

**DIGITAL ELECTRONIC TEMPERATURE
CONTROLLER WITH DEFROSTING
FUNCTION**

F 30



USER MANUAL - V2
www.osakasolutions.com

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.

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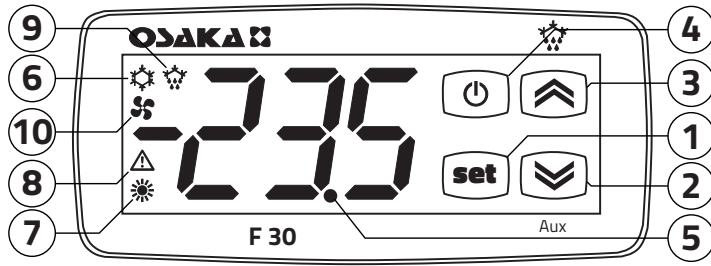
1. INSTRUMENT DESCRIPTION

1.1 General description

The model **F 30** 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 arrival at temperature or by length of time of continuous compressor operation 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.

1.2 Front panel description



1. **set**: 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 **set** can be used together with the **▲** key to change the programming level of the parameters. When the keyboard is locked, the keys **set** 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 selection, Aux output control etc. (see "Functions of keys **○** 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 **set** key to change parameters level. Pressed together with the **set** key for 5 s allows the keyboard unlock.
4. **○**: 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 **○** and **▼/AUX**").
5. **LED dp/Stand by**: 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 **set** 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 **set** key rapid procedure.

The parameter can have the following values:

0F The Set Points cannot be changed with the **set** key rapid procedure (pressing/releasing the **set** key, nothing happens);

- 1 Only SP can be set with this procedure ("normal" Set Point);
- 2 Only SPE can be set with this procedure ("Economic"/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 **set** 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 **set** button to exit the fast programming mode.

If also the "Economic" Set Point ($tEd = 3$) can be set, pressing and releasing again the **set** 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 **set** button to exit the fast Set Point change.

To exit the fast Setpoint programming mode push the **set** 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. For SPH ($tEd = 3$ or **6**) will be the same. of the one used for SPE.

2.2 Standard mode parameters programming

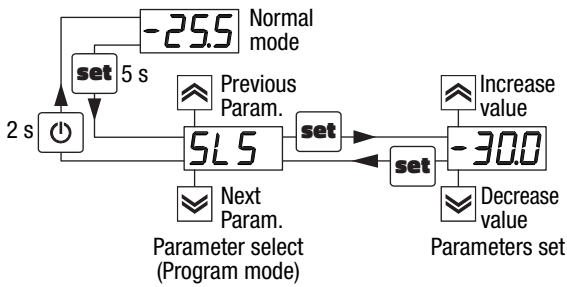
To access the instrument function parameters when password protection is disabled, press the key **set** and keep it pressed for about 5 seconds, after which the display shows the code that identifies the first programmable parameter

The desired parameter can be selected using the **▲/▼** keys, then, pressing the **set** 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 **set** 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 key pressed for 2 s.



2.3 Parameter protection using the password

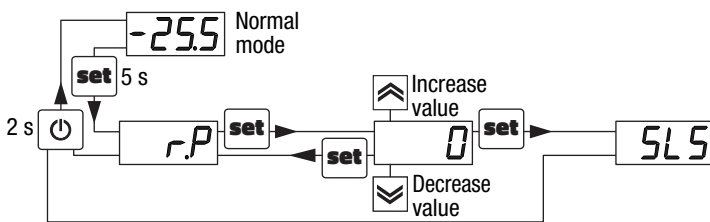
The instrument has a parameter protection function using a password that can be personalised through the tPP parameter. To protect the parameters, set the desired password number in the parameter tPP .

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

Press the key, the display shows 0, using the keys, insert the programmed password number and press the key 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 $\text{tPP} = \text{of}$.



Note: If the Password gets lost, just switch OFF and ON the instrument, push 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 tPP .

2.4 Customized mode parameter programming (parameters programming level)

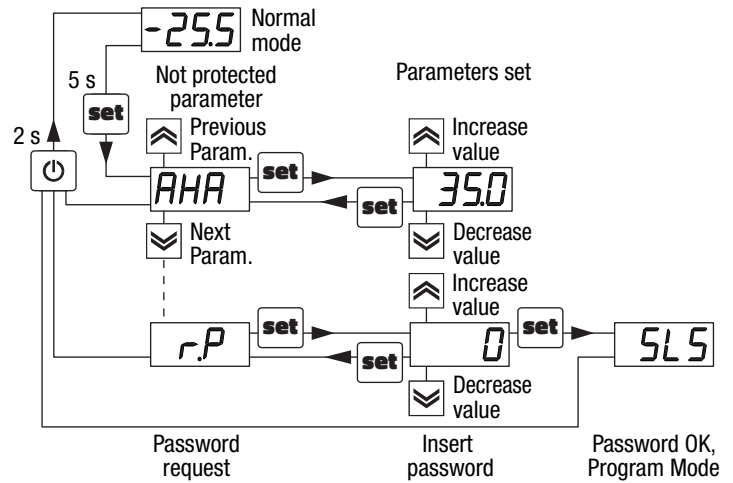
The password hides all the configuration parameters behind a factory set password to avoid unwanted changes to the controller parameters. To make a parameter accessible without having to enter the password when tPP password protection is activate, use the procedure that follows:

Enter the program mode using the tPP 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 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 tPP 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 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 shows SLn to indicate that the lock is active.

To unlock the keyboard it is enough to contemporarily push + 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 equipment must be adequately protected and away from liquids, dust, grease and dirt. They must be accessible only with the use of a right tool and safety system (except the front).

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

It is recalled that the installer must ensure that the norm for electromagnetic compatibility is respected after implantation in

the installation of equipment, eventually using the right filters if is needed.

In case of failure or malfunction of measuring and control equipment that can create dangerous situations or damage to persons, things, animals or products (defrost food or changes in their ideal state), it is recalled that the facility should be equipped with electronic devices or electromechanical safety and warning system.

They should be placed outside the measuring and control equipments, possible protective devices, responding to specific safety requirements that are covered by the norm of the product or suggest the common sense.

For your own safety, is highly recommended fulfilling the instructions provided above.

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.

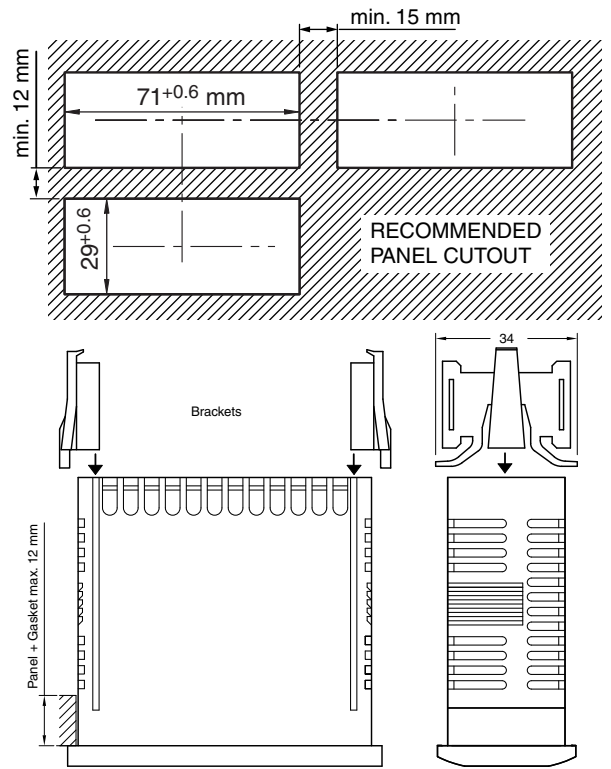
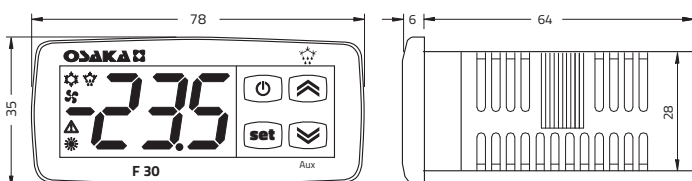
We recommend that the gasket is mounted in order to obtain the front protection degree as declared.

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..

4.1.1 Mechanical dimensions, panel cut-out and mounting [mm]



4.2 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.

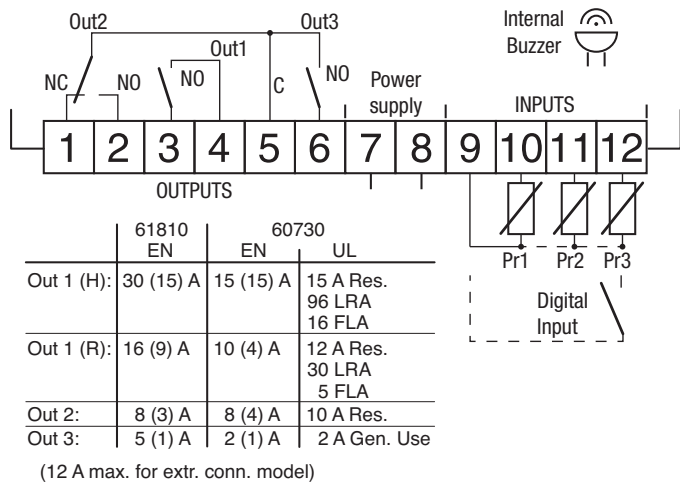
Furthermore, the input cable of the probe has to be kept separate from line voltage wiring. If the input cable of the probe is screened, it has to be connected to the ground at only one side.

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.

4.2.1 Electrical wiring diagram



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 \odot pressed for 1 s if $tUF = 3$;
- With the key ∇/AUX pressed for 1 s if $tFb = 3$;
- Using the Digital Input if parameter $iF_i = 7$;

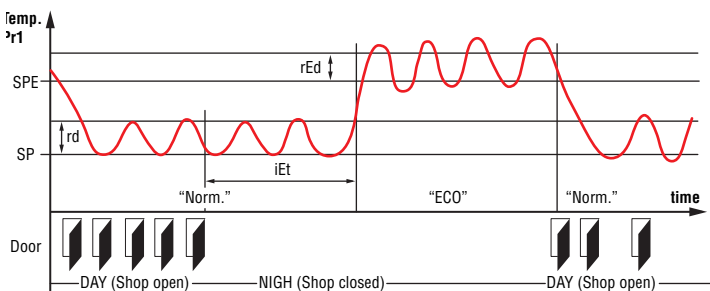
5.2 Normal, Economic and Turbo operation

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** - r_d , **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 \odot key if parameter $tUF = 2$;
- Using the ∇ key if parameter $tFb = 2$;
- Using the Digital Input if parameter $iF_i = 6$.

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

- Elapsed the tEt time after the door has been closed (Normal/

Eco switching).

- At door opening if the SPE Setpoint is activated by tEt parameter (Eco/Normal switching).
- Elapsed the tEt time after the door has been closed and from the activation of SPE Setpoint by tEt parameter (Eco/Normal switching).

To use this function, it is necessary to set the Digital Input as:

$iF_i = 1, 2$ or 3 .

If $tEt = \text{OFF}$ the selection of Eco/Normal modes via the digital input is disabled.

If $tEt = \text{OFF}$ the time-out switching from Eco to Normal mode is disabled.

Switching to Economic mode is indicated by the label Eco .

When $tdS = \text{E}$ 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 tdS .

When used as a shop window light ($oF_o = 3$), **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 \odot key if parameter $tUF = 4$;
- Pressing the ∇/AUX key if parameter $tFb = 4$;
- From digital input if parameter $iF_i = 8$;

Turbo mode can be selected automatically:

- Leaving Eco mode (only if $rHE = \text{C3}$)
- Every time the instrument is switched ON (only if $rHE = \text{C3}$ and $Pr1 > SPE + rEd$)

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

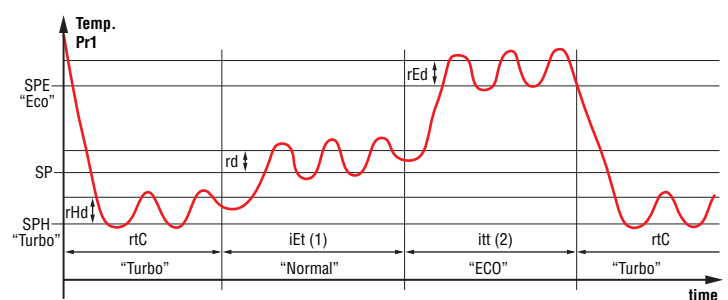
Setting $rHE = \text{C3}$ gives the following operating cycle:

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 rEt the instrument automatically switches 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 tEt 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 tEt .

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 tEt 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 *SL5* and the one set with parameter *SH5* 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 *SH5*; the Turbo Set point (*SHP*) can be set to a value between the one set with parameter *SL5* 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 (**CO** = °C/1°; **C1** = °C/0.1°; **FO** = °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 *iL1* (input Pr1), *iL2* (Pr2 input) and *iL3* (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 *iF* 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 *iD5* 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 *EcD* if the instrument is in (**Eco mode**);

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

When one of the measures is displayed (*iD5* = **P1/P2/Ec**) the *iLU* 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 *iD5* parameter, all the measurement variables can be shown pressing the  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 /AUX key for

3 s. At the end of the key /AUX 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 display mode after 15 s from the last  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 *iL*. 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 *iL*) the instrument displays alternately *oP* and the variable set at *iD5* parameter. With this mode of operation of the digital input activates also the time set with parameter *ROR* 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 (*ROR*), 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 (*ROR*) both the fans and the compressor are re-activated.

4. External alarm signal with NO contact: at input closing (and after the *iL* 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 *iL* 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 *iL* 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 *iL* time) the instrument is switched ON while it is placed in Stand-by mode when the digital input is open;

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

-1, -2, -3, etc. - 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 *oo1*, *oo2* and *oo3*.

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 ($rHE = nr$ or HC);

oF Output disabled.

If one of the outputs is configured as auxiliary output ($o01/o02/o03 = Au$), its function is set by parameter $oF0$ and its operation can be conditioned by the time set to at parameter oTv .

Parameter $oF0$ can be configured for the following functions:

- oF** Auxiliary output not active;
- 1** Temperature control output delayed with NA contact: the auxiliary output is activated with a delay that can be set with parameter oTv 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 (\odot or \ominus/AUX): the output is activated by pressing the keys \odot or \ominus/AUX 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 oTv . When $oTv = oF$ the output is activated and deactivated only manually, using the \odot or \ominus/AUX keys or via the digital input. Differently, the output, once activated, is turned OFF automatically after the oTv 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 ($rF1 = 1, 2, 3$).

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

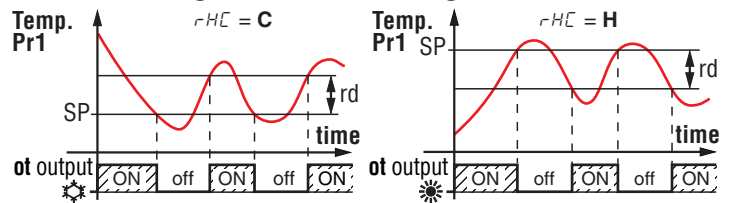
- oF** Buzzer always disabled;
- 1** The Buzzer sounds when an alarm is active;
- 2** The Buzzer sounds when a key pressed (no alarm);
- 3** The Buzzer sounds when a key pressed and when an alarm is active.

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 active Set Point/s $SP/SPH/SPH$, the Histeresys $r-d/rEd/rHd$ and the function mode set with rHE parameter.

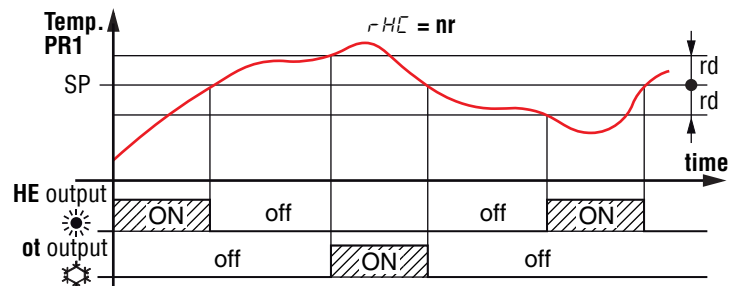
Using the rHE parameter can be obtained the functions that follow.

$rHE = C$ (Cooling) or $rHE = H$ (Heating)



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

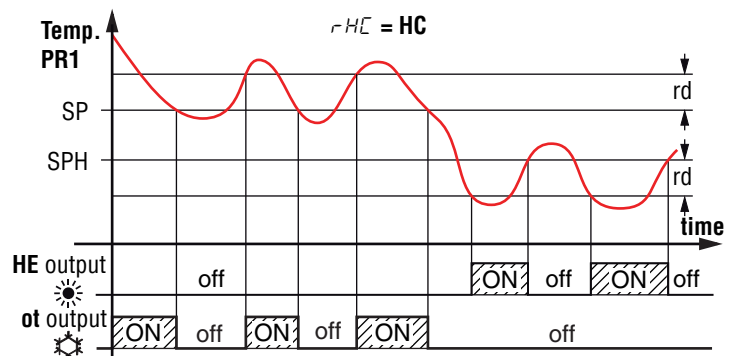
$rHE = nr$ (Neutral Zone)



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

$rHE = HC$

(Cooling and Heating with independent Set Points)



As in the previous case, when $rHE = HC$ the output configured as **ot** operates with cooling action (like $rHE = C$) 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 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* = **OFF** the output, in probe error condition, will always be OFF. On the contrary, programming *rt1* to any value and *rt2* = **OFF** the output, in probe error conditions, will always be on.

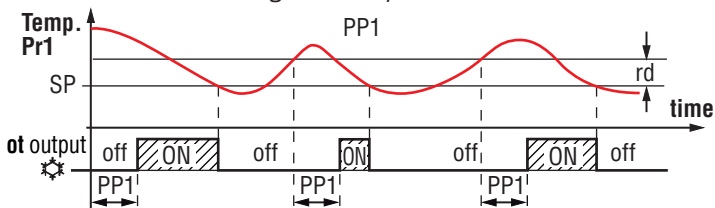
Remember that the operation of the temperature controller can be conditioned by the following functions: *Compressor protection function and power-on delay, Defrost, Open door and External alarm with output block* from digital input.

5.7 Compressor protection function and power-on delay

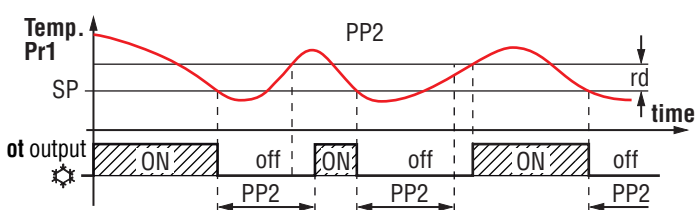
The "**Compressor Protection**" function aims to avoid repeated compressor start-ups controlled by the instrument in cooling applications or otherwise can be used to add a timed control on the actuator control output

This function foresees 3 time controls on the switching ON 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).

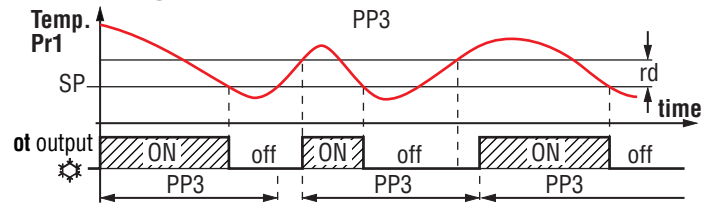


2. Second control (parameter *PP2*) foresees an inhibition to the activation of the output by a time delay that starts when the output is turning OFF (delay after switching-OFF).



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 the temperature, 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 length is by time-out (time *ddE*). During the defrost, the **dF** output behaves as an heating mode control with Set Point = *ddE*, 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 occurs:

- 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 *dd5* 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 ddi parameter. If $ddi = \mathbf{oF}$ 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 ddi 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 ddi time.

To force the instrument to perform a defrost cycle at each power ON (as long as the conditions set with parameters $d5t$ and $d5E$ are satisfied) set parameter $d5d = \mathbf{oF}$.

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 $d5d = ddi$.

Setting $ddi = \mathbf{oF}$ 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 $ddd = \mathbf{0}$ the Dynamic defrost is disabled.

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

To enable the *Dynamic Defrost Intervals System*, program $ddi = \mathbf{rt}$, **ct** or **cS** and set $ddd = \mathbf{any\ value}$.

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

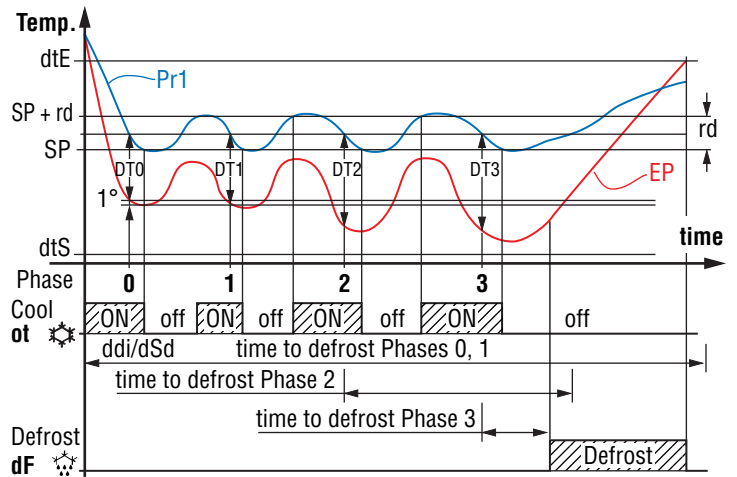
This mode allows to dynamically reduce the defrost interval counting (ddi or $d5d$ if is the first defrost), anticipating, when necessary, the defrost execution, all based on an algorithm that detects a drop in the refrigerator thermal exchange performance.

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 a consistent 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 $ddd = \mathbf{40\%}$ 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 $ddd = \mathbf{100\%}$ at the first increase of the stored difference of temperature ($> 1^\circ$) 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 evaporator, 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 $d5F$ 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 $d5F = \mathbf{-99.9}$ 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 $dcd = \mathbf{oF}$ 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.

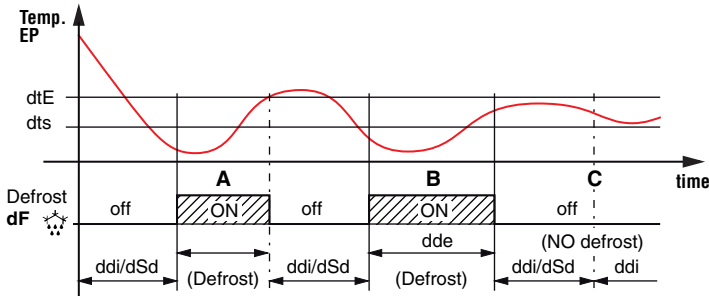
If the evaporator probe is not used or the thermostated defrost mode is used ($ddy = \mathbf{Et}$), the cycle length is set by parameter dde .

If the Evaporator Probe (**EP**) is used and the thermostated electric defrost is not selected ($ddY = \mathbf{EL, in, no}$), the defrost time occurs when the temperature measured by **EP** probe exceeds the temperature at parameter $d\text{t}E$.

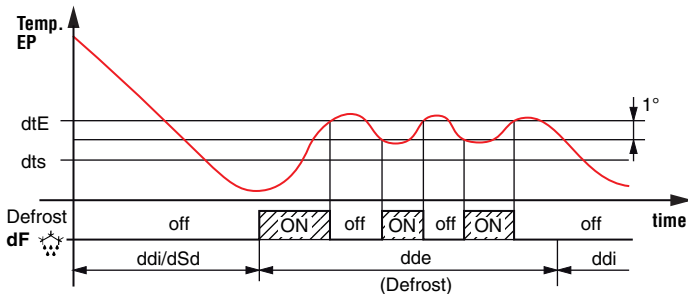
If this temperature is not reached in the time set in the parameter $d\text{d}E$, defrost cycle is interrupted.

To avoid unnecessary defrosting when the evaporator temperature is high in modes $ddC = \mathbf{rt, ct, cS}$ parameter $d\text{t}S$ 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 $d\text{t}S$ and also $d\text{t}E$ the defrosting is inhibited.




Example: Defrost A ends due to reaching of temperature $d\text{t}E$, defrost B ends at the end of the $d\text{d}E$ time as the temperature $d\text{t}E$ is not reached, defrosting C does not take place as the temperature is higher than $d\text{t}S$.



*Example of electric defrost with evaporator temperature control: the defrost end after $d\text{d}E$ programmed time. During defrost the **dF** output switch ON/OFF to control evaporator temperature in heating mode with set point $d\text{t}E$ 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 $d\text{t}d$ 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 $d\text{t}E$, and duration $d\text{d}E$.

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 $d\text{d}E$ 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 $d\text{d}L$ and $R\text{d}R$ it is possible to define the display behaviour during defrost:

$d\text{d}L = \mathbf{on}$

The $d\text{d}L$ 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 $R\text{d}R$

$d\text{d}L = \mathbf{Lb}$

Shows the label $d\text{E}F$ during the defrost cycle and $P\text{d}F$ 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 $R\text{d}R$

$d\text{d}L = \mathbf{oF}$

The display continues showing the temperature measured by the $P\text{r}1$ 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 $F\text{t}n$, $F\text{t}F$ and $F\text{F}E$.

Parameters $F\text{t}n$ and $F\text{t}F$ can be used to determine the behavior of the evaporator fans when the **ot** output (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 $F\text{t}n$ (fan activation time) and $F\text{t}F$ (fan deactivation time).

When output **ot** is switched **OFF** the instrument activates the output **Fn** for the time $F\text{t}n$, then deactivates it for the time $F\text{t}F$ and so on whilst the output **ot** remains **OFF**.

Programming $F\text{t}n = \mathbf{oF}$ the output **Fn** in **ot OFF** condition remains switched **OFF**.

Programming instead $F\text{t}n$ to any value and $F\text{t}F = \mathbf{oF}$ the output **Fn** when **ot** in **OFF** condition remains switched **ON**.

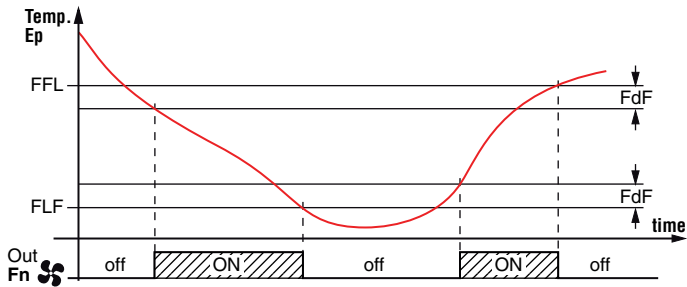
The parameter **FFE** decides whether the fans must always be switched **ON** independently of the defrosting status ($F\text{F}E = \mathbf{on}$) or switched **OFF** during defrosting ($F\text{F}E = \mathbf{oF}$).

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 $F\text{F}d$. 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 $F\text{t}n$, $F\text{t}F$ and $F\text{F}E$, 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 $F\text{F}L$ parameter (too hot) or even when it is lower than the $F\text{L}F$ parameter (too cold).

The relative differential that can be set in parameter $F\text{d}F$ 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 H_i and L_o ;
- External alarm AL ;
- Door open oP .

The alarm functions acts on LED Δ , on the internal buzzer, if present and configured by the obu parameter and on the desired output if configured by parameters $oo1$, $oo2$ or $oo3$.

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

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 acknowledgeable 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 RLR .

If $RLR = oF$, the instrument cancels the alarm signal when the alarm status ends, if instead $RLR = on$, 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 ($oo1/oo2/oo3 = An/-An$) it is necessary to set the parameter $RLR = on$.

5.10.1 Temperature alarms

The temperature alarm works according to **Pr1** or **AU** probes measurement, the type of alarm set in the parameter ARY the alarm thresholds set in parameters RHR (maximum alarm) and RLR (minimum alarm) and the relative differential RRd .

Through parameter ARY it is possible to set the alarm thresholds RHR and RLR as absolute or relative to the active Set Point, must be related to $Pr1$ or Au probes and if the message H_i (High alarm) and L_o (Low Alarm) are to be displayed at alarm intervention.

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

- 1 Absolute alarms referred to probe $Pr1$, displays H_i/L_o ;
- 2 Relative Alarms referred to probe $Pr1$, displays H_i/L_o ;
- 3 Absolute alarms referred to probe Au , displays H_i/L_o ;
- 4 Relative Alarms referred to probe Au , displays H_i/L_o ;
- 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.

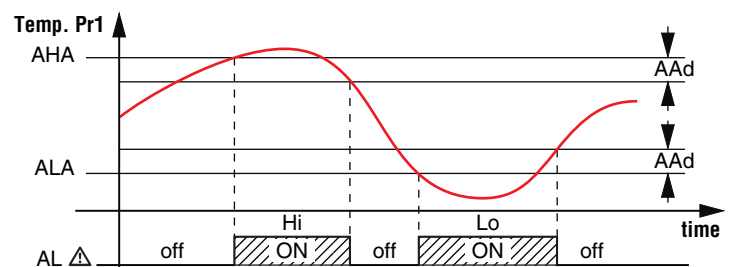
Using some parameters it is also possible to delay the enabling and the intervention of these alarms.

These parameters are:

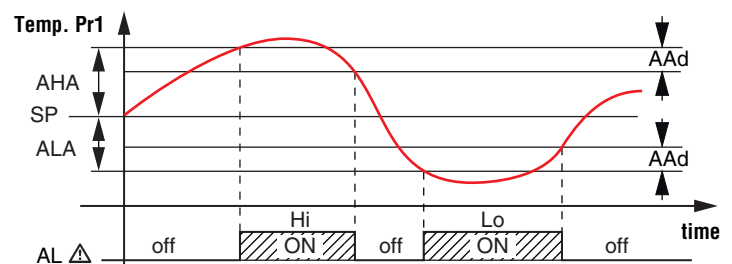
APR Temperature alarm exclusion time on switching ON the instrument if the instrument is in alarm status when it is switched ON. If the instrument is not in alarm status when it is switched on the time APR it is not considered.

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

ARL Temperature alarms delay activation time. Temperature alarms are enabled at the end of the exclusion times and are activated after the ARL 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 RHR and RLR when the alarms are set as absolute ($ARY = 1, 3, 5, 7$).



or they assume the values $[SP + RHR]$ and $[SP + RLR]$ if the alarms are relative ($ARY = 2, 4, 6, 8$).



The maximum and minimum temperature alarms can be disabled

by setting the related parameters R_{HRA} and $R_{LRA} = \mathbf{oF}$.

The temperature alarms are signalled lighting up the alarm LED (Δ) 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 $iF_i = \mathbf{4}$ or $\mathbf{5}$. The instrument signals the alarm turning **ON** the alarm LED (Δ) and displaying R_L label alternated to the variable set with parameter i_{d5} .



Mode $iF_i = \mathbf{4}$ operates no action on the control output, while $iF_i = \mathbf{5}$ deactivates the control output at digital input intervention.

5.10.3 Open door alarm

The instrument can signal the open door alarm condition using the digital input setting $iF_i = \mathbf{1}$, $\mathbf{2}$ and $\mathbf{3}$. 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 i_{d5} .

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

5.11 Function of keys and /AUX

Two of the instrument keys, in addition to their normal functions, can be configured to operate other commands. The  key function can be defined using the L_{UF} parameter while the /AUX key via parameter L_{Fb} . 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 ($oF_o = \mathbf{2}$);
2. Pressing the key for at least 1 s, can be sequentially select a **normal** or **eco** operating mode (SP/SP_E).
A selection has been made the display shows for about 1 s the active Set Point code (SP or SP_E);
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.

5.12 Parameters configuration by "KEY USB"

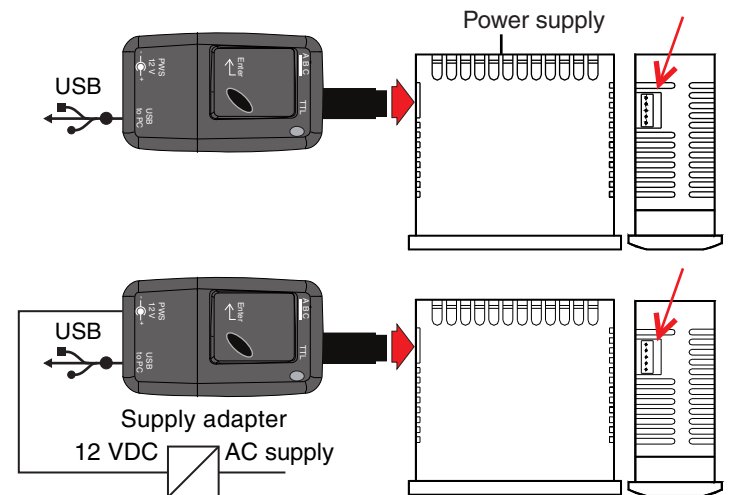
The instrument is equipped with a connector that allows the transfer from and toward the instrument of the functioning parameters through the device **KEY USB** with 5 poles connector.



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 KEY USB 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 KEY USB instruction manual.

6. 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 ÷ SHS	-50.0	
2	SHS Maximum Set Point	SLS ÷ 999	99.9	
3	SP Set Point	SLS ÷ SHS	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	iuP 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	iFt Measurement filter	oF ÷ 20.0 sec	2.0	
8	iC1 Pr1 Probe Calibration	-30.0 ÷ +30.0°C/°F	0.0	
9	iC2 Pr2 Probe Calibration	-30.0 ÷ +30.0°C/°F	0.0	
10	iC3 Pr3 Probe Calibration	-30.0 ÷ +30.0°C/°F	0.0	
11	iCU Display offset	-30.0 ÷ +30.0°C/°F	0.0	
12	iP2 Input Pr2 usage	oF - Unused; EP - Evaporator probe; Au - Auxiliary probe; dG - Digital Input.	EP	
13	iP3 Input Pr3 usage		dG	
14	iFi Function and logic functioning of the Digital Input (adding the "-" minus sign the logic is inverted)	0 - No function; -1/1 - Open Door; -2/2 - Open Door with Fan Lock; -3/3 - Open Door with Fan and Output Lock; -4/4 - External Alarm; -5/5 - External alarm with control output disabling; -6/6 - Normal/Eco select; -7/7 - On/Stand by select; -8/8 - Start a Turbo cycle; -9/9 - Force defrost by digital input (N.O) and after the "iti" time; -10/10 - Finish defrost in progress by digital input (N.O) and after the "iti" time.	5	
15	iti Digital Input Delay	oF - Disabled; -1 ÷ -59 (sec) / 1 ÷ 99 (min).	-5	
16	iEt Eco Mode activation delay at Door closed	oF - Disabled; -1 ÷ -59 (min) / 1 ÷ 99 (hrs).	oF	
17	itt Max. time functioning in Eco Mode	oF - Disabled; -1 ÷ -59 (min) / 1 ÷ 99 (hrs).	oF	
18	idS 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 (sec) / 1 ÷ 99 (min).	oF	
23	rt2 Output deactivation time for Pr1 probe error	oF - Disabled; -1 ÷ -59 (sec) / 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 with 3 autom. switch modes.	C	


Parameter	Description	Range	Def.	Note
25	rtC Length of Turbo cycle	oF - Disabled; -1 ÷ -59 (min) / 1 ÷ 99 (hrs).	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	
29	dSt Delay start Defrost by <i>dEF</i> start temperature	oF - Disabled; -1 ÷ -59 (sec) / 1 ÷ 99 (min)	1	
30	ddl Display Lock during defrost	oF - Not active; on - Active at last measure; Lb - Active with label (<i>dEF</i> during defrost and <i>PdF</i> at defrost).	Lb	
31	dcd Defrost activation time for continuous compressor operating	oF - Disabled; -1 ÷ -59 (min) / 1 ÷ 99 (hrs).	oF	
32	dde Max. defrost duration	oF - Disabled; -1 ÷ -59 (sec) / 1 ÷ 99 (min).	30	
33	dtd Compressor delay after defrost (drainage time)	oF - Disabled; -1 ÷ -59 (sec) / 1 ÷ 99 (min)	2	
34	ddt Defrosting Type	EL - Electrical heating/stop compressor; in - Hot gas/reverse cycle; no - Without compressor output conditioning; Et - Electrical heating with evaporator temperature control.	EL	
35	ddc Defrosting starting mode	rt - At intervals per time when connecting the equipment; ct - At intervals for compressor operating time (compressor output activated); cs - Defrost for each stop of the compressor (compressor output off by reaching the Set + interval rt); cl - A schedule set by clock in real time.	rt	
36	dPE Mode of the ending of the defrost	oF - It is finalized only by time; EP - By temperature probe EP; P1 - By temperature Probe Pr1	EP	
37	ddi Defrosting interval	oF - Disabled; -1 ÷ -59 (min) / 1 ÷ 99 (hrs).	6	
38	dSd Delay first defrost after power-on	oF - Disabled; -1 ÷ -59 (min) / 1 ÷ 99 (hrs).	6	
39	ddd Dynamic Defrost Percentage reduction	0 ÷ 100%	0	
40	dEi Defrosting interval for evaporator probe error	oF - Disabled; -1 ÷ -59 (min) / 1 ÷ 99 (hrs).	6	
41	dEE Length of defrost cycle for evaporator probe error	oF - Función desactivada; -1 ÷ -59 (sec) / 1 ÷ 99 (min).	10	
42	Ftn Fan time activation with ot output (compressor) OFF	oF - Función desactivada; -1 ÷ -59 (sec) / 1 ÷ 99 (min).	5	
43	FtF Fan time deactivation with ot output (compressor) OFF	oF - Disabled; -1 ÷ -59 (sec) ÷ 1 ÷ 99 (min).	oF	
44	FFL High temperature fan deactivation	-99.9 ÷ 999°C/°F	10.0	
45	FLF Low temperature fan deactivation	-99.9 ÷ 999°C/°F	-99.9	
46	FdF Differential fan control	0.0 ÷ 30.0°C/°F	1.0	
47	FFE Fan status during defrost	oF - on	oF	
48	FFd Fan delay after defrost	oF - Disabled; -1 ÷ -59 (sec) / 1 ÷ 99 (min).	2	
49	PP1 ot output delay at switching ON	oF - Disabled; -1 ÷ -59 (sec) / 1 ÷ 99 (min)	oF	
50	PP2 ot output delay after switching OFF	oF - Disabled; -1 ÷ -59 (sec) / 1 ÷ 99 (min).	oF	
51	PP3 Min. time between two ot output switching ON	oF - Disabled; -1 ÷ -59 (sec) / 1 ÷ 99 (min).	oF	
52	Pod Outputs delay at power ON	oF - Disabled; -1 ÷ -59 (sec) / 1 ÷ 99 (min).	oF	

Parameter	Description	Range	Def.	Note
53	AAy Temperature Alarm 1 type	1 - Absolute for Pr1 with Hi-Lo label; 2 - Relative to Pr1 with Hi-Lo label; 3 - Absolute for Au with Hi-Lo label; 4 - Relative to Au with Hi-Lo label; 5 - Absolute for Pr1 no label; 6 - Relative to Pr1 no label; 7 - Absolute for Au no label; 8 - Relative to Au no label.	1	
54	AHA High temperature Alarm threshold	oF - Disabled; -99.9 ÷ +999 °C/°F.	oF	
55	ALA Low temperature Alarm threshold	oF - Disabled; -99.9 ÷ +999 °C/°F	oF	
56	AAAd Temperature Alarms Differential	0.0 ÷ 30.0 °C/°F	1.0	
57	AAAt Temperature Alarms Delay	oF - Disabled; -1 ÷ -59 (sec) / 1 ÷ 99 (min).	oF	
58	AtA Alarms memory	oF - on	oF	
59	APA Temperature Alarms delay at power ON	oF - Disabled; -1 ÷ -59 (min) / 1 ÷ 99 (hrs).	2	
60	AdA Temperature Alarms delay and unlock display delay after defrost	oF - Disabled; -1 ÷ -59 (min) / 1 ÷ 99 (hrs).	-5	
61	AoA Open Door Alarm Delay	oF - Disabled; -1 ÷ -59 (sec) / 1 ÷ 99 (min).	3	
62	oo1 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;	ot	
63	oo2 OUT2 function	on - ON when the instrument is ON; HE - Heating (Neutral zone control).	dF	
64	oo3 OUT3 function	HE - Heating (Neutral zone control).	Fn	
65	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.	3	
66	oFo Auxiliary output function	oF - Function disabled; 1 - Control output ot delayed; 2 - Manual activation by key or digital input; 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). 5 - Manual activation of the output configured as auxiliary by keyboard even in Stand-by state.	5	
67	otu Time relative to auxiliary output	oF - Disabled; -1 ÷ -59 (sec) / 1 ÷ 99 (min).	oF	
68	tUF  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.	3	
69	tFb  / AUX Key Function	oF - Disabled; 1 - SP; 2 - SPE; 3 - SP y SPE; 4 - SP Activo; 5 - SP y SPH; 6 - SP, SPE y SPH.	oF	
70	tLo Keyboard lock function delay	oF - Disabled; -1 ÷ -59 (sec) / 1 ÷ 30 (min)	oF	
71	tEd Set Point visibility with key fast procedure 	0 - None; 1 - SP; 2 - SPE; 3 - SP y SPE; 4 - SP Activo; 5 - SP y SPH; 6 - SP, SPE y SPH.	4	
72	tPP Password to Access Parameter functions	oF - Disabled; 001 ÷ 999.	oF	

7. PROBLEMS, MAINTENANCE AND WARRANTY

7.1 Notifications

7.1.1 Error messages

Error	Reason	Action
<i>E1 -E1</i> <i>E2 -E2</i> <i>E3 -E3</i>	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
<i>EP_r</i>	Internal EEPROM memory error	Press  key
<i>E_{rr}</i>	Fatal memory error	Replace the instrument or ship to factory for repair

7.1.2 Other messages

Message	Reason
<i>od</i>	Delay at power-on in progress
<i>L_n</i>	Keyboard locked
<i>H_i</i>	Maximum temperature alarm in progress
<i>L_o</i>	Minimum temperature alarm in progress
<i>AL</i>	Digital Input alarm in progress
<i>oP</i>	Door Open
<i>dEF</i>	Defrost in progress with <i>ddl = Lb</i>
<i>PdF</i>	Post-defrosting in progress with <i>ddl = Lb</i>
<i>Eco</i>	Eco Mode in progress
<i>t_{rb}</i>	Turbo Mode in progress

7.2 Cleaning

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

7.3 Warranty and Repairs

This device has a guarantee in form of repair or replacement by manufacturing defects in materials of 12 months from the date of purchase.

OSAKA SOLUTIONS automatically void this guarantee and is not liable for any damages deriving from:

- Use, installation, or use and handling undue, others than those described above and, in particular, differs from the safety requirements established by the regulations.
- Use in applications, machines or electrical panels that do not provide adequate protection against liquids, dust, grease and electric shocks to the installation conditions made.
- The inexperienced handling, and / or alteration of the product.
- The installation / use in applications, machines or electrical panels do not comply with the valid norm.

In case of defective product under warranty or out of that period, it should contact the post sales service to perform the necessary steps. Request document repair "RMA" (by mail or fax) and complete it, is necessary send the RMA and the device to SAT OSAKA by method prepaid.

7.4 Disposal



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

8. TECHNICAL DATA

8.1 Electrical characteristics

Power supply: 230 VAC, 115 VAC, 12 VAC/VDC $\pm 10\%$;

AC frequency: 50/60 Hz;

Power consumption: about 3.5 VA;

Inputs: 3 inputs for **temperature probes:**

NTC (103AT-2, 10 k Ω @ 25 °C);

1 free of voltage digital input as an alternative to input probe Pr3;

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;

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.

8.2 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 \div 2.5 mm²/AWG 24 \div 14 cables;

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

Protection degree: IP65 (NEMA 3S) mounted with gasket;

Pollution degree: 2;

Operating temperature: 0 \div 50 °C;

Operating humidity: < 95 RH% with no condensation;

Storage temperature: -25 \div +60 °C.

8.3 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 \div +109 °C/-58 \div +228 °F;

Display resolution: 1° or 0.1° (range -99.9 \div +99.9°);

Overall accuracy: $\pm(0.5\% fs + 1 \text{ digit})$;

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).