e33

DIGITAL ELECTRONIC TEMPERATURE CONTROLLER WITH DEFROSTING FUNCTION

OPERATING INSTRUCTIONS

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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.

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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

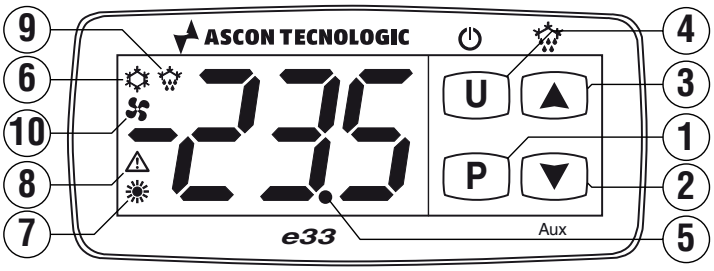
1.1 General description

The model **e33** is a microprocessor based digital electronic temperature controller that is typically used in **cooling applications** with **ON/OFF temperature control** and **defrost control at time intervals**, by **temperature reaching** or by **continuous compressor operation time** through **stopping the compressor, electric heating** or **hot gas/cycle inversion**.

The instrument has up to **3 relay outputs** and up to **3 NTC temperature probes** inputs **one of which** can be **configured as digital input**; it can also be equipped with a built-in buzzer for alarms acoustic report.

The operating parameters configuration can be made through the **keypad**, through the **A01** device connected to the **TTL port** (standard) or using the **NFC** communication (optional).

1.2 Front panel pescription



1 (P)**:** Used for setting the Set Point (short press) and for programming the function parameters (pressed for 5 s). In programming mode is used to enter in parameters edit mode and confirm the values. In programming mode (P) can be used together with the (▲) key to change the programming level of the parameters. When the keyboard is locked, the keys (P) and (▲) used together (hold pressed for 5 s), unlock the keyboard.

2 (▼)**/Aux:** In programming mode is used for decreasing the values to be set and for selecting the parameters. If programmed using the *tFb* parameter, when it is pressed for 1 s during normal operation mode, it can perform other functions such as Eco mode selectionf, Aux output control etc. (see "Functions of keys (U)/(⏻) and (▼)/Aux").

3 (▲)/☼**:** In normal mode (pressed for 5 s) can be used to **start/stop manual defrosting** (☼**)**. In programming mode is used for increasing the values to be set and for selecting the parameters. In programming mode can be used together with (P) key to change parameters level. Pressed together with the (P) key for 5 s allows the keyboard unlock.

4 (U)/⏻**:** Used (short press) for displaying the instrument variables (measured temperatures etc.). In programming mode can be used to return in normal mode (hold for 2 s).
If programmed using the *tUF* parameter, when it is pressed for 1 s during normal operation mode allows to turn **ON/OFF** (Stand by) the **control action** or other functions like the **Aux** input control etc. (see "Functions of keys (U)/⏻ and (▼)/Aux").

5 **LED dp:** Decimal Point, when the instrument is placed in Stand by mode, this is the only lighted LED. During the normal operation is the decimal point. In programming mode, while the parameter code is displayed, the dot indicates the parameter protection level: **not protected** (lit up), **protected** (flashing) and **hidden** (turned OFF).

6 **LED** ☼: Indicates the output status (compressor or temperature control device) when the instrument is programmed for **cooling operation**; **ON** (lit up), **OFF** (turned OFF) or **inhibited** (flashing).

7 **LED** ☀**:** Indicates the output status (compressor or temperature control device) when the instrument is programmed for **heating operation**; **ON** (lit), **OFF** (turned OFF) or **inhibited** (flashing).

8 **LED** ⚠**:** Indicates the **alarm status**: **ON** (lit), **OFF** (turned OFF) or **silenced or stored** (flashing).

9 **LED** ☼**:** Indicates that the **defrost** is **in progress** (on) or **drainage time in progress** (flashing).

10 **LED** **:** Indicates **fan** output status **ON** (on), **OFF** (off) or **inhibited** (flashing).

2. PROGRAMMING

2.1 Fast Set Point programming

The normal mode to program the setpoint is done by momentarily pressing the (P) key, the display shows *SP* (or *SPE*) alternated to the programmed value.

To change it press the (▲) key to increase the value or (▼) to decrease it.

These keys increase or decrease the value one digit at a time, but if the button is pressed for more than one second the value increase or decreases rapidly and after two seconds the speed increases even more in order to quickly reach the desired value.

However, through *tEd* parameter you can determine if and which Set Point can be set with the (P) key rapid procedure.

The parameter can have the following values:

oF The Set Points cannot be changed with the (P) key rapid procedure (pressing/releasing the (P) key, nothing happens);

1 Only **SP** can be set with this procedure (Normal Set Point);

2 Only **SPE** can be set with this procedure (Eco Set Point);

3 Both **SP** and **SPE** can be set with this procedure;

4 To select the Active Set Point (**SP** or **SPE**);

5 Both **SP** and **SPH** can be set with this procedure (**SPH**: Set Point Turbo or independent *Heating Set Point*);

6 All the 3 Set Points (**SP**/**SPE**/**SPH**) can be set with this procedure.

For example, in case the parameter *tEd* = **1** or **3**, the procedure is the following:

Press and release the (P) key, the display shows *SP* alternated to the Set Point value. To change the Set Point, press the (▲) key to increase the value or (▼) to decrease it

If only Set Point 1 is present (*tEd* = **1**), once the desired value is set, press the (P) button to exit the fast programming mode.

If also the Eco Set Point (*tEd* = **3**) can be set, pressing and releasing again the (P) button the display shows *SPE* alternated to its programmed value. To change the value use the (▲) and (▼) keys as for the *SP* Set Point value. Once the desired value is correctly set, press the (P) button to exit the fast Set Point change.

For **SPH** (*tEd* = **5** or **6**) the procedure is the same of the one used for SPE.

To exit the fast Setpoint programming mode push the (P) key after the last Set Point has been displayed or pressing no buttons for about 10 s, after which the display returns to normal operation.

2.2 Standard mode parameters programming

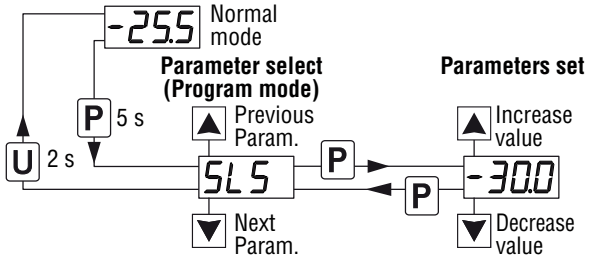
To access the instrument function parameters when password protection is disabled, press the key (P) and keep it pressed for about 5 seconds, after which the display shows the code that identifies the first programmable parameter

The desired parameter can be selected using the (▲)/(▼) keys, then, pressing the (P) key, the display shows the parameter code alternated to its value that can be changed with the (▲) and (▼) keys.

Once the desired value has been set, press the key (P) again: the new value is stored and the display shows only the code of the selected parameter

Pressing the (▲) and (▼) keys, it is possible to select another parameter and change it as described.

To exit the programming mode, press no keys for about 30 s or keep the U key pressed for 2 s.



2.3 Parameter protection using the password

The instrument has a parameter protection function using a password that can be personalised through the PPP parameter

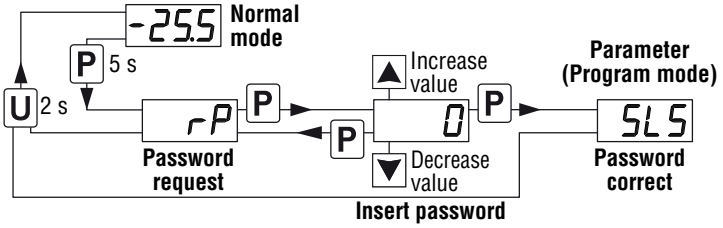
To protect the parameters, set the desired password number in the parameter PPP.

When the protection is active, press the P key to access the parameters and keep it pressed for about 5 s, after which the display shows rP.

Press the P key, the display shows 0, using the ▲/▼ keys, insert the programmed password number and press the key P again.

If the password is correct the instrument displays the code of the first parameter and it will be possible to program the instrument in the same way described in the previous section.

The password protection can be disabled by setting PPP = **oF**.



Note: If the Password gets lost, just switch OFF and ON the instrument, push P key during the initial test keeping it pressed for 5 s. In this way it is possible to access all the parameters, verify and modify the parameter PPP.

2.4 Customized mode parameter programming (parameters programming level)

The password hides all the configuration parameters behind a factory set password to avoid unwanted changes to the controller parameters. To make a parameter accessible without having to enter the password when PPP password protection is activate, use the procedure that follows:

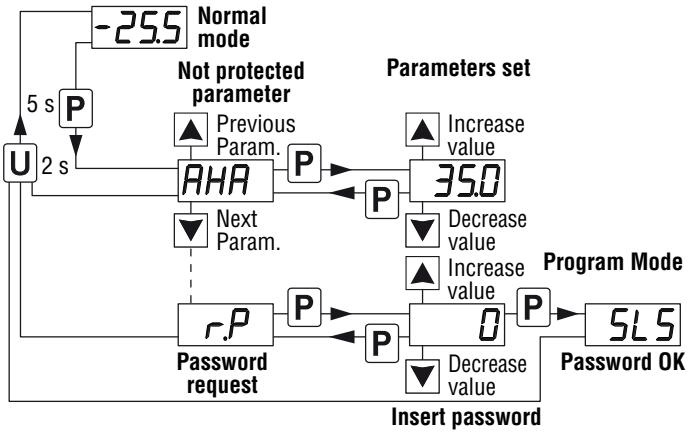
Enter the program mode using the PPP Password and select the parameter that must be accessible (no password protection).

Once a parameter is selected, if the **dp LED flashes** the parameter is programmable by entering the password (is "**protected**"). If the **dp LED is steady ON** the parameter is programmable without password (is "**unprotected**").

To change the parameter visibility, press the P key and keeping it pressed also press the ▲ button.

The **dp LED** changes its state indicating the new level of parameter accessibility (**ON** = not protected; **flashing** = password protected).

In case some parameters are not protected, accessing the the programming mode the display first shows the not protected parameters, then the rP parameter (through which will be possible to access the "protected" parameters).



2.5 Reset parameters to default value

The instrument allows the reset of the parameters to values programmed in factory as default

To restore the default parameters value set value -48 at rP password request Therefore, to make the reset to the default parameters, enable the Password using the PPP parameter so that the rP setting is requested, at this point insert **-48** instead of the programmed access password.

Once confirmed the password with the P key the display shows "- - -" for 2 s therefore the instrument resets all the parameters to factory default setting.

2.6 Keyboard lock function

On the instrument it is possible to completely lock the keyboard.

This function is useful when the controller is in an accessible area and the changes must be avoided.

To activate the keyboard lock it is enough program the parameter tLo to a value different from **oF**.

The tLo value is the keys inactivity time after which the keyboard will be automatically locked.

Therefore, pressing no buttons for the time set at tLo, the instrument automatically disable the normal functions of the keys.

When the keyboard is locked, if any of the key is pressed, the display showss Ln to indicate that the lock is active.

To unlock the keyboard it is enough to contemporarily push P + ▲ keys and keep them pushed for 5 s, after which the label LF appears on the display and all the key functions will be available again.

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.

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

The instrument used with NTC 103AT11 probe (identifiable by the printed code “103AT-11” visible on the sensor part) is compliant with standard EN 13485 (“Thermometers for measuring the air and product temperature for the transport, storage and distribution of chilled, frozen, deep-frozen/quick-frozen food and ice cream”) with the following classification: [EN13485 air, S, A, 2, -50°C +90°C]

Remember that the end user must periodically check and verify the thermometers in compliance with standard EN 13486.

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, in case 78 x 35 mm, is designed for flush-in panel mounting. Make a 71 x 29 mm hole and insert the instrument, fixing it with the provided special brackets.

In order to obtain the declared front protection degree, mount the gasket and use the screw type bracket (both optional).

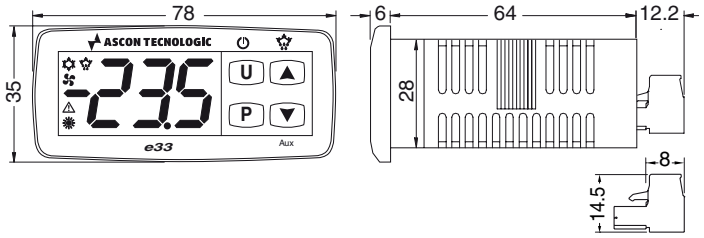
Avoid placing the instrument in environments with very high humidity levels or dirt that may create condensation or introduction of conductive substances into the instrument

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.

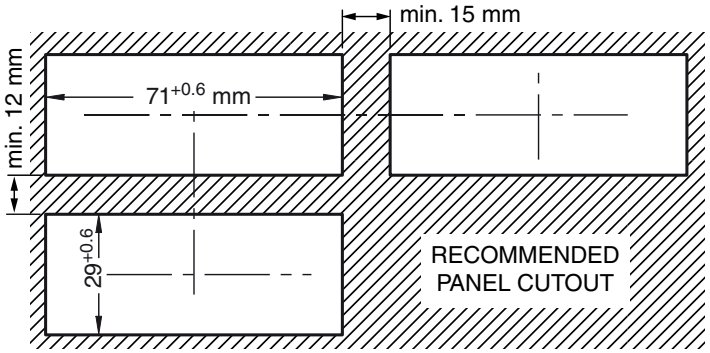
Connect the instrument as far away as possible from sources of electromagnetic disturbances such as motors, power relays, relays, solenoid valves, etc..

4.2 Dimensions [mm]

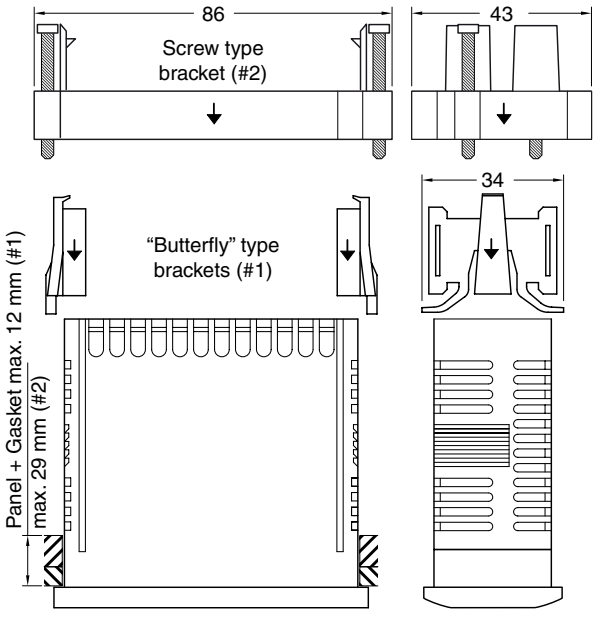
4.2.1 Mechanical dimensions



4.2.2 Panel cut-out



4.2.3 Mounting brackets



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.

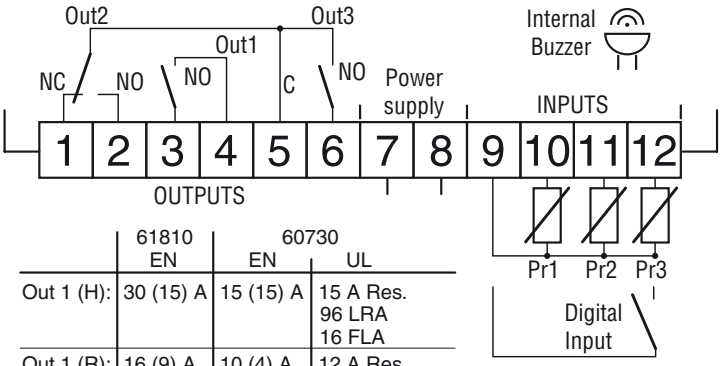
It is strongly recommended that cables with proper insulation, according to the working voltages and temperatures, be used.

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.

Whether the instrument is a 12 V version (Power supply code F) it is recommended to use an external TCTR transformer, or with equivalent features (class II insulation) and to use only one transformer for each instrument because there is no insulation between supply and input

⚠ We 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	UL
Out 1 (H):	30 (15) A	15 (15) A	15 A Res. 96 LRA 16 FLA
Out 1 (R):	16 (9) A	10 (4) A	12 A Res. 30 LRA 5 FLA
Out 2:	8 (3) A	8 (4) A	10 A Res.
Out 3:	5 (1) A	2 (1) A	2 A Gen. Use

(12 A max. for removable connectors models)

5. FUNCTIONS

5.1 ON/Stand-by function

Once powered the instrument can assume 2 different conditions:

ON: Means that the controller uses the control functions.

STAND-BY:

Means that the controller uses no control function and the display is turned off except for the Stand-by LED.

The transition between Standby and ON is equivalent to power ON the instrument providing the electrical power

In case of power failure, the system always sets itself in the condition it was in before the black-out

The ON/Stand-by function can be selected:

– With the key U/⏻ pressed for 1 s if tUF = **3**;

– With the key ▼/**Aux** pressed for 1 s if tFb = **3**;

– Using the Digital Input if parameter iF1 = **7**;

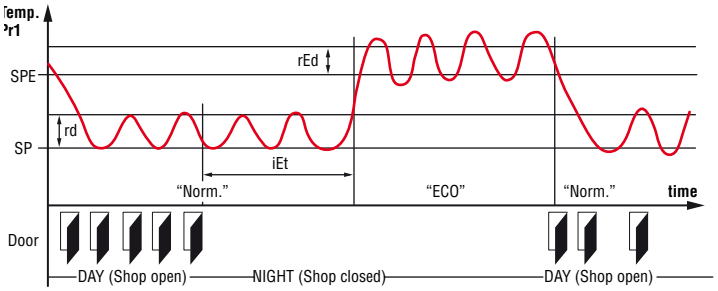
5.2 Normal, Economic and Turbo operation

This tool allows to pre-set 3 different Setpoints, **Normal** - SP, **Economic** (or Eco) - SPE and **Turbo** SPH.

Associated with each Setpoint there is the relative differential (hysteresis): **Normal** - rd, **Eco** - rEd and **Turbo** - rHE. Switching between the various modes can be **automatic** or **manual**.

5.2.1 Normal/Eco operation selection

This function can be used when you need to switch two functional temperatures (eg. Day/Night or week-day/week-end).



The Normal/Eco operation can be selected in manual mode:

– Using the U/⏻ key if parameter tUF = **2**;

– Using the ▼/**Aux** key if parameter tFb = **2**;

– Using the Digital Input if parameter iF1 = **6**.

The Normal/Eco operation can be selected in automatic mode:

– Elapsed the iEt time after the door has been closed (Normal/Eco switching).

– At door opening if the SPE Setpoint is activated by iEt parameter (Eco/Normal switching).

– Elapsed the itt time after the door has been closed and from the activation of SPE Setpoint by iEt parameter (Eco/Normal switching).

To use this function, it is necessary to set the Digital Input as: iF1 = **1**, **2** or **3**.

If iEt = **oF** the selection of Eco/Normal modes via the digital input is disabled.

If itt = **oF** the time-out switching from Eco to Normal mode is disabled.

Switching to Economic mode is indicated by the label Eco. When id5 = **Ec** the Economic mode is pointed out with a fixed Eco label otherwise the label Eco appears every 10 s alternated to the display set with parameter id5.

When used as a shop widow light (oFo = **3**), **Eco** mode selection is always associated with the Auxiliary Output turn OFF function.

5.2.2 Turbo/Normal/Eco operation selection

Turbo mode can be selected manually:

– Pressing the U/⏻ key if parameter tUF = **4**;

– Pressing the ▼/**Aux** key if parameter tFb = **4**;

– From digital input if parameter iF1 = **8**;

Turbo mode can be selected automatically:

– Leaving Eco mode (only if rHC = **C3**)

– Every time the instrument is switched ON (only if rHC = **C3** and Pr1 > SPE + rEd)

The instrument quits Turbo mode and returns to normal mode automatically at the end of rtC time or manually using the programmed command (key or digital input).

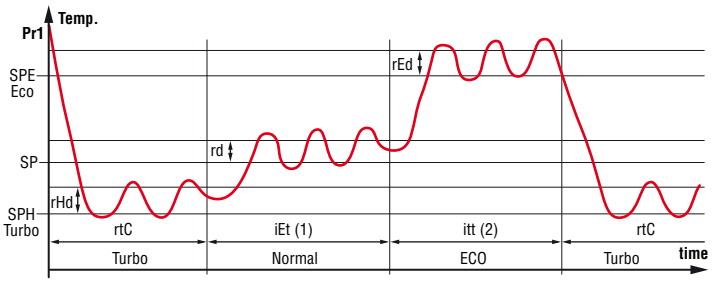
Setting rHC = **C3** gives the following operating cycle:

At power ON, the instrument starts in the mode it was in when it was switched OFF (Normal or "Eco") unless the temperature at power ON is > SPE + rEd. In this case (see fig.) a **Turbo** cycle is automatically initiated.

After time rtC the instrument automatically swiyches to **Normal** mode. If the door is opened frequently, the instrument remains in **Normal** mode. If however the door is not opened for time set at iEt parameter, it automatically switches to **Eco** mode.

The instrument remains in **Eco** mode until the door is opened again or, if set, until the time-out itt.

On leaving **Eco** mode the instrument therefore runs a **Turbo** cycle to allow product temperature to be restored, after which it reverts to **Normal** mode and so on.



1 The time iEt is reset every time the door is opened and in the case shown the door is always closed.

2 The time itt stops when the door is opened and the instrument immediately switches to **Turbo** mode. In the case shown, the door is always closed.

When in **Turbo** mode, the instrument shows the characters trb alternated to the normal display indication.

The normal Set Point **SP** can be set to a value between the one set with parameter SLS and the one set with parameter SHS while the Economic Set Point **SPE** can be set to a value between the one set with parameter SP and the one set with parameter SHS; the Turbo Set point (SHP) can be set to a value between the one set with parameter SLS and the one set with parameter SP.

Note: In the following examples the Set Point is generally indicated as **SP** and the differential as rd however the instrument will act according to the Set Point and the differential selected as active.

5.3 Measure and display configuration

With parameter uP it is possible to select the temperature engineering unit and the desired measure resolution (**C0** = °C/1°; **C1** = °C/0.1°; **F0** = °F/1°; **F1** = °F/0.1°).

The instrument allows the measure calibration, which can be used to recalibrate the instrument according to application needs, the calibration is made by using parameters iC1 (input Pr1), iC2 (Pr2 input) and iC3 (Pr3 input).

Parameters iP2 and/or iP3 allows to select the instrument usage of **Pr2**/**Pr3** measure as:

EP Evaporator probe: used to managing the defrost and the evaporator fans (see relative functions).

Au Auxiliary probe;

DG Digital Input (see the Digital input functions).

If **Pr2**/**Pr3** input is not used, set iP2/ iP3 = **oF**.

Two inputs cannot set to perform the same function.

If two inputs are set to do the same function, this is done only by the **P2** input.

Using iFt parameter can be set a software filter for measuring the input values in order to decrease the sensibility to rapid temperature changes (increasing the sampling time).

Through the idS parameter is possible to set the variable normally displayed:

P1 **Pr1** probe measurement;

P2 **Pr2** probe measurement;

P3 **Pr3** probe measurement;

SP Active Set Point;

EC Pr1 probe measure if the instrument is in Normal mode, the label Eco if the instrument is in (**Eco mode**);

OFF If the numerical display must be switched off (**oF**).

When one of the measures is displayed (idS = **P1**/**P2**/**Ec**) the iCU parameter allows to set an offset that is to be applied only to the displayed variable (all controls will always made according to the correct temperature value, changed only by the calibration parameters).

Regardless of what is set at idS parameter, all the measurement variables can be shown pressing the U key.

The display alternately shows the code that identifies the variable and its value. The variables are:

Pr1 Probe 1 measurement;

Pr2 Probe 2 measurement (on/oFF if Pr2 is a Digital input);

Pr3 Probe 3 measurement (on/oFF if Pr3 is a Digital input);

Lt Minimum stored Pr1 temperature;

Ht Maximum stored Pr1 temperature.

The Peak (min./max.) temperature values of **Pr1** probe are **NOT** stored in case of power failure. While the controller is showing the peak values, these can be reset pressing the ▼ key for 3 s. At the end of the key ▼ pressure, the display shows "- - -" for an instant to indicate that the min./max. values have been erased and the new peak is the temperature read in that moment.

The system exits the variable dosplay mode after 15 s from the last U key pressure.

It is also noted that the **Pr1** probe display can also be changed by "*Defrost display lock*" function via the ddL parameter (see the Defrost function).

5.4 Digital input configuration

The digital input function (available on **terminal 12** or instead of **Pr2** input if iP2 = **dg**) 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 alternately displays oP and the variable set at id5 parameter. This DI operation mode activates also 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 and the **Eco** mode activation was enabled through parameter iEt;

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 fan outputs lock and NO contact: similar to iF = **2** but with compressor and fans lock. At open door alarm intervention (AoA) both the fans and the compressor are re-activated.

4 External alarm signal with NO contact: at input closing (and after the it time) the alarm is activated and the instrument alternately shows on the display: AL and the variable set with parameter id5;

5 External alarm signal with all control outputs disabled and NO contact: at input closing (and after the it time) all the control outputs are disabled, the alarm is activated and the instrument alternately shows on the display: AL and the variable set with parameter id5;

6 Normal/Eco mode selection with NO contact: at input closing (and after the it time) the instrument switches to **Economic** 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 while it is placed in Stand-by mode when the digital input is open;

8 **Turbo activation** command with NO contact: at input closing (and after the it time) the instrument starts a Turbo cycle;

9 **Defrost activation** command with NO contact: at input closing (and after the it time) the instrument starts a defrost cycle;

10 **End-Defrost** command with NO contact: at input closing (and after the iti time), if the defrost cycle is in progress the instrument stops it, otherwise inhibits the defrost start;

-1... -10 - Features identical to the above but obtained through a NC contact and a reversed logic operation.

5.5 Outputs and buzzer 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). To manage the cooling control device for neutral zone control or Cooling/Heating (rHC = **nr** or **HC**);

df To control the defrosting device;

Fn To control the evaporator fans;

Au To control the auxiliary device;

At To control a silenceable alarm device through a contact that is NO in normal operation then closed when the alarm sounds;

AL To control an alarm that cannot be silenced through a contact that is NO in normal operation then closed when the alarm sounds;

An To control an alarm with a memory function through a contact that is NO in normal operation then closed when the alarm sounds (see alarm memory);

-t To control a silenceable alarm device through a contact that is NC in normal operation then closed when the alarm sounds;

-L Control an alarm that cannot be silenced through a contact that is NC in normal operation then closed when the alarm sounds;

-n To control an alarm with a memory function through a contact that is NC in normal operation then closed when the alarm sounds;

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 as a control of the shop window lighting, anti-fogging resistors or other utilities;

HE To control a heating device in neutral zone or Cooling/Heating control mode (rHC = **nr** or **HC**);

oF Output disabled.

If one of the outputs is configured as auxiliary output (o1/o2/o3 = **Au**), its function is set by parameter oFo and its operation can be conditioned by the time set to at parameter otu. Parameter oFo can be configured for the following functions:

oF Auxiliary output not active;

1 Temperature control output delayed with NO contact: the auxiliary output is activated with a delay that can be set with parameter otu applied to the output configured as **ot**. The output is then turned OFF at the same time as the **ot** output is disabled. This function mode can be used as a command for a second compressor or for all other working utilities according to the same ot output conditions, but which must be delayed after the start up of the compressor to avoid excess electricity absorption;

2 Activation by front key (U or ⏬): the output is activated by pressing the keys U or ⏬ suitably configured (tUF or tFb = **1**). These commands have a bi-stable (toggle) function (at first pression the output is activated, at the second is disabled). In this mode, the **Aux** output can be turned OFF automatically after the time set at parameter otu. When otu = **oF** the output is activated and deactivated only manually, using the U or ⏬ keys or via the digital input. Differently, the output, once activated, is turned OFF automatically after the otu time. This mode of operation can be used as a control of the shop window lighting, anti-fogging resistors or other utilities;

3 Shop window light managed by Normal/Eco mode. This output will be ON in Normal mode and OFF when in Eco mode operation.

4 Internal Light output managed by digital input. This output will be ON when door is opened (iF = **1**, **2**, **3**).

If present, the internal buzzer can be configured by parameter obu for the following functions:

oF Buzzer always disabled;

1 The Buzzer sounds when an alarm is active;

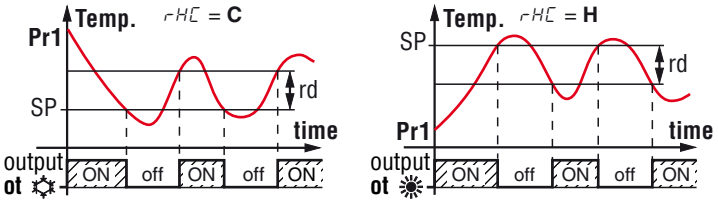
2 The Buzzer sounds when a key pressed (no alarm);

3 The Buzzer sounds when a key pressed and when an alarm is active.

5.6 Temperature control

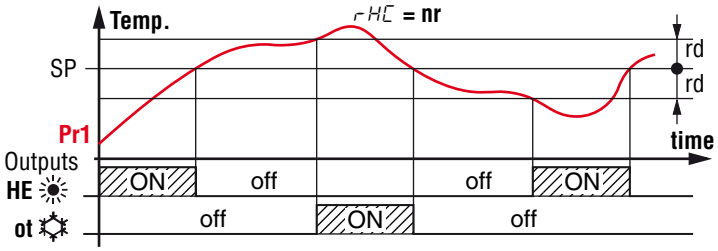
The instrument controls the temperature with an ON/OFF action and operates on the outputs configured as ot and HE depending on the PR1 probe measuring, the acive Set Point/s SP/SPE/SPH, the Hysteresis rd/rEd/rHd and the function mode set with rHC parameter. Using the rHC parameter can be obtained the functions that follow.

C Cooling;
H Heating.



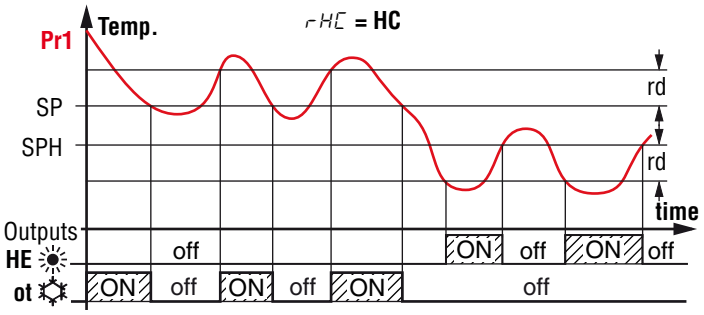
Depending on the function mode programmed with parameter rHC the differential is automatically considered by the controller with positive values for a **Refrigeration** control (rHC = **C**) or negative values for a **Heating** control (rHC = **H**).

nr Neutral Zone



When rHC = **nr**, the output configured as **ot** operates with a cooling action (like rHC = **C**) while the output configured as **HE** operates with a heating action both with the active Set Point (SP/SPE/SPH). The intervention differential (rd/rEd/rHd) is automatically assumed by the controller to have positive values for the cooling action and negative values for the heating action.

HC Cooling and Heating with independent Set Points



As in the previous case, when rHC = **HC** the output configured as **ot** operates with cooling action (like rHC = **C**) while the output configured as **HE** operates with heating action. In this case, however, the Set Point for the **ot** output is the active one between SP, SPE or SPH, while for the **HE** output the Set Point is SPH. The intervention differential for the **ot** output is the active between rd, rEd or rHd and is automatically assumed by the controller to have positive values for the cooling action while for the output **HE** the differential is rHd considered with negative values as for the Heating actions.

In this mode, the activation of the Turbo cycle causes the instrument to operate with Neutral Zone and SPH set point. The time protections described in the next paragraph (PP1/PP2/PP3) always work on the output configured as **ot** and have no effect on the **HE** output.

In the event of a probe error, it is possible to set the instrument so that that the output continues to work in cycles according to the times programmed with parameter rt1 (activation time) and rt2 (deactivation time).

If a **Pr1** probe error occurs, the instrument can continue to activate the **ot** output for rt1 time, then disables it for rt2 time and so on until the error persists.

By programming rt1 = **oF** the output, in probe error condition, will always be OFF. On the contrary, programming rt1 to any value and rt2 = **oF** the output, in probe error conditions, will always be on.

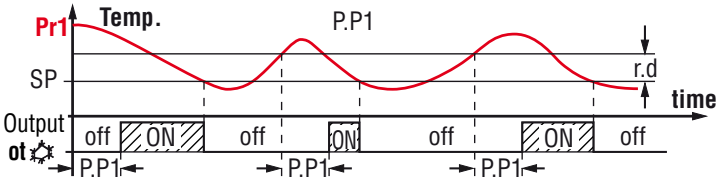
Remember that the operation of the temperature controller can be conditioned by the following functions: *Compressor protection function and power-on delay*, *Defrost*, *Open door* and *External alarm with output block* from digital input.

5.7 Compressor protection and power-on delay

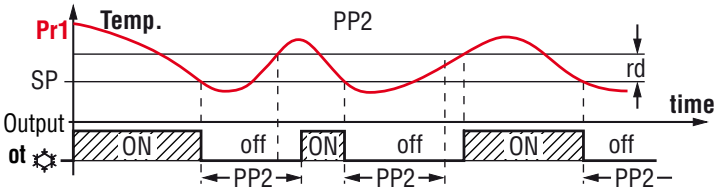
The "**Compressor Protection**" function aims to avoid repeated compressor start-ups controlled by the instrument in cooling applications or otherwise can be used to add a timed control on the actuator control output

This function foresees 3 time controls on the switching ON of the output configured as **ot**. The protection consists of preventing the **ot** output being switched ON during the times set with parameters PP1, PP2 and PP3 and therefore that any activation occurs only after all times are elapsed.

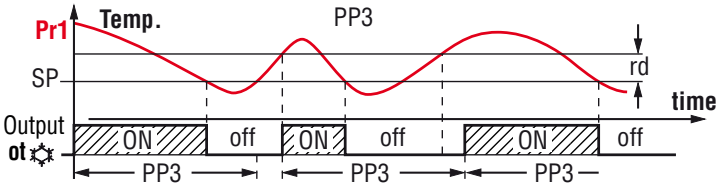
1 First control (parameter PP1) foresees a delay to **ot** output activation (switching-ON delay).



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



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



During the output inhibition the LED **OUT** (Cool ☼ or Heat ☀) blinks. It is also possible to prevent activation of all the outputs after the instrument is turned ON, for the time set in the parameter Pod.

During the power ON delay phase, the display shows the indication od alternated with the normal visualization.

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 Stopping compressor 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** continuous to operate in order to control thetemperature, also the output **dF** is enabled;

Et **With electrical heating and defrosting temperature control**: during defrosting, the output **ot** is deactivated while the output **dF** operate as evaporator temperature control.

In this mode the defrost lenght is by time-out (time *dde*). During the defrost, the **dF** output behaves as an heating mode control with Set Point = *dtE*, differential fixed at 1°C and operates with the values of the **EP** evaporator probe.

5.8.1 Starting automatic defrosts

The automatic control of defrost occours:

– By interval times (regular or dynamic);

– By Evaporator temperature;

– By continuous compressor running time.

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

Defrost by regular interval time

As an alternative to programmable defrosts, the instrument allows to execute the defrosts at programmed interval time.

Through the *ddC* parameter, can be set the defrost interval counting mode:

rt At real-time power-ON intervals. The *dd1* interval is counted as the total ignition time of the instrument. This mode is the one currently used in the refrigeration systems.

ct At time intervals of the compressor operation. The *dd1* interval is counted as the sum of the operating times of the **ot** output (**ot** output activated). This mode is usually used in refrigeration systems with compressor stop defrosting.

cS Defrost cycle at each compressor stop. The instrument starts a defrost cycle every time the **ot** output is deactivated, when the Set Point is reached or at the expiration of the interval set with *dd1* paramreter. If *dd1* = **oF** the defrost happens only at compressor stop.

This mode is used only on particular refrigerating machines in which is required the maximum evaporator efficiency at each compressor cycle.

To enable automatic defrost at intervals, after setting the *ddC* parameter as desired between **rt**, **ct** or **cS**, with the ddi parameter select the time interval between the end of a defrost and the beginning of the next.

The time that the instrument must wait to perform the first defrost after power ON can be set with parameter *d5d*. This allows to perform the first defrost to a different interval from *dd1* time.

To force the instrument to perform a defrost cycle at each power ON (as long as the conditions set with parameters *dt5* and *dtE* are satisfied) set parameter *d5d* = **oF**.

This allows the evaporator to be permanently defrosted, even when frequent interruptions to power supply occur that may cause the cancellation of the various defrosting cycles.

If instead it is desired that all the defrosts are performed at the same interval time, set *d5d* = *dd1*.

Setting *dd1* = **oF the** Automatic defrost function by interval is totally disabled (including the first, regardless of the time set to the *d5d* parameter).

Dynamic Defrost Intervals System

If *ddd* = **0** the Dynamic defrost is disabled.

Note: For this function is necessary to use the evaporator probe.

To enable the *Dynamic Defrost Intervals System*, program *ddC* = **rt**, **ct** or **cS** and set *ddd* = **any value**.

Setting *ddd* = **0**, the defrost intervals are those set by the user and the *Dynamic Defrost Intervals System* is disabled.

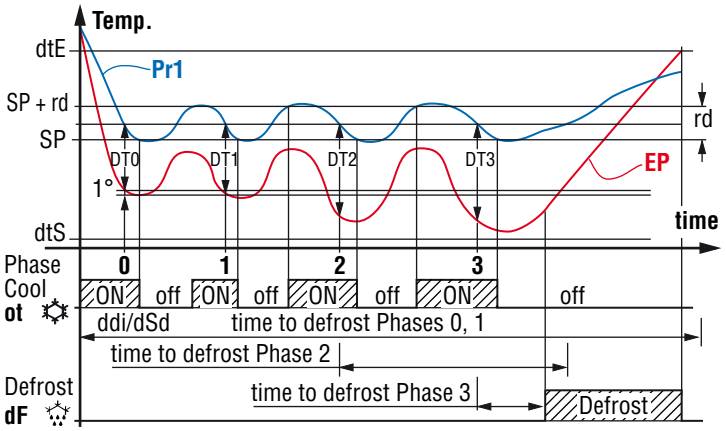
This mode allows to dynamically reduce the defrost interval counting (*dd1* or *d5d* if is the first defrost), anticipating, when necessary, the defrost execution, all based on an algorithm that detects a drop in the refrigerator thermal exchange performance.

The algorithm estimates a reduction in thermal exchange based on the increase in temperature difference between **Pr1** (cell control) and evaporator probe (probe configured as **EP**). The result is stored by the instrument when the temperature is close to the Set Point setting.

The advantage of the *Dynamic Defrost Interval* is the possibility to program a defrost interval time longer than normal.

In this way, when necessary, the instrument has the possibility to anticipate the defrost or to start the cycle after the programmed time.

If the system results correctly set, it is possible to avoid many unnecessary defrosting cycles (and therefore to obtain aconsistent energy saving) that may occur with normal operation when, to ensure more system efficiency, the defrosting interval is programmed with a time that is often too short.



Example “dynamic defrost intervals system” with a reduction *ddd* = **40%** and end defrost by temperature.

With the parameter *ddd* - *Defrost interval percentage reduction* is possible to establish the percentage of reduction of the remaining time to start defrost when the conditions for the reduction happen.

If parameter *ddd* = **100%** at the first increase of the stored difference of temperature (> 1°) between cell (**Pr1**) and evaporator (**EP**) probes a defrost starts immediately.

For correct functioning the instrument needs a first reference value of the temperature difference between cell and evapora-

tor, in this way all variations to the Active Set Point value, to the differential rd, the start of a continuous cycle or a defrost execution deletes this reference value and any reduction cannot be performed until the acquisition of a new reference value.

Defrost by evaporator temperature

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

This system can be used to guarantee a defrost if the evaporator reaches very low temperatures that normally result symptomatic of a bad thermal exchange in comparison to the normal working conditions.

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 the continuous operation for an extended period of the compressor is usually symptomatic of a bad thermal exchange in comparison to the normal working conditions.

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

5.8.2 Manual defrost

To start a manual defrost cycle, press the key ▲/☼ when in Normal operation mode and keep it pressed for about 5 s after which, if the conditions are correct, the LED ☼ lights up and the instrument performs a defrost cycle.

To stop a defrost cycle, press the key ▲/☼ during the defrost and keep it pressed for about 5 seconds.

5.8.3 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.

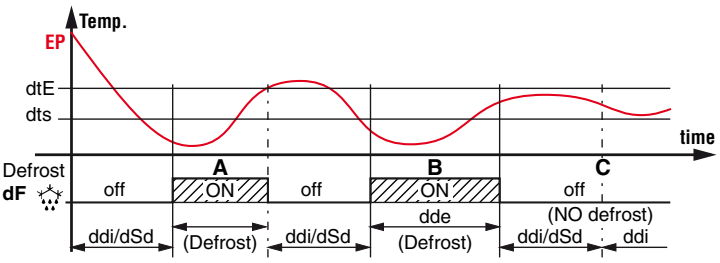
If the evaporator probe is not used or the thermostated defrost mode is used (ddy = **Et**), the cycle length is set by parameter ddE.

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.

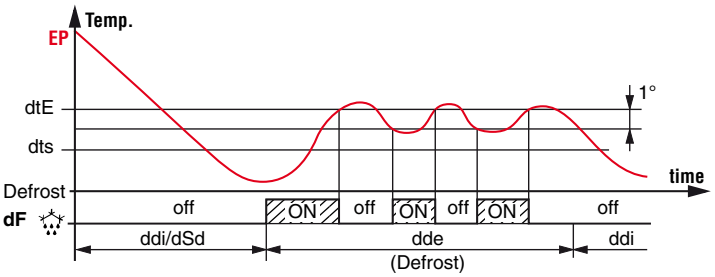
If this temperature is not reached in the time set in the parameter ddE, defrost cycle is interrupted.

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.



*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 ddE programmed time. During defrost the **dF** output switch ON/OFF to control evaporator temperature in heating mode with set point dtE and 1° differential (Hysteresis).*

The active defrost is shown on the instrument display with the lighting up of the LED ☼.

At the end of defrosting, it is possible to delay the new compressor start up (output **ot**) at the time set in parameter dtd to allow the evaporator to drain. During this delay, the LED ☼ flashes to indicate the draining state.

5.8.4 Intervals and defrosts duration in case of evaporator probe error

In event of evaporator probe error the defrosts occur at intervals dE1 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 (the time ddE is a security time-out) and in case is used the “Dynamic Intervals Defrost System” the interval is usually set more longer than what is normally programmed into instruments that do not have the function.

5.8.5 Display lock during Defrost

Through parameters ddL and AdA it is possible to define the display behaviour during defrost:

on The ddL parameter locks the display at the last temperature reading during all the defrost cycle until, at the end of defrost, the temperature has not reached the lock value or the value [SP + rd] or is elapsed the time set at parameter AdA

Lb Shows the label dEF during the defrost cycle and PdF after the defrost until, at the end of defrost, the temperature has not reached the lock value or the value [SP + rd] or is elapsed the time set on parameter AdA

oF The display continues showing the temperature measured by the Pr1 probe during the defrost cycle.

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 Ftn, FtF and FFE.

Parameters Ftn and FtF 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 that the **Fn** output continues working in cycles according to the times programmed at parameters Ftn (fan activation time) and FtF (fan deactivation time).

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

Programming Ftn = **oF** the output **Fn** in **ot OFF** condition remains switched **OFF**.

Programming instead Ftn to any value and FtF = **oF** the output **Fn** when **ot** in **OFF** condition remains switched **ON**.

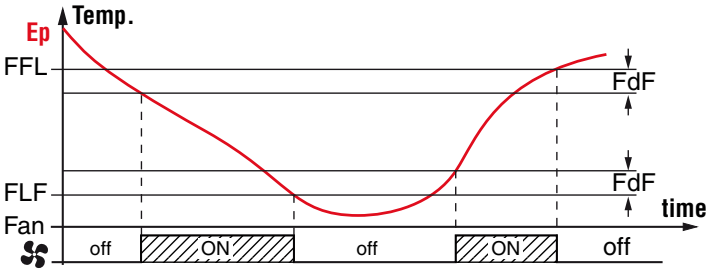
The parameter **FFE** decides whether the fans must always be switched **ON** independently of the defrosting status (FFE = **on**) or switched **OFF** during defrosting (FFE = **oF**).

In this later case, it is possible to delay the start up of the fans even after the end of the defrosting of the time set in the parameter FFd. When this delay is active the LED flashing to point out that the delay is in progress.

When the evaporator probe is used the fans, as well as being conditioned by the parameters Ftn, FtF 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, E2, -E2 and E3, -E3;

– Temperature alarms HA and LA;

– External alarm AL;

– Door open oP.

The alarm functions acts on LED ⚠, on the internal buzzer, if present and configured by the obu parameter and on the desired output if configured by parameters oA1, oA2 or oA3.

Any active alarm condition is signaled lighting up the LED ⚠, while the acknowledged alarm status is shown by flashing the LED ⚠.

The buzzer (if present) can be configured to point out the alarms by programming parameter obu = **1** or **3** and always acts to signal the acknowlegeable alarms. This means that, when activated, it can be switched **OFF** by briefly pressing any key.

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

At When the output is to be activated in alarm condition and can be deactivated manually by pressing any key of the instrument (typical application for an acoustic signal);

AL When the output is to be activated in alarm condition but cannot be deactivated manually; it is then deactivated only when the alarm status ceases (typical application for a light signal);

An When the output is to be activated in alarm condition and that remains active even when the alarm status has ceased. The disabling action (recognition of stored alarm) can only be carried out manually by pressing any key when the alarm status has removed (typical application for light signal).

-t when one wants the function described as At but with an inverse function (output activated in normal condition and disabled in alarm status).

-L This alarm function is similar to **AL** but with inverse logic (output active in normal conditions and disabled in alarm status).

-n This alarm function is similar to **An** but with inverse working logic (output active in normal conditions and disabled in alarm status).

The instrument offers the possibility to have the alarm memory function activated via the parameter AtA.

If AtA = **oF**, the instrument cancels the alarm signal when the alarm status ends, if instead AtA = **on**, the instrument maintains the alarm signal also when the alarm status ends.

To cancel the alarm memory signal, press any key.

It must be remembered that if an output function is desired with an alarm memory (oA1/oA2/oA3 = **An**/**-An**) it is necessary to set the parameter AtA = **on**.

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, displays *H./Lo*;
2 Relative Alarms referred to probe Pr1, displays *H./Lo*;
3 Absolute alarms referred to probe Au, displays *H./Lo*;
4 Relative Alarms referred to probe Au, displays *H./Lo*;
5 Absolute alarm referred to probe Pr1, displays no labels;
6 Relative alarm referred to probe Pr1, displays no labels;
7 Absolute alarm referred to probe Au, displays no labels;
8 Relative alarm referred to probe Au, displays no labels.

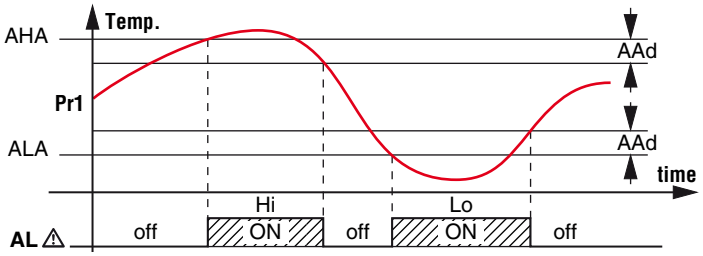
Using some parameters it is also possible to delay the enabling and the intervention of these alarms.

These parameters are:

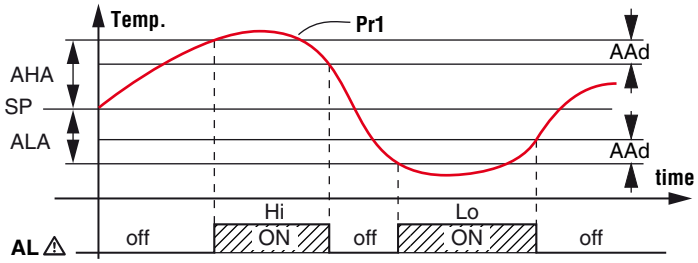
APA Temperature alarm exclusion time on switching ON the instrument if the instrument is in alarm status when it is switched ON. If the instrument is not in alarm status when it is switched on the time *APA* it is not considered.

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

AAt 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**, **5**, **7**).



or they assume the values [*SP* + *AHA*] and [*SP* + *ALA*] if the alarms are relative (*AAY* = **2**, **4**, **6**, **8**).



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 (⚠) and, if configured, also with the buzzer.

5.10.2 External alarm from digital input

The instrument can signal an alarm external to the instrument using the digital input setting *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 outputs at digital input intervention.

5.10.3 Open door alarm

The instrument can signal the open door alarm coondition using the digital input setting *iF.* = **1**, **2** and **3**. As the digital input is activated, the instrument signals that the door is open showing on the display the **oP** label alternated to the variable set with parameter *idS*.

After the delay set with parameter *AoA* the instrument signals the Open Door alarm with the configured devices (buzzer and/or Output), lighting up the LED ⚠ while showing the **oP** label. At the open door alarm intervention are also re-activated the inhibited outputs (compressor).

5.11 Function of keys U/⏻ and ⏷/Aux

Two of the instrument keys, in addition to their normal functions, can be configured to operate other commands. The U/⏻ key function can be defined using the *tUF* parameter while the ⏷/**Aux** key via parameter *tFb*. Both parameters have the same possibilities and can be configured to perform the following functions:

oF The key carries out no function;

1 Pressing the key for at least 1 s, it is possible to enable/disable, if configured, the auxiliary output (*oFo* = **2**);

2 Pressing the key for at least 1 s, can be sequentially select a **normal** or **eco** operating mode (*SP*/*SPE*). A selection has been made the display shows for about 1 s the active Set Point code (*SP* or *SPE*);

3 Pressing the key for at least 1 s is possible to switch the instrument from **ON** to **Stand-by** state and vice-versa;

4 Pressing the key for at least 1 s activates/deactivates a Turbo cycle.

6. ACCESSORIES

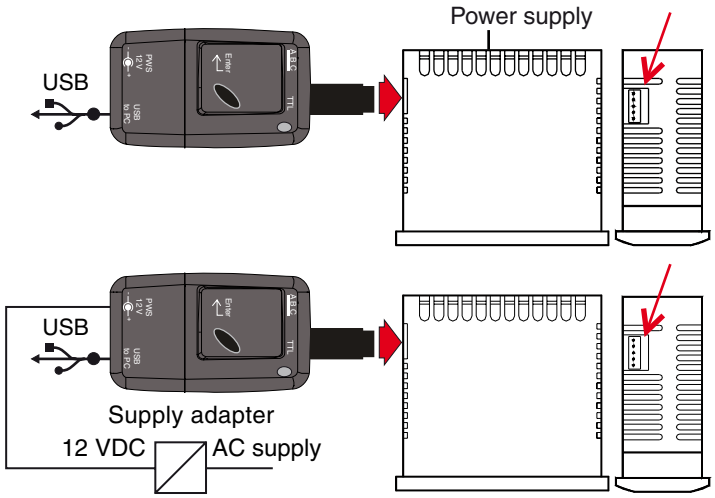
6.1 Parameters configuration by A01

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.

This 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.

To use the device **A01** it is necessary that the device or instrument are being supplied directly or through the key.



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

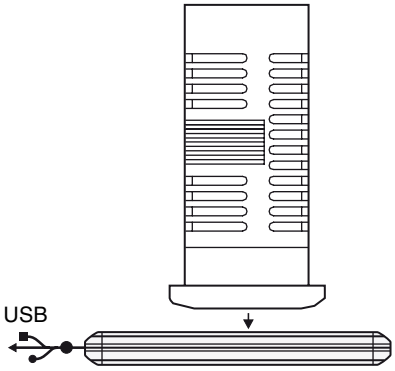
6.2 Parameters configuration by AFC1

The **AFC1** is a contactless **NFC** (**N**ear **F**ield **C**ommunications) connection device that allows to **Upload/Daownload** the operating parameters **From/To** the instruments.

The **AFC1** is powered directly by the **USB** port through which is connected to a **PC**.

When the instrument is equipped with the **NFC** communication option, the parameter configuration performed with the "*AT UniversalConf*" program (see previous paragraph) can be transferred to the instrument also through the **AFC1** device.

To load the operating parameters in the instrument using the **AFC1** device, place the instrument on the **AFC1** with the display facing the **NFC** symbol ((( ))), then send the parameters to the instrument's memory.



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.

Parameter		Description	Range	Def.	Note
1	SLS	Minimum Set Point	-99.9... HS	-50.0	
2	SHS	Maximum Set Point	LS... 999	99.9	
3	SP	Set Point	LS ÷ HS	0.0	
4	SPE	Set Point Eco	SP ÷ SHS	0.0	
5	SPH	Turbo Set Point (or indep. Heating Set Point, HC mode)	SLS ÷ SP	0.0	
6	uP	Unit of measurement and resolution (decimal point)	**C0** °C, resolution 1°; **F0** °F, resolution 1°; **C1** °C, resolution 0.1°; **F1** °F, resolution 0.1°.	C1	
7	rFt	Measurement filter	**oF** Not used; 0.1 ÷ 20.0 s	2.0	
8	rC1	Pr1 Probe Calibration	-30.0 ÷ +30.0°C/°F	0.0	
9	rC2	Pr2 Probe Calibration	-30.0 ÷ +30.0°C/°F	0.0	
10	rC3	Pr3 Probe Calibration	-30.0 ÷ +30.0°C/°F	0.0	
11	rCU	Display offset	-30.0 ÷ +30.0°C/°F	0.0	
12	rP2	Input Pr2 usage	**oF** Unused; **EP** Evaporator probe; **Au** Auxliary probe; **dG** Digital Input.	dG	
13	rP3	Input Pr3 usage		dG	
14	rF	Function and logic functioning of the Digital Input (adding the "-" minus sign the logic is inverted)	**0** No function; **1** Open Door; **2** Open Door with Fan Lock; **3** Open Door with Fan and Output Lock; **4** External Alarm; **5** External alarm with control output disabling; **6** Normal/Eco select; **7** On/Stand by select; **8** Start a Turbo cycle; **9** Defrost cycle start; **10** Defrost cycle end.	0	
15	rt	Digital Input Delay	**oF** Disabled; -1 ÷ -59 (s) ÷ 1 ÷ 99 (min).	oF	
16	rEt	Eco Mode activation delay at Door closed	**oF** Disabled; -1 ÷ -59 (min) ÷ 1 ÷ 99 (h).	oF	
17	rtt	Max. time functioning in Eco Mode	**oF** Disabled; -1 ÷ -59 (min) ÷ 1 ÷ 99 (h).	oF	
18	rdS	Variable normally displayed	**oF** Display not lit; **P1** Probe Pr1 measure; **P2** Probe Pr2 measure; **P3** Probe Pr3 measure; **Ec** Measure **Pr1** in Normal mode + **ECO** label when in ECO mode; **SP** Active Set Point.	P1	
19	rd	Differential (Hysteresis)	0.0 ÷ 30.0°C/°F	2.0	
20	rEd	Differential (Hysteresis) in ECO mode	0.0 ÷ 30.0°C/°F	2.0	
21	rHd	Differential (Hysteresis) in Turbo mode or Heating in HC mode	0.0 ÷ 30.0°C/°F	2.0	
22	rt1	Output activation time for Pr1 probe error	**oF** Disabled; -1 ÷ -59 (s) 1 ÷ 99 (min).	oF	
23	rt2	Output deactivation time for Pr1 probe error	**oF** Disabled; -1 ÷ -59 (s) 1 ÷ 99 (min).	oF	
24	rHC	Output operating mode	**H** Heating; **C** Cooling; **nr** Neutral zone; **HC** Neutral Zone with indep. Set Point; **C3** Cooling with3 autom. switch modes.	C	
25	rtC	Lengh of Turbo cycle	**oF** Function disabled; -1 ÷ -59 (min) 1 ÷ 99 (h).	oF	
26	dtE	Defrost stop temperature	-99.9 ÷ +999°C/°F	8.0	
27	dtS	Defrost enable temperature	-99.9 ÷ +999°C/°F	2.0	
28	dtF	Defrost start temperature	-99.9 ÷ +999°C/°F	-99.9	

Parameter		Description	Range	Def.	Note
29	dSt	Delay start Defrost by dtF start temperature	**oF** Function disabled; -1 ÷ -59 (s) ÷ 1 ÷ 99 (min)	1	
30	ddL	Display Lock during defrost	**oF** Not active; **on** Active at last measure; **Lb** Active with label (dEF during defrost and PdF at defrost).	oF	
31	dcd	Defrost activation time for continuous compressor operating	**oF** Disabled; -1 ÷ -59 (min) ÷ 1 ÷ 99 (h)	oF	
32	ddE	Max. defrost duration	**oF** Function disabled; -1 ÷ -59 (s) ÷ 1 ÷ 99 (min).	oF	
33	dtd	Compressor delay after defrost (drainage time)	**oF** Function disabled; -1 ÷ -59 (s) ÷ 1 ÷ 99 (min)	20	
34	ddt	Defrosting Type	**EL** Electrical heating/stop compressor; **in** Hot gas/reverse cycle; **no** Without compressor output condictioning; **Et** Electrical heating with evaporator temperature control.	EL	
35	ddC	Defrosting starting mode	**rt** Real time intervals; **ct** "ot" output on time intervals; **cS** defrost every "ot" switching off (+ rt intervals); **cL** Do not use.	rt	
36	dd i	Defrosting interval	**oF** Function disabled; -1 ÷ -59 (min) ÷ 1 ÷ 99 (h).	oF	
37	dSd	Delay first defrost after power-on	**oF** Defrost at power-on; -1 ÷ -59 (min) ÷ 1 ÷ 99 (h).	oF	
38	ddd	Dynamic Defrost Percentage reduction	0 ÷ 100%	0	
39	dE i	Defrosting interval for evaporator probe error	**oF** Function disabled; -1 ÷ -59 (min) ÷ 1 ÷ 99 (h)	6	
40	dEE	Lengh of defrost cycle for evaporator probe error	**oF** Function disabled; -1 ÷ -59 (s) ÷ 1 ÷ 99 (min).	10	
41	Ftn	Fan time activation with **ot** output (compressor) **OFF**	**oF** Function disabled; -1 ÷ -59 (s) ÷ 1 ÷ 99 (min).	5	
42	FtF	Fan time deactivation with **ot** output (compressor) **OFF**	**oF** Function disabled; -1 ÷ -59 (s) ÷ 1 ÷ 99 (min).	oF	
43	FFL	High temperature fan deactivation	- 99.9 ÷ 999 °C/°F	10.0	
44	FLF	Low temperature fan deactivation	- 99.9 ÷ 999°C/°F	-99.9	
45	FdF	Differential fan control	0.0 ÷ 30.0°C/°F	1.0	
46	FFE	Fan status during defrost	oF - on	oF	
47	FFd	Fan delay after defrost	**oF** Function disabled; -1 ÷ -59 (s) ÷ 1 ÷ 99 (min).	oF	
48	PP1	**ot** output delay at switching **ON**	**oF** Function disabled; -1 ÷ -59 (s) ÷ 1 ÷ 99 (min).	oF	
49	PP2	**ot** output delay after switching **OFF**	**oF** Function disabled; -1 ÷ -59 (s) ÷ 1 ÷ 99 (min).	oF	
50	PP3	Min. time between two **ot** output switching **ON**	**oF** Function disabled; -1 ÷ -59 (s) ÷ 1 ÷ 99 (min).	oF	
51	Pod	Outputs delay at power **ON**	**oF** Function disabled; -1 ÷ -59 (s) ÷ 1 ÷ 99 (min).	oF	
52	AAy	Temperature Alarm 1 type	**1** Absolute for **Pr1** with label H i or Lo; **2** Relative to **Pr1** with label H i or Lo; **3** Absolute for **Au** with label H i or Lo; **4** Relative to **Au** with label H i or Lo; **5** Absolute for **Pr1** with no label; **6** Relative to **Pr1** with no label; **7** Absolute for **Au** with no label; **8** Relative to **Au** with no label.	1	
53	AHA	High temperature Alarm threshold	**oF** Function disabled; -99.9 ÷ +999°C/°F.	oF	
54	ALA	Low temperature Alarm threshold	**oF** Function disabled; -99.9 ÷ +999°C/°F	oF	
55	AAd	Temperature Alarms Differential	0.0 ÷ 30.0°C/°F	1.0	
56	AAt	Temperature Alarms Delay	**oF** Function disabled; -1 ÷ -59 (s) ÷ 1 ÷ 99 (min).	oF	
57	AtA	Alarms memory	**oF** Alarm memory disabled; **on** Alarm memory enabled;	oF	

Parameter		Description	Range	Def.	Note
58	APA	Temperature Alarms delay at power ON	**oF** Function disabled; -1 ÷ -59 (s) ÷ 1 ÷ 99 (min).	2.00	
59	AdA	Temperature Alarms delay and unlock display delay after defrost	**oF** Function disabled; -1 ÷ -59 (min) ÷ 1 ÷ 99 (h).	1.00	
60	AoA	Open Door Alarm Delay	**oF** Function disabled; -1 ÷ -59 (s) ÷ 1 ÷ 99 (min).	3.00	
61	o o 1	OUT1 function	**oF** No function; **ot** Temperature control (compr.); **dF** Defrost; **Fn** Fans; **Au** Auxiliary; **At/-t** Silenceable alarm; **AL/-L** Not silenceable Alarm; **An/-n** Stored Alarm; **on** ON when the instrument is ON; **HE** Heating (Neutral zone control).	ot	
62	o o2	OUT2 function		dF	
63	o o3	OUT3 function		Fn	
64	obu	Buzzer function mode	**oF** Function disabled; **1** Active for alarms only; **2** Active for key pressed only; **3** Active for alarms and key pressed.	oF	
65	oFo	Auxiliary output function	**oF** Function disabled; **1** Control output **ot** delayed; **2** Manual activation by key or digital inpu; **3** Shop window light with Eco mode (ON with SP, OFF with SPE); **4** Internal light (OFF with door closed and ON with door opened).	oF	
66	otu	Time relative to auxiliary output	**oF** Function disabled; -1 ÷ -59 (s) ÷ 1 ÷ 99 (min).	oF	
67	tUF	(U)/(⏻) Key Function	**oF** No function; **1** Auxiliary output command; **2** Normal/Eco Mode selection; **3** Switch ON/Switch OFF (Stand-by); **4** Turbo cycle command.	oF	
68	tFb	(▼)/Aux Key Function		oF	
69	tLo	Keyboard lock function delay	**oF** Function disabled; -1 ÷ -59 (s) ÷ 1 ÷ 30 (min).	oF	
70	tEd	Set Point visibility with (P) key fast procedure	**0** None; **1** SP; **2** SPE; **3** SP and SPE; **4** Active SP; **5** SP and SPH; **6** SP, SPE and SPH.	4	
71	tPP	Password to Access Parameter functions	**oF** Function disabled; 001 ÷ 999.	oF	

8. PROBLEMS AND MAINTENANCE

8.1 Notifications

8.1.1 Error messages

Error	Reason	Action
E1 -E1 E2 -E2 E3 -E3	The probe may be interrupted (**E**) or in short circuit (**-E**) or may measure a value outside the range allowed	Check the probe connection with the instrument and check that the probe works correctly
EPr	Internal EEPROM memory error	Press (P) key
Err	Fatal memory error	Replace the instrument or ship to factory for repair

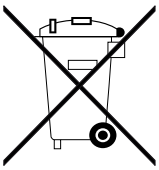
8.1.2 Other messages

Message	Reason
od	Delay at power-on in progress
Ln	Keyboard locked
H i	Maximum temperature alarm in progress
Lo	Minimum temperature alarm in progress
AL	Digital Input alarm in progress
oP	Door Open
dEF	Defrost in progress with ddL = Lb
PdF	Post-defrosting in progress with ddL = Lb
Eco	Eco Mode in progress
trb	Turbo Mode in progress

8.2 Cleaning

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

8.3 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: 230 VAC, 115 VAC, 12 VAC/VDC ±10%;

AC frequency: 50/60 Hz;

Power consumption: about 3.5 VA;

Inputs: **3 inputs** for **temperature probes**:
NTC (103AT-2, 10 kΩ @ 25°C);
1 free of voltage digital input as an alternative to **Pr3** input probe;

Output: Up to 3 relay outputs:

	EN 61810	EN 60730	UL 60730
Out1 (H) - SPST-NO - 30A - 2HP 250V, 1HP 125 VAC	30 (15) A	15 (15) A	15 A Res., 96 LRA, 16 FLA
Out1 (R) - SPST-NO - 16A - 1HP 250V, 1/2HP 125 VAC	16 (9) A	10 (4) A	12 A Res., 30 LRA, 5 FLA
Out2 - SPDT - 8A - 1/2HP 250V, 1/3HP 125 VAC	8 (3) A	8 (4) A	10 A Res.
Out3 - SPST-NO - 5A - 1/10HP 125/250 V	5 (1) A	2 (1) A	2 A Gen. Use

12 A max. for those with removable terminal model;

Relay output Electrical life: 100000 operations;

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

Overvoltage category: II;

Rated impulse voltage: 2500 V for 115/230 V; 500 V for 12-24 V;

Protection class: Class II;

Isolation: Reinforced insulation between the low voltage parts (type C or D power supply and relay output) and front panel; Reinforced insulation between the low voltage parts (type C or D power supply and relay output) and the extra low voltage section (inputs), No insulation between type F power supply 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: 78 x 35 mm, depth 64 mm;

Weight: about 190 g;

Mounting: Incorporated flush in panel (thickness max. 12 mm) in a 71 x 29 mm hole;

Connections:

Inputs: fixed or removable screw terminal block for 0.2 ÷ 2.5 mm²/AWG 24 ÷ 14 cables;

Power supply and Outputs: fixed or removable screw terminal block or Faston 6.3 mm for 0.2 ÷ 2.5 mm²/ AWG 24 ÷ 14 cables;

Protection degree: IP65 mounted with gasket and screw type bracket (both optional);

Pollution degree: 2;

Operating temperature: 0 ÷ 50°C;

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/stopping compressor or hot-gas/reverse cycle;
Measurement range: NTC: -50 ÷ +109°C/-58 ÷ +228°F;
Display resolution: 1° or 0.1° (range -99.9 ÷ +99.9°);
Overall accuracy: ±(0.5% fs + 1 digit);
Sampling rate: 130 ms;
Display: 3 Digit Red or Blue (optional), height 17.7 mm;
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),
Control 37/2005/CE (EN13485 air, S, A, 2, -50°C +90°C with probe NTC 103AT11).

11. INSTRUMENT ORDERING CODE

MODEL
e33 - = Instrument with mechanical keyboard
e33N - = Instrument with NFC technology and mechanical keyboard

a: POWER SUPPLY
D = 230 VAC
C = 115 VAC
F = 12 VAC/VDC

b: OUTPUT 1 (OUT 1)
H = Out1 Relay SPST-NO 16A-AC1 (for resistive loads)
R = Out1 Relay SPST-NO 30A-AC1 (for resistive loads)

c: OUTPUT 2 (OUT 2)
R = Out2 Relay SPDT 8A-AC1 (for resistive loads)
- = No

d: OUTPUT 3 (OUT 3)
R = Out3 Relay SPST-NO 5A-AC1 (for resistive loads)
- = No

e: BUZZER
B = Buzzer
- = No

f: POWER SUPPLY AND OUTPUT TERMINALS
V = Screw terminals (standard)
E = Complete removable screw terminals (step 5.00)
N = Removable screw terminals (step 5.00)
F = Faston 6.3 mm

g: INPUT TERMINALS
V = Screw terminals (standard)
E = Complete removable screw terminals (step 5.00)
N = Removable screw terminals (step 5.00)

h: DISPLAY
I = Red (standard)
C = Blue

j: PACKAGING + BRACKET TYPE
B = AT package + “Butterfly” type brackets (standard)
C = AT package + gasket + screw type bracket

	-	a	b	c	d	e	f	g	h	i	j	k	II	mm

i, k: RESERVED CODES; **II, mm**: SPECIAL CODES