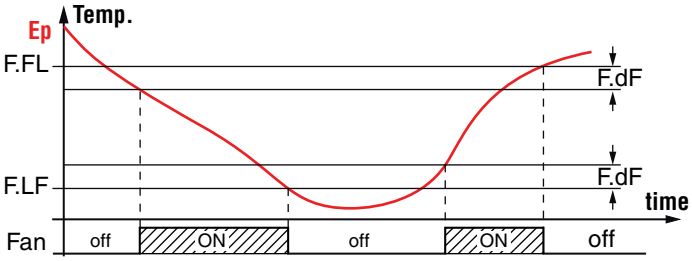
The parameter *FFE* decides whether the fans must always be switched ON independently of the defrosting status (*FFE* = **on**) or switched OFF during defrosting (*FFE* = **oF**).

In this later case, it is possible to delay the fans start also after the defrost end of the time set at the parameter *FFd*.

When the evaporator probe is used the fans, as well as being conditioned by the parameters *FEn*, *FEF* and *FFE*, are also conditioned by a temperature control.

It is possible to determine whether the fans should be disabled when the temperature measured by the evaporator probe is higher than the *FFL* parameter (too hot) or even when it is lower than the *FLF* parameter (too cold).

The relative differential that can be set in parameter *FdF* is also associated with these parameters.




**Note:** It is necessary to pay attention to the correct use of this fans temperature control functions because in the typical application of refrigeration the stop of the evaporator fans stops also the thermal exchange.

Remember that the fans functioning can be conditioned by the *Door open* function by the digital input.

## 5.10 Alarm functions

The alarm conditions of the instrument are:

– Probe errors E1, -E1 And E2, -E2;

– Temperature alarms H, and Lo;

– External alarm AL;

– Door open oP;

– Power supply alarms HU, LU.

Any active alarm condition acts on the output configured by parameters o01, o02 or o03 (if any) and is pointed out by turning on the Alarm LED (flashing red).

The possible selections of output parameters for the alarm signalling functions are:

**At**, **AL**, **AN**

If the output must be not active in normal condition and active in alarm condition (contact NO);

**-t, -L, -n**

If the output must be active in normal condition and not active in alarm (contact NC). This option functions with a logic inverted than the preceeding one.

### 5.10.1 Temperature alarms

The temperature alarm works according to **Pr1** or **AU** probes measurement, the type of alarm set in the parameter AAY the alarm thresholds set in parameters AHA (maximum alarm) and ALA (minimum alarm) and the relative differential AAd.

Through parameter AAY it is possible to set the alarm thresholds AHA and ALA as absolute or relative to the active Set Point, must be related to **Pr1** or **Au** probes and if the message H, (High alarm) and Lo (Low Alarm) are to be displayed at alarm intervention.

Depending on the desired alarm operating mode, parameter AAY can be set as:

**1** Absolute alarms referred to probe Pr1;

**2** Relative Alarms referred to probe Pr1;

**3** Absolute alarms referred to probe Au;

**4** Relative Alarms referred to probe Au;

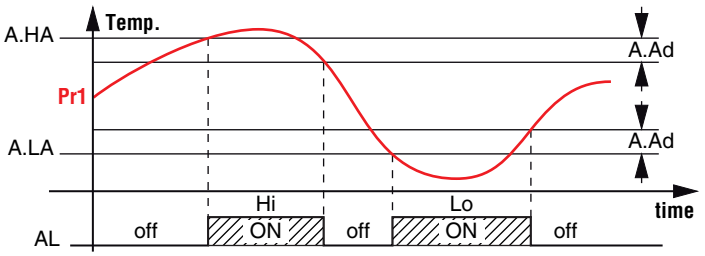
**5**, **6**, **7**, **8** Not used.

Using some parameters it is also possible to delay the enabling and the intervention of these alarms. These parameters are:

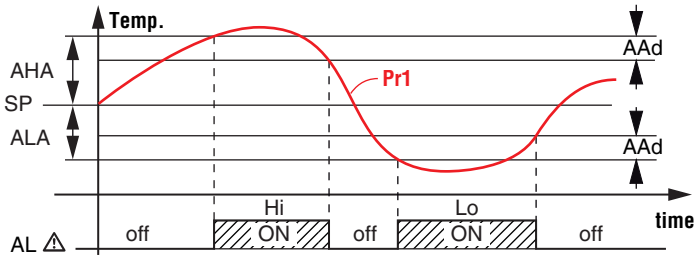
**A.PA** Temperature alarm exclusion time at switching ON the instrument if the instrument is in alarm status when it is switched ON. If the instrument is not in alarm status when it is switched on the time APA it is not considered.

**A.dA** Temperature alarm exclusion time at the end of defrost cycle (and, if programmed, after the draining) or after a continuous cycle.

**A.At** Temperature alarms delay activation time. Temperature alarms are enabled at the end of the exclusion times and are activated after the AAt time when the temperature measured by the probe exceeds or goes below the respective maximum and minimum alarm thresholds. The alarm thresholds are those set at parameters AHA and ALA when the alarms are set as absolute (AAY = **1**, **3**,).




or they assume the values [SP + AHA] and [SP + ALA] if the alarms are relative (AAY = **2**, **4**).




The maximum and minimum temperature alarms can be disabled by setting the related parameters AHA and ALA = **oF**. The temperature alarms are signalled lighting up the alarm LED.

### 5.10.2 External alarm from digital input

The instrument can signal an alarm external to the instrument by activating the digital input with a function programmed as (iF, = **4** or **5**). The instrument signals the alarm flashing with the Alarm LED and, if configured, turns ON the output set as Alarm output.

Mode iF, = **4** operates no action on the control output, while iF, = **5** deactivates the control output at digital input intervention.

### 5.10.3 Open door alarm

The instrument can sense the open door condition using the digital input setting iF, = **1**, **2** and **3**. As the Digital input is activated, the instrument waits for the delay set at parameter doA, signals the alarm flashing with the Alarm LED and, if configured, turns ON the output set as Alarm output. At the open door alarm intervention is also re-activated, if inhibited, the outputs (fans and/or compressor).

### 5.10.4 Mains voltage alarms

The instrument can automatically deactivate the outputs when the mains voltage, measured by the instrument through its power supply, is lower or higher than the values set to the parameters:

U.LU Undervoltage alarm (expressed in Vx10);

U.HU Overvoltage alarm (expressed in Vx10).

At alarm activation, and once the delay set at parameter UUd, te instrument disables the all the outputs and signals the alarm by flashing with the red Alarm LED.

In the case that the voltage measurement results NOT correct, it can be changed with an offset that can be set using the U.OU parameter.

# 6. ACCESSORIES

## 6.1 Parameters configuration by A01

The instrument is equipped with a connector that allows the transfer from and toward the instrument of the functioning parameters through the device **A01** with 5 poles connector.


For additional info, please have a look at the **A01 instruction manual**.

## 6.2 Parameters configuration by AFC1

The **AFC1** is a contactless NFC (Near Field Communications) connection device. It is able to transfer the data of the configuration program from the Personal Computer to the controller and vice-versa simply by placing the instrument directly on the **AFC1** device.


To configure the instrument with the **AFC1** device, the instrument must be placed on the side indicated with the appropriate symbol on the AFC1 device, which is powered directly by the USB port connected to the PC.

## 7. PROGRAMMABLE PARAMETERS TABLE

Here below is a description of all the parameters available on the instrument. Some of them may not be present, either due to the fact they depend on the type of instrument or because they are automatically disabled as unnecessary.

| Param. | | Description | Range | Def. | Note |
|---|---|---|---|---|---|
| 1 | SLS | Minimum Set Point | -99.9 ÷ S.HS | 0.0 | |
| 2 | SHS | Maximum Set Point | S.LS ÷ 999.0 | 10 | |
| 3 | SPE | Set Point Eco | 0.0 ÷ 30.0 (°C/°F) | 4.0 | |
| 4 | uP | Measurement Temperature unit | C0, C1 = °C, resolution 1°;<br>F0, F1 = °F resolution 1°. | C0 | |
| 5 | C1 | Pr1 probe calibration | -30.0 ÷ +30.0°C/°F | 0.0 | |
| 6 | C2 | Pr2 probe calibration | -30.0 ÷ +30.0°C/°F | 0.0 | |
| 7 | P2 | Probe 2 usage | oF Unused;<br>EP Evaporator probe;<br>Au Auxliary probe;<br>dG Digital Input. | dg | |
| 8 | iF | Function and logic functioning of the Digital Input (adding the "-" minus sign the logic is inverted) | **0** No function;<br>**1** Open Door;<br>**2** Open Door with Fan Lock;<br>**3** Open Door with Fan and Output Lock;<br>**4** External Alarm;<br>**5** External Alarm with Output Lock;<br>**6** Normal/Eco mode select;<br>**7** ON/Stand-by mode select;<br>**8** Not to be used. | 2 | |
| 9 | it | Digital Input Delay | **oF** Function disabled;<br>0.01 ÷ 99.59 (min.s). | oF | |
| 10 | Et | Eco Mode activation delay at Door closed | **oF** Function disabled;<br>0.01 ÷ 99.59 (h.min). | oF | |
| 11 | tE | Max. time functioning in Eco Mode | **oF** Function disabled;<br>0.01 ÷ 99.59 (h.min). | oF | |
| 12 | rd | Differential (Hysteresis) in Normal mode | 0.0 ÷ 30.0°C/°F | 2.0 | |
| 13 | rEd | Differential (Hysteresis) in Eco mode | 0.0 ÷ 30.0°C/°F | 2.0 | |
| 14 | rt1 | Output activation time for Pr1 probe error | **oF** Function disabled;<br>0.01 ÷ 99.59 (min.s). | oF | |
| 15 | rt2 | Output deactivation time for Pr1 probe error | **oF** Function disabled;<br>0.01 ÷ 99.59 (min.s). | oF | |
| 16 | dtE | End defrost temperature | -99.9 ÷ +999°C/°F | 8.0 | |
| 17 | dtS | Enable defrost temperature | -99.9 ÷ +999 °C/°F | 2.0 | |
| 18 | dtF | Start defrost temperature | -99.9 ÷ +999 °C/°F | -99.9 | |
| 19 | dSt | Defrost start delay for evaporator temperature | **oF** Function disabled;<br>0.01 ÷ 99.59 (min.s) | 1.00 | |
| 20 | dcd | Defrost activation time for continuous compressor operating | **oF** Function disabled;<br>0.01 ÷ 99.59 (h.min) | oF | |
| 21 | ddE | Max. defrost duration | **oF** Function disabled;<br>0.01 ÷ 99.59 (min.s). | 20.00 | |
| 22 | ddP | Auxiliary output (Aux.) activation time | **oF** Function disabled;<br>0.01 ÷ 99.59 (min.s) | oF | |
| 23 | dPd | Auxiliary output (Aux.) deactivation time | **oF** Function disabled;<br>0.01 ÷ 99.59 (min.s) | oF | |
| 24 | dtd | Compressor delay after defrost (draining) | **oF** Function disabled;<br>0.01 ÷ 99.59 (min.s) | oF | |
| 25 | ddt | Defrost type | **EL** Electrical heating/stop compressor;<br>**in** Hot gas/Reversed cycle;<br>**no** Without compressor output condictioning;<br>**Et** Electrical heating with evaporator temperature control. | EL | |
| 26 | dd | Defrosting interval | **oF** Function disabled;<br>0.01 ÷ 99.59 (h.min). | 6.00 | |
| 27 | dSd | First defrost delay after power-ON | **oF** At Power ON;<br>0.01 ÷ 99.59 (h.min). | 6.00 | |
| 28 | dE | Defrosting interval for evaporator probe error | **oF** Function disabled;<br>0.01 ÷ 99.59 (h.min). | 6.00 | |
| 29 | dEE | Lengh of defrost cycle for evaporator probe error | **oF** Function disabled;<br>0.01 ÷ 99.59 (min.s). | 10.00 | |

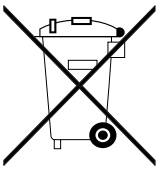
| Param. | | Description | Range | Def. | Note |
|---|---|---|---|---|---|
| 30 | FEn | Fan time activation with compressor output OFF | **oF** Function disabled;<br>0.01 ÷ 99.59 (min.s). | 5.00 | |
| 31 | FEF | Fan time deactivation with compressor output OFF | **oF** Function disabled;<br>0.01 ÷ 99.59 (min.s). | oF | |
| 32 | FFL | High temperature fan deactivation | -99.9 ÷ +999°C/°F | 10.00 | |
| 33 | FLF | Low temperature fan deactivation | -99.9 ÷ +999°C/°F | -99.9 | |
| 34 | FdF | Differential fan control | 0.0 ÷ 30.0°C/°F | 1.0 | |
| 35 | FFE | Fan status during defrost | oF/on | oF | |
| 36 | FFd | Fan delay after defrost | **oF** Function disabled;<br>0.01 ÷ 99.59 (min.s). | oF | |
| 37 | PP1 | Out delay at switching ON | **oF** Function disabled;<br>0.01 ÷ 99.59 (min.s). | oF | |
| 38 | PP2 | Out delay after switching OFF | **oF** Function disabled;<br>0.01 ÷ 99.59 (min.s). | oF | |
| 39 | PP3 | Delay between two output switching ON | **oF** Function disabled;<br>0.01 ÷ 99.59 (min.s). | oF | |
| 40 | Pod | Output delay at Power ON | **oF** Function disabled;<br>0.01 ÷ 99.59 (min.s). | oF | |
| 41 | AAy | Temperature Alarm 1 type | **1** Absolute for **Pr1** probe;<br>**2** Relative for **Pr1** probe;<br>**3** Absolute for **Au** probe;<br>**4** Relative for **Au** probe;<br>**5**, **6**, **7**, **8** Not used | 1 | |
| 42 | AHA | High temperature Alarm threshold | **oF** Function disabled;<br>-99.9 ÷ +999°C/°F | oF | |
| 43 | ALA | Low temperature Alarm threshold | **oF** Function disabled;<br>-99.9 ÷ +999°C/°F | oF | |
| 44 | AAd | Temperature Alarms Differential | 0.0 ÷ 30.0°C/°F | 1.0 | |
| 45 | AAt | Temperature Alarms Delay | **oF** Function disabled;<br>0.01 ÷ 99.59 (min.s). | oF | |
| 46 | APA | Temperature Alarms delay at power ON | **oF** Function disabled;<br>0.01 ÷ 99.59 (h.min). | 2.00 | |
| 47 | AdA | Temperature Alarms delay after defrost | **oF** Function disabled;<br>0.01 ÷ 99.59 (h.min). | 1.00 | |
| 48 | AoA | Open door delay | **oF** Function disabled;<br>0.01 ÷ 99.59 (min.s). | 3.00 | |
| 49 | o1 | Out1 function | **oF** No function;<br>**ot** Temperature control (compr.);<br>**dF** Defrost;<br>**Fn** Fans;<br>**Au** Aux. output control in cyclic ON/OFF (ON time: 22 = ddP, OFF time: 23 = dPd);<br>**At/AL/An** Alarm with NO contact;<br>**-t/-L/-n** Alarm with NC contact;<br>**on** ON when the instrument is ON;<br>**HE** Not used;<br>**L1** Showcase light in Eco mode (ON with **SP** and OFF with **SPE**);<br>**L2** Cell light (OFF with door closed, ON with door open). | ot | |
| 50 | o2 | Out2 function | | dF | |
| 51 | o3 | Out3 function | | Fn | |
| 52 | tuF | Enable Stand-by when the knob is in position "0" | **oF** No;<br>**1** Standby enabled. | oF | |
| 53 | ULU | Undervoltage alarm | **oF** Function disabled;<br>9 ÷ 27 (V x 10) | oF | |
| 54 | UHU | Overvoltage alarm | **oF** Function disabled;<br>9 ÷ 27 (V x 10) | oF | |
| 55 | UAd | Voltage alarm delay | **oF** Function disabled;<br>-01 ÷ -59 (s); 01 ÷ 99 (min) | oF | |
| 56 | UOU | Voltage calibration offset | -30 ÷ +30 V | 0 | |

## 8. MAINTENANCE

### 8.1 Cleaning

We recommend cleaning of the instrument only with a slightly wet cloth using water and not abrasive cleaners or solvents.

### 8.2 Disposal



The appliance (or the product) must be disposed of separately in compliance with the local standards in force on waste disposal.

## 9. WARRANTY AND REPAIRS

The instrument is under warranty against manufacturing flaws or faulty material, that are found within 18 months from delivery date. The warranty is limited to repairs or to the replacement of the instrument.

The eventual opening of the housing, the violation of the instrument or the improper use and installation of the product will bring about the immediate withdrawal of the warranty effects.

In the event of a faulty instrument, either within the period of warranty, or further to its expiry, please contact our sales department to obtain authorisation for sending the instrument to our company.

The faulty product must be shipped to Ascon Tecnologic with a detailed description of the faults found, without any fees or charge for Ascon Tecnologic, except in the event of alternative agreements.

## 10. TECHNICAL DATA

### 10.1 Electrical characteristics

**Power supply:** 115 VAC, 230 VAC, 100 ÷ 240 VAC ±10%;

**AC frequency:** 50/60 Hz;

**Power consumption:** About 2 VA (100 ÷ 240 V); about 5 VA (115 V); about 10 VA (230 V);

**Inputs:** **2 input** for **NTC temperature probes**: (103AT-2, 10 kΩ @ 25°C);
**1 free of voltage digital input alternative to Pr2 probe**;

**Output:** Up to **3 relay output** SPST-NO:

| | EN 61810 | EN 60730 | UL 60730 |
|---|---|---|---|
| **Out1 (R)** - SPST-NO - 16A - 1HP 250V, 1/2HP 125 VAC | 16 (9) A | 10 (4) A | 10 A Res., 60 LRA, 10 FLA |
| **Out2, Out3 (R)** - SPST-NO - 5A - 1/10HP 125/250 VAC | 5 (1) A | 2 (1) A | 2 A Gen. usage |

**Relay output Electrical life:** 30000 operations;

**Action type:** Type 1.C (EN 60730-1);

**Overvoltage category:** II;

**Rated impulse voltage:** 2500 V at 115/230 V;

**Protection class:** Class II;

**Isolation:** Reinforced isolation between the low voltage parts and front panel; no isolation between power supply, relay output and inputs.

### 10.2 Mechanical characteristics

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

**Heat and fire resistance category:** D;

**Ball Pressure Test as described in EN60730:** accessible parts 75°C; support live parts 125°C;

**Dimensions:** 82 x 38 mm, depth 33.5 mm;

**Weight:** About 190 g;

**Mounting:** Incorporated flush in panel with Ø10.5 hole fixed with an M10 nut or with 2 self-threading Ø3.2 mm screws;

**Connections:**

**Power supply and Outputs:** Faston 6.3 mm for 0.2 ÷ 2.5 mm²/AWG 24 ÷ 14 cables

**Inputs:** Mini removable connectors with pitch 2.54 mm;

**Pollution degree:** 2;

**Operating temperature:** 0 ÷ 50°C (or -20 ÷ +50°C for the versions with power supply type 0, 1, 2);

**Operating humidity:** < 95 RH% with no condensation;

**Storage temperature:** -25 ÷ +60°C.

### 10.3 Functional features

**Temperature Control:** ON/OFF mode;

**Defrost control:** Interval cycles or evaporator temperature by electric heating or hot-gas/reverse cycle, stopping compressor;

**Measurement range:** NTC: -50 ÷ +109°C/-58 ÷ +228°F;

**Software class and structure:** Class A;

**Compliance:**

– Directive 2004/108/CE (EN55022: class B; EN61000-4-2: 8kV air, 4kV cont.; EN61000-4-3: 10V/m; EN61000-4-4: 2kV supply and relay outputs, 1kV inputs; EN61000-4-5: supply 2kV com. mode, 1 kV\diff. mode; EN61000-4-6: 3V);

– Directive 2006/95/CE (EN 60730-1, EN 60730-2-9).

## 11. HOW TO ORDER

**MODEL**
**ET3 -** = Electronic controller for cooling units

**a: NFC PARAMETER PROGRAMMING**
**-** = Not present
**N** = Controller programmable through NFC

**b: POWER SUPPLY**
**V** = 230 VAC (not isolated with condenser)
**Z** = 115 VAC (not isolated with condenser)
**S** = 100... 240 VAC (not isolated with switching Power Supply)
**2** = 230 VAC -20T50 (not isolated with condenser)
**1** = 115 VAC -20T50 (not isolated with condenser)
**0** = 100...240 VAC -20T50 (not isolated with switching Power Supply)

**c: OUTPUT 1 (OUT 1)**
**R** = Relay output SPST-NO 16A-AC1 (resistive load)

**d: OUTPUT 2 (OUT 2)**
**R** = Relay output SPST-NO 5A-AC1 (resistive load)
**-** = Not present

**e: OUTPUT 3 (OUT 3)**
**R** = Relay output SPST-NO 5A-AC1 (resistive load)
**-** = Not present

**f: POWER SUPPLY AND OUTPUT TERMINALS**
**F** = Faston 6.3 mm

**g: INPUT TERMINALS**
**1** = 2 input connectors pitch 2.54 mm with 2 + 3 poles (Standard)
**3** = 2 input connectors pitch 2.54 mm, with clip and 2 + 3 poles

**h: HOUSING/KEYS**
**0** = Standard Black with knob and horizontal 0 reference
**V** = Standard Black with knob and vertical 0 reference
**-** = Standard Black without knob

| ET3 | - | a | b | c | d | e | f | g | h | i | j | kk | ll |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

**i, j**: RISERVED CODES; **kk, ll**: SPECIAL CODES