F 500/ F 500-RS

DIGITAL ELECTRONIC REFRIGERATION UNITS CONTROLLER

USER MANUAL

FOREWORD

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.

This document is the exclusive property of OSAKA which forbids any reproduction and divulgation , even in part, of the document, unless expressly authorized.

OSAKA SOLUTIONS, SL reserves the right to make any formal or functional changes at any moment and without any notice.

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 devices which will guarantee safety.

OSAKA and its legal representatives do not assume any responsibility for any damage to people, things or animals deriving from violation, wrong or improper use or in any case not in compliance with the instrument's features.

INDEX

1 - INSTRUMENT DESCRIPTION

1.1 - GENERAL DESCRIPTION

The F 500 / F 500-RS model is a digital electronic microprocessor controller that can be used typically for refrigeration applications. It has temperature control with ON/OFF regulation and control of defrosting at defined times (Real Time Clock Defrosting), 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 appliance has special defrosting optimisation functions and functions to reduce the amount of energy used by the controlled system.

The instrument has up to 4 relay outputs, up to 4 inputs configurable for PTC, NTC and Pt1000 temperature probes, and 2 digital inputs. It can also be equipped with an internal buzzer for acoustic notification of alarms; an RS485 serial communication interface with MODBUS-RTU communication protocol; and a calendar clock.

The clock allows you to define the times of defrosting events, auxiliary output switching, switching of the regulating set point, instrument on/off, etc. (max 14 daily and 98 weekly events)

Another feature of the calendar clock version of the instrument is that it has the HACCP function which can store the last 10 alarms that have occurred (alarm type, start, duration and temperature peaks)

The 4 outputs can be used to control the compressor or the temperature control device, the defroster, the evaporator fans and a configurable auxiliary device (Light, Alarm, second evaporator, etc.)

The 4 temperature probe inputs can be used to regulate cell temperature, measure evaporator temperature, and measure two auxiliary temperatures (e.g. product temperature, condenser temperature, temperature of a second evaporator, etc.).
Two digital inputs are always available and, as an alternative to the Pr3 and Pr4 temperature probe inputs, two other digital inputs can be configured.
The 4 digital inputs can be configured to execute various functions such as cell door signal, defrost commands, selecting a different temperature-regulating set point, reporting an external alarm, activating a continuous cycle, activating the auxiliary output, etc.

1.2 - FRONT PANEL DESCRIPTION

1 - Key SET : Used for setting the Set point (press and release) and for programming the function parameters (hold pressed for 5 sec.)
In programming mode is used to enter in parameters edit mode and confirm the values. In programming mode it can be used together with the UP key to change the programming level of the parameters.
When the keyboard is locked it can be used together with the UP (hold pressed for 5 sec.) key to unlock the keyboard.

2 - Key DOWN/Aux : In programming mode is used for decreasing the values to be set and for selecting the parameters. In normal mode it can also be programmed via the parameter “t.Fb” to carry out other functions (hold pressed for 1 sec.) such as activating the Aux output, starting up the continuous cycle, etc. (see functions of keys STAND-BY and Down).

3 - Key UP/DEFROST : In normal mode can be used to start/stop manual defrosting (hold pressed for 5 sec.). In programming mode is used for increasing the values to be set and for selecting the parameters. In programming mode can be used togetherwith Key SET to change parameters level. Pressed together with the Key SET for 5 sec. allow the keyboard unlock

4 - Key STAND-BY : Used (press and release) for visualising the instrument variables (measured temperatures etc.). In programming mode can be used to come back in normal mode (hold for 2 sec.). In normal mode it can also be programmed via the parameter “t.UF” to carry out other functions (hold pressed for 1 sec.) such as turning on and off (stand-by) the device, activating the Aux output, starting up the continuous cycle, etc. (see functions of keys STAND-BY and Down).

5 - Led SET : In normal mode it serves to indicate when a key is pressed. In programming mode indicates the programming level of the parameters.

6 - Led OUT - COOL : Indicates the output status (compressor or temperature control device) when the istrument is programmed for cooling operation; on (on), off (off) or inhibited (flashing).

7 - Led OUT - HEAT : Indicates the output status (compressor or temperature control device) when the istrument is programmed for heating operation; on (on), off (off) or inhibited (flashing).

8 - Led DEFROST : Indicates defrosting in progress (on) or drainage time in progress (flashing)

9 - Led FAN : Indicates fan output status on (on), off (off) or delayed after defrosting (flashing)

10 - Led ALARM : Indicates the alarm status (on), off (off) and silenced or memorized (flashing)

11 - Led AUX : Indicates AUX output status on (on), off (off) or inhibited (flashing)

12 - CLOCK LED : Indicates that the internal clock is running. If flashing slowly, it means that there is a clock error (clock chip not working). If flashing rapidly, it means the clock battery is drained.

13 - Led Stand-By: Indicate the Stand-by status.

2 - PROGRAMMING

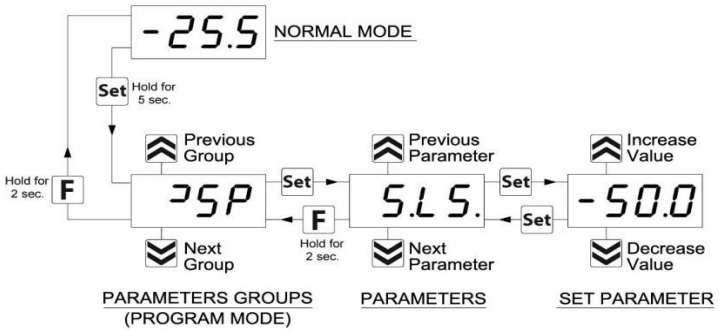
2.1 -FAST PROGRAMMING OF SET POINT

Press the Key SET then release it and the display will show **“SP”** (or **“SPE”**) alternating with the set value.
To change it press the UP key to increase the value or DOWN 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 pressed, the speed increases even more to all the desired valued to be reached rapidly.
However, through par. **"t.Ed”** is possible to determine whether and which Sets are set with the fast mode by button SET.
The parameter is programmable with a value between oF and 4 which means that:
oF = Nothing is set with the Key SET (the SET pressed and released has no effect)
1 = can be adjusted only SP (normal)
2 = can be adjusted only SPE (economic)
3 = can be adjusted both SP and SPE
4 = can be adjusted the active set (SP or or SPE)
5 = can be adjusted SP and SPH (“Turbo” or ind. “Heating”)
6 = can be adjusted SP, SPE and SPH
For example, if the parameter "t.Ed" = 1 or 3, the procedure is as follows:
Press Key SET then release it and the display will show **"SP"** alternate value.
To modify press key UP or DOWN to increase the value to decrease.
If there is only the Set Point 1 ("t.Ed" = 1) once the desired value by pressing the SET button to exit the Set programming mode.
If is also programmable the EconomicSet Point ("t.Ed" = 3) by pressing and releasing the SET key again the display will show **"SPE"** alternate to the set value.
To modify press key UP or DOWN like Set “SP”.
When the desired value is set press the Key SET to exit from Set Point programming mode.
Exiting the Set mode is achieved by pressing the SET key or automatically if no key is pressed for 10 seconds. After that time the display returns to the normal function mode.

2.2 - STANDARD MODE PARAMETERS PROGRAMMING

To access the instrument’s function parameters when password protection is disable, press the Key SET and keep it pressed for about 5 seconds, after which the display will visualised the code that identifies the first group of parameters (“ **SP** “).
Using the UP and DOWN keys, the desired group of parameters can be selected and pressing the SET key, the display will show the first parameter code of the group.
Using the UP and DOWN keys, the desired parameter can be selected and pressing the SET key, the display will alternately show the parameter code and its setting that can be changed with the UP and DOWN keys.
Once the desired value has been set, press the Key SET again: the new value will be memorised and the display will show only the code of the selected parameter.
Pressing the UP and DOWN keys, it is possible to select another parameter and change it as described.
To come back at the group selection mode keep the STAND-BY key pressed for 1 sec. until will show the code group.

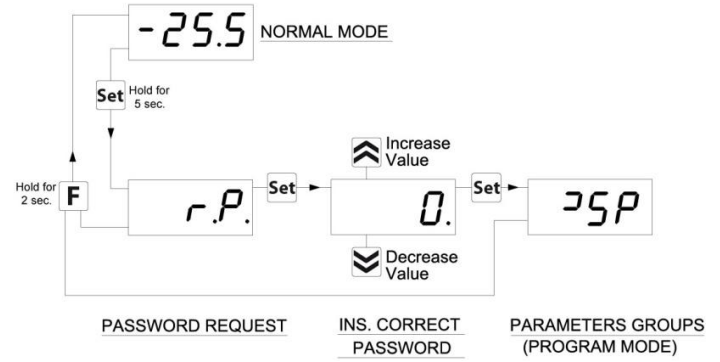
Pressing the UP and DOWN keys, it is possible to select another group of parameters, another parameter and change it as described.
To exit the programming mode, do not press any key for about 30 seconds, or keep the STAND-BY key pressed for 2 sec. until it exits the programming mode.



2.3 - PARAMETER PROTECTION USING THE PASSWORD

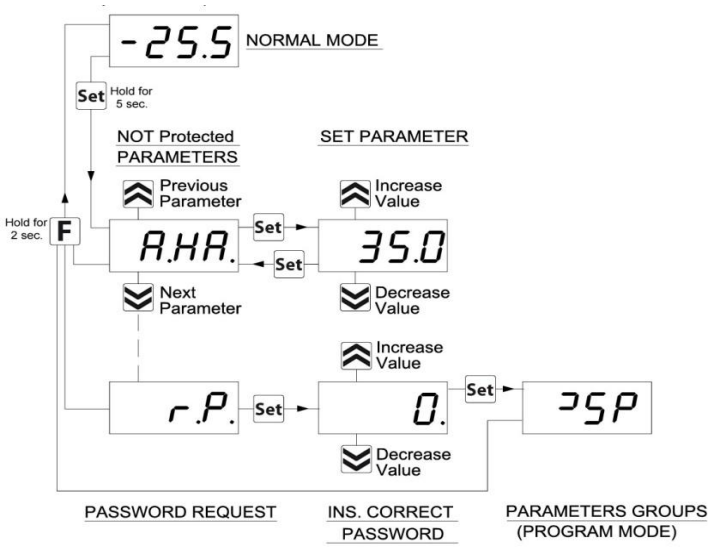
The instrument has a parameter protection function using a password that can be personalised, through the **"t.PP"** parameter.
If one wishes to have this protection, set the password number desired in the parameter "t.PP". When the protection is activate, press the SET key to access the parameters and keep it press for about 5 seconds, after which the display will show **"r.P"** .
At this point press SET, the display show "0", using the UP and DOWN keys, set the password number programmed and press the Key SET.
If the password is correct, the display will visualise the code that identifies the first group of parameters and it will be possible to program the instrument in the same ways described in the previous section.
Protection using a password can be disabled by setting the parameter "t.PP" = oF.

Note: *If the Password gets lost, just swith off and on the instrument supply, push SET key during the initial test and keeping the key pressed for 5 seconds.*
In this way it's possible to have access to all the parameters, verify and modify the par. "t.PP".



2.4 - CUSTOMIZED MODE PARAMETER PROGRAMMING (PARAMETERS PROGRAMMING LEVEL)

The password protection hides all the configuration parameters behind a factory set password to avoid unwanted changes being made to the programming of the controller.
To make a parameter accessible without having to enter the password when "t.PP" password protection is activate follows this procedure.
Enter the programming using the Password "t.PP" and select the parameter which is desired to be accessible with no password protection.
Once the parameter has been selected, if the SET led is blinking, this means that the parameter is programmable by entering the password (it's then "protected") if it's instead on, this means the parameter is programmable without password (not protected).
If you want to change the accessibility of the parameter push SET key, keep it pressed and press together also the key UP.
The led SET will change its state indicating the new access level of the parameter (on = not protected; blinking = protected by password).
In case some parameters are not protected, when one tries to have access at the programming, the display will show all the parameters not protected and the par. **"r.P"** (through which will be possible to have access to the "protected" parameters).



With regard to setting unprotected parameters, an exception is HACCP alarm-related parameters ("H.01", "H.02", etc. which are visible only when there are alarms stored in memory) whose display level can be set via the **"t.HA"** parameter**.**
If **"t.HA" = 1**, parameters relating to stored HACCP alarms are visible only within the]HA group (which can be displayed like all other groups without a password if t.PP=oF or by entering the set t.PP password).
If **"t.HA" = 2**, parameters relating to stored HACCP alarms are visible both within the "]HA" group (which can be displayed like all other groups without a password if t.PP=oF or by entering the set t.PP password) and as unprotected parameters if the t.PP parameter is given a password.

2.5 - RESET PARAMETERS TO DEFAULT VALUE/LEVEL

The instrument allows the reset of the parameters to values programmed in factory as default.
To restore to the values of default the parameters set the value **-48** to "r.P" password request.
Once confirmed the password with the Key SET the display it shows "---" for 2 sec. therefore the instrument effects the parameters reset.

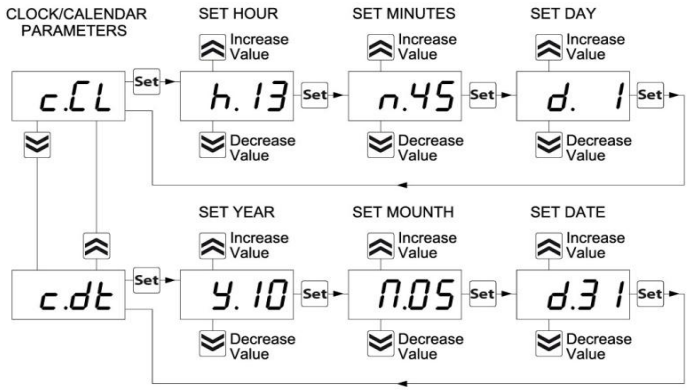
2.6 - KEYBOARD LOCK FUNCTION

On the instrument it's possibile to lock completely the keyboard.
This function is particularly useful when the regulator is reachable by the users and it's desired to avoid any modification.

To activate the keyboard lock it's enough program the par. **"t.Lo"** to a different value to oF.
The value program to this parameter it is the time of inactivity of the keys afterwhich the keyboard will be locked.
Insofar not pressing any key for the time "t.Lo" the instrument automatically disable the normal functions of the keys.
When the keyboard is lock, if any of the key is pushed, on the display will appear **"Ln"** to indicate the active lock.
To unlock the keyboard it's enough to contemporarily push Key SET and UP and keep them pushed for 5 sec., afterwhich the label **"LF"** will appear on the display and all the keys functions will be available again .

2.7 - SETTING THE CURRENT TIME AND DATE

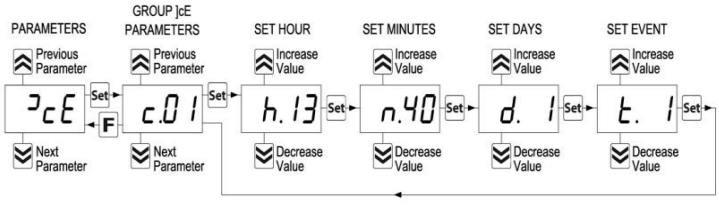
If the instrument is supplied with the internal calendar/clock, this must be enabled and programmed to the current time and day of the week using the **"c.CL"** parameter, and to the current date using the **"c.dt"** parameter.



After selecting the "c.CL" parameter, press the SET key repeatedly to cycle through the following in the order shown:
"h." and the hours (e.g. "h.14")
"n." and the minutes (e.g. "n.52")
"d." and the day of the week (e.g. "d.1")
The days are numbered as follows:
d. 1 = Monday
d. 2 = Tuesday
d. 3 = Wednesday
d. 4 = Thursday
d. 5 = Friday
d. 6 = Saturday
d. 7 = Sunday
+ the option oF which considers the clock to be disabled.
After selecting the "c.CL" parameter, press the SET key repeatedly to cycle through the following in the order shown:
"y" and current year (ex. "y.10)
"M" and current month (ex. "M.05")
"d" and current date (ex. "d.31")
When the internal clock is running, the Clock LED will come on.
If it is on and steady, this indicates that, since the time the clock was enabled, the power supply to the instrument has never failed and therefore the current time is presumably correct.
If it is flashing, this indicates that at some point since the clock was enabled the power supply has certainly failed and therefore the current time may not be correct.
In this condition, pressing any key cancels the signal and the LED returns to solid (on and not flashing).

2.8 - PROGRAMMING EVENTS TO OCCUR AT DEFINED TIMES

All events are programmable through the 14 parameters **"c.01" ... "c.14"** contained in the **" [1]cE"** group.
Exactly as for current time, because the parameters for time-related functions require multiple values to be input, these parameters are programmed in the following way:



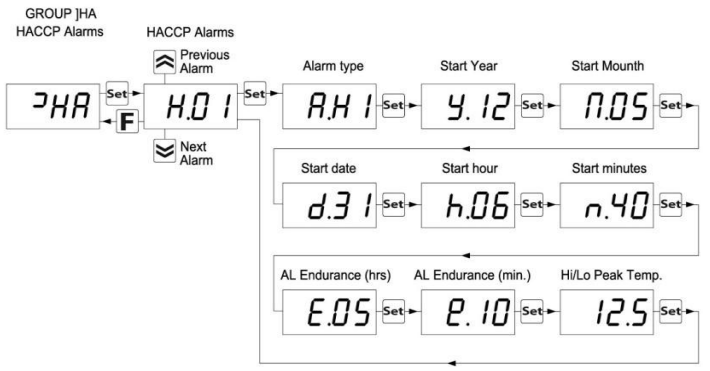
After selecting the desired parameter, press the SET key repeatedly to cycle through the following:
"h." and the hours (e.g. "h.13")
"n." and the minutes (e.g. "n.40")
"d." and the day of the week (e.g. "d.1")
"t." and the type of event to be executed at the programmed time (e.g. t.1).
The days are numbered as follows:
d. 1 = Monday
d. 2 = Tuesday
d. 3 = Wednesday
d. 4 = Thursday
d. 5 = Friday
d. 6 = Saturday
d. 7 = Sunday
d. 8 = every day
d. 9 = Monday, Tuesday, Wednesday, Thursday, Friday
d. 10 = Monday, Tuesday, Wednesday, Thursday, Friday, Saturday
d.11 = Saturday and Sunday
d.oF = no day (event disabled)
The instrument offers 14 event programming parameters, allowing a maximum of 14 x 7 = 98 weekly events to be scheduled (using d.8).
For the types of events that can be programmed, see the relevant section.

2.9 - DISPLAYING HACCP ALARMS

The so-called HACCP (Hazard Analysis and Critical Control Points) function causes the instrument to record the last 10 alarms that have occurred together with information that is useful for determining the criticality of the alarm.
The function is available only for instruments that have the calendar clock.
The following HACCP alarms can be stored in memory:

HACCP alarm code	Alarm
H1	Maximum temperature alarm H1
L1	Minimum temperature alarm L1
H2	Maximum temperature alarm H2
L2	Minimum temperature alarm L2
bo	Power failure alarm (black-out)
AL	Alarm from digital input

These alarms are displayed by the same display procedure as for the programming parameters by accessing parameters **"H.01" ... "H.10"** contained in the **[1]HA** group.
Exactly as for current time and events, because the parameters relating to time-related functions require multiple values to be input, these parameters are programmed in the following way:
After selecting the desired parameter, press the SET key repeatedly to cycle through the following:
- Alarm type (**A. =** see HACCP alarm codes)
- Alarm start time HACCP (**y.** =year, **M.** =month, **d.** =day, **h.** =hours, **n.** =minutes)
- HACCP alarm duration (**E.** = hours, **e.** = minutes)
- Critical temp. (max. peak if Hi alarm or min. peak if Lo or other alarm)



The instrument automatically sorts these parameters from most recent (H.01) to oldest (H.10) whenever an alarm is recorded or deleted.
If more than 10 alarms occur, the instrument deletes the information about the oldest alarm by overwriting it with the most recent alarm.
When this occurs the instrument increments by one the value of the **"H.dL"** parameter by which it is possible to display the number of alarms the instrument has been forced to delete when these exceeded the permitted memory.
After selecting the parameter for the alarm which the user wishes to display, if the label flashes this indicates that the alarm has never been displayed (and therefore not recognised).
To recognise it, simply access the parameter via the SET key and display it.
The next time the parameter label is displayed it will be shown solid (not flashing).
If the alarm is still ongoing at the time of its display, the data are displayed but the alarm is not recognised.

In the event of unrecognised (and therefore still ongoing) HACCP alarms, the instrument displays the message **“HAC”** alternating with the normal display.
Within the parameter the data will be displayed sequentially as the SET key is repeatedly pressed.
The alarm is deleted by holding down the Down key for more than 5 seconds while one of the data of the alarm is displayed.
Similarly the value of the “H.dL” parameter can be reset by holding down the Down key for more than 5 seconds while the value is being displayed)
For HACCP alarm configuration and operation, see the relevant section.

3 - INFORMATION ON INSTALLATION AND USE

3.1 - PERMITTED USE

The instrument has been projected and manufactured as a measuring and control device to be used according to EN60730-1 for the altitudes operation until 2000 ms. The use of the instrument for applications not expressly permitted by the above mentioned rule must adopt all the necessary protective measures.
The instrument CANNOT be used in dangerous environments (flammable or explosive) without adequate protection.
The instrument used with NTC 103AT11 probe (identifiable by the printed code “103AT-11” visible on the sensor part) or Pt1000 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, 1,-50°C +90°C]
Remember that the end user must periodically checks and verify the thermometers in compliance with standard EN 13486.
The installer must ensure that EMC rules are respected, also after the instrument installation, if necessary using proper filters. 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 devices which will guarantee safety.

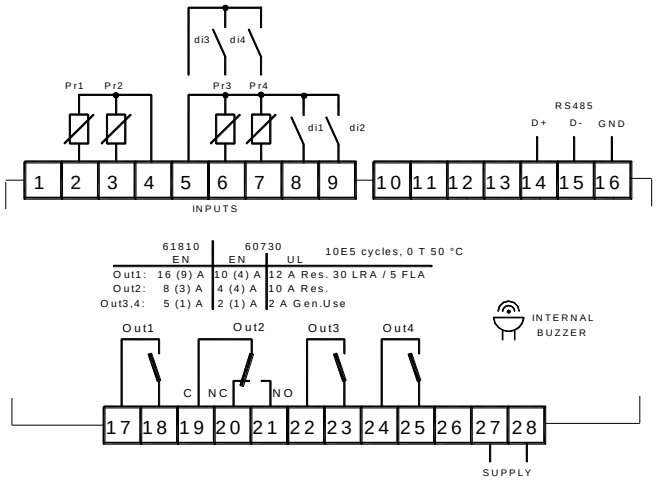
3.2 - MECHANICAL MOUNTING

The instrument, in case 78 x 35 mm, is designed for flush-in panel mounting. Make a hole 71 x 29 mm 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.

3.3 - ELECTRICAL CONNECTION

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 overload of current: 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 with only one side. 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.

3.4 - ELECTRICAL WIRING DIAGRAM



4 - FUNCTIONS

4.1 - ON / STAND-BY FUNCTION

The instrument, once powered up, can assume 2 different conditions:
- ON : means that the controller uses the control functions.
- STAND-BY : means that the controller does not use any control function and the display is turned off except for the Stand-by led.
If there is no power, and then power returns, the system always sets itself in the condition it was in before the black-out.
The ON/Stand-by function can be selected:
- Pressing the Key STAND-BY for at least 1 sec. if the parameter **"t.UF"** = 3 or 5
-Pressing the key DOWN/AUX for at least 1 sec. if the parameter **"t.Fb"** = 3 or 5
- using the digital input if the parameter **“i.xF”** = 7 or 15
- by programming a programmable event through the clock (if present)

4.2 - "NORMAL", "ECONOMICAL" AND "TURBO" OPERATING MODES

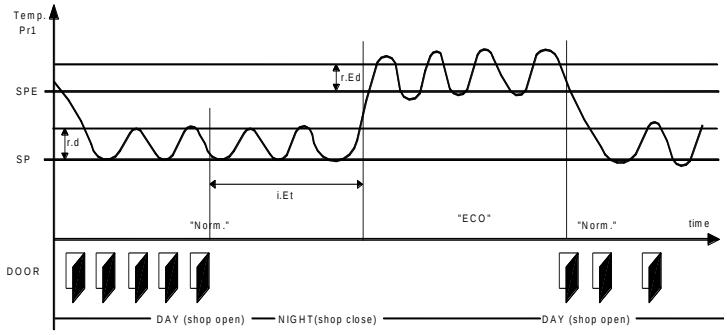
The instrument can be used to enter up to 3 different regulating set points: Normal - **“SP”**; Economical - **“SPE”**; and “Turbo” - **“SPH”**.
Associated with each of these is the corresponding differential (hysteresis): normal - **“r.d”**; Economical - **“r.Ed”;** and “Turbo” - **“r.Hd”**.
Switching between the various modes can be automatic or manual

<u>"NORMAL-ECONOMICAL" MODE OPERATION</u>
Can be used where it is necessary to switch between two different operating temperatures (e.g. day/night or working days/holidays)

<u>NORMAL/ECONOMICAL mode can be selected manually:</u>
– by pressing the STAND-BY key if parameter **"t.UF"** = 2
– by pressing the DOWN/AUX key if parameter **"t.Fb"** = 2
– by a digital input if parameter **“i.xF”** = 6

<u>NORMAL/ECONOMICAL mode can be selected automatically:</u>
– after the door has been closed for time **“i.Et”** (switching from Norm. to Eco)
– when the door is opened if the SPE set point is active from parameter “i.Et” (switching from Eco to Norm.)
- after the door has been closed for time **“i.tt”** since activation of the SPE set point from parameter “i.Et” (switching from Eco to Norm.)
- at times defined through the clock by programming events **t.6** (switch to Eco mode) and **t.7** (switch to normal mode). For further

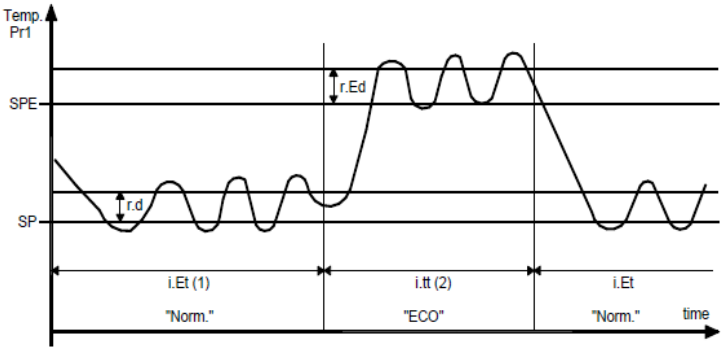
information see the section on programming events through the clock.



Example of automatic switching between Eco mode and normal mode. During working hours the door is frequently opened and the controller stays in normal mode. When the door has not been opened for time "i.Et", the controller switches to Eco mode. As soon as the door is opened again, the controller reverts to normal mode.

This function requires use of a digital input configured as **"i.xF"** = 1, 2 or 3 (door open input)
If "i.Et" = oF, selection of Eco/Norm. mode via the digital input configured as door, is deactivated.
If "i.tt" = oF, switching the mode from Eco to Normal due to time-out is deactivated.

(1) – The time i.Et is reset every time the door is opened. In the case shown, the door is always closed.



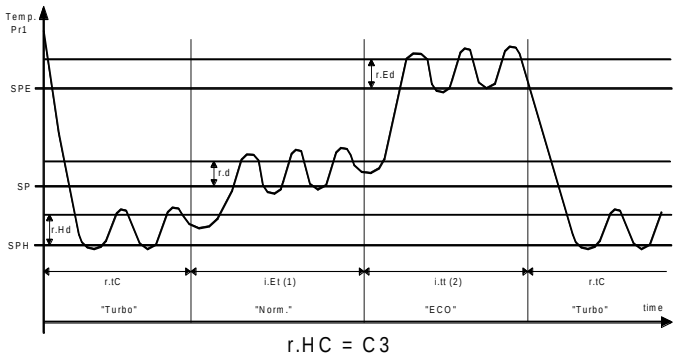
(2) – The time i.tt stops when the door is opened and the instrument immediately switches to "normal" mode. In the case shown, the door is always closed.

When in economical mode, the label **"Eco"** is displayed.
If "i.dS"= Ec, in economical mode the instrument displays "Eco" all the time. Otherwise the label "Eco" appears approx. every 10 seconds alternating with the normal display set by the "i.dS" parameter.
Selection of Eco mode is always also combined with the function of turning off the Auxiliary output if used as a window light ("o.Fo"= 3).

"TURBO – NORMAL – ECONOMICAL" MODE OPERATION

"Turbo" mode can be selected manually:
– by pressing the STAND-BY key if parameter **"t.UF"** = 4
– by pressing the DOWN/AUX key if parameter **"t.Fb"** = 4
– by a digital input if parameter **"i.xF"** = 8

"Turbo" mode can be selected automatically:
- on leaving Eco mode (only if "r.HC" = C3)
- every time the instrument is switched on (only if "r.HC" = C3 and Pr1 > SPE+r.Ed)
The instrument quits "turbo" mode automatically at the end of time "r.tC" or manually using the programmed command (key or digital input) and the instrument always returns to normal mode.
"Turbo" mode can be applied manually, for example when the user wishes to lower the temperature of the products quickly after loading the refrigerator.
However, "Turbo" mode is applied automatically to restore product temperature at the end of economical mode.
Setting "r.HC" = C3 gives the following operating cycle:



r.HC = C3

(1) - The time i.Et is reset every time the door is opened and in the case shown the door is always closed.
(2) – The time i.tt stops when the door is opened and the instrument immediately switches to "Turbo" mode. In the case shown, the door is always closed.

When switched on, the instrument starts in the mode it was in when it was switched off ("Normal" or "Eco") unless the temperature at switch-on is > SPE+r.Ed. In this case (see fig.) a "Turbo" cycle is automatically initiated.
After time "r.tC" the instrument automatically enters "Normal" mode.
If the door is opened frequently the instrument stays in "Normal" mode. If however it is not opened for time "i.Et" 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 "i.tt".
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.
When "turbo" mode is on, this is indicated by the characters **"trb"** shown on the display, alternating with the normal display.
The Set point "SP" can be set with a value between the programmed value in parameter. **"S.LS"** and the programmed value in parameter **"S.HS".**
The Set point "SPE" can be set with a value between the programmed value in parameter. **"SP"** and the programmed value in parameter **"S.HS".**
The Set point "SPH" can be set with a value between the programmed value in parameter. **"S.LS"** and the programmed value in parameter **"SP".**
Note: *in the examples that follow, the Set point is generally indicated as "SP" and the histeresis as "r.d", how when operating the instrument will work according to the Set point and histeresis selected as actives.*

4.3 - MEASURING AND DISPLAY

All the parameters concerning measuring are contained in the group **"]In".**
Via the parameter **"i.SE"** it is possible to select the type of probes that one wishes to use and which can be: thermistores PTC KTY81-121 (**Pt**), NTC 103AT-2 (**nt**) or Pt1000 (**P1**).
Via the parameter **"i.uP",** it is possible to select the temperature unit of measurement the desired measurement resolution (**C0**=°C / 1° ; **C1**=°C / 0.1° ; **F0**= °F / 1°; **F1**= °F / 0.1°).
The instrument allows the measuring to be calibrated, that can be used for re-calibrating the instrument according to application needs, through the parameters **"i.C1"** (for the input Pr1),**"i.C2"** (for the input Pr2) **,"i.C3"** (for the input Pr3) **,"i.C4"** (for the input Pr4).
The functions carried out by Pr2, Pr3 and Pr4 probes is defined by the parameters **"i.P2", "i.P3"** and **"i.P4"**
This parameters can be configured for the following functions:
= EP - Evaporator probe: used to managing the defrost and the evaporator fans (see relative functions).
= Au - Auxiliary Probe: can be used as a display-only probe but it is also possible to assign temperature alarms to it (possible uses: product probe, anti-freeze probe, etc.)

= **cd** - Condenser Probe: can be used as a display-only probe but it is also possible to assign temperature alarms to it in order to give alarms relating to condenser malfunction (e.g. dirty/clogged condenser).
= 2E - Evaporator Probe 2: the probe performs the functions described later for controlling defrosts in the second evaporator in twin-evaporator plants.
= dG - Digital input (see digital inputs functions)
If probe Pr2 and/or Pr3 and/or Pr4 is/are not used, set the relative parameter **"i.P2"**and/or **"i.P3"** and/or **"i.P4"** = oF.
It is not possible to program more parameters for the same function (priority goes to lowest input).
Using the parameter **"i.Ft",** it is possible to set the time constant for the software filter for measuring the input values to be able to reduce the sensitivity to measurement disturbances (increasing the time).
Through the parameter **"i.dS",** it is possible to fix the normal visualisation on the display that can be the measurement of the probe Pr1 (P1), the measurement of the probe Pr2 (P2), the measurement of the probe Pr3 (P3), the measurement of the probe Pr4 (P4), the active set point value (SP), the label "Eco" when the instrument is in Eco mode (Ec) or it can have the numerical display switched off (oF).
Through the parameter **"i.CU",** it is possible to program an measure offset that will be applied to the temperature show on the display (only if i.dS"= P1, P2, P3, P4, Ec).
The normal visualisation on the display is established by par. "i.dS", but it is possible to visualise all the variables and the highest and lowest Pr1 peak measurement values in rotation by quickly pressing and releasing Key STAND-BY.
The display will alternately show the code that identifies the variable and its value.
The variable are:
"Pr1" - Pr1 temperature
"Pr2" - Pr2 temperature
"Pr3" - Pr3 temperature (on/oF state if is progr. as digital input)
"Pr4" - Pr4 temperature (on/oF state if is progr. as digital input)
"**Lt"** and the lowest Pr1 peak temperature
"Ht" and the highest Pr1 peak temperature
and , if real time clock is enable:
"h." - current hour
"n." - current minutes
"d." - current day of the week
When the instrument is switched off, peak values are always re-set. However, it is also possible to reset these values if the instrument is switched on by using the DOWN key hold for 3 sec. during peak visualization.
The display will show "---" and peak memory will be reset.
The exit of this visualisation mode occurs automatically 15 seconds after the last pressing on the Key STAND-BY.
Please remember that visualisation of the Pr1 probe can be changed by the defrosting display lock function, by using the parameter **"d.dL"** (see defrost function).

4.4 - DIGITAL INPUTS

All the parameters concerning digital inputs are contained in the group **"[]In".**
The instrument has 2 digital inputs for voltage-free contacts whose function is defined by the parameters **"i.1F"** and **"i.2F"** and whose action can be delayed by the time period set in the parameters **"i.1t"** and **"i.2t".**
In addition, the instrument may have 2 further digital inputs for voltage-free contacts as an alternative to the measurement inputs Pr3 and Pr4.
In order to use these inputs digitally, the user must set the relevant parameter "i.P3" or "i.P4" = dG.
The function performed by these digitally configured inputs is defined by the parameters **"i.3F"** and **"i.4F"** while the action is instantaneous and cannot be delayed.
The parameters **"i.1F" , "i.2F", "i.3F", "i.4F"** can be configured for the following functions:
= 0 - No function
= 1 -Cell door opening by contact normally open: on closing the digital input the instrument visualises **oP** and the variable set in parameter "i.dS" alternately on the display. With this function mode, the action of the digital input also activates the time that can be set in parameter "A.oA" after which the alarm is activated to signal that the door has been left open.
= 2 -Cell door opening with fan stop by contact normally open: on closing the digital input the fans are stopped and the instrument visualises **oP** and the variable set in parameter "i.dS" alternately on the display. With this function mode, the action of the digital input also activates the time that can be set in parameter "A.oA" after which the alarm is activated to signal that the door has been left open and the fan restart.
= 3 - Cell door opening with compressor and fan stop by contact normally open: similar to "i.Fi" = 5 but with fan and compressor stop. At the intervention of the door open alarm alarm compressor and fan restarts.
= 4 - External alarm signal by contact normally open: on closing the digital input the alarm is activated and the instrument visualises **AL** and the variable set in parameter "i.dS" alternately on the display.
= 5 - Signalling of external alarm with disablement of all the control outputs by contact normally open: on closing the digital input all the control outputs are disabled, the alarm is activated and the instrument visualises **AL** and the variable set in parameter "i.dS" alternately on the display.
= 6 - Selecting the active set point (SP/SPE) with contact normally open: on closing the digital input the temperature set point "SPE" is activated. When instead the input is open the set point "SP" is active.
= 7 - Switching on/switching off (Stand-by) of instrument by contact normally open: on closing the digital input the instrument is switched on while it is placed in Stand-by when opened.
= 8 - "Turbo" cycle activation command with normally-open contact: closing the input starts a "turbo" cycle.
= 9 - Remote command of auxiliary output AUX with normally-open contact: closing the input activates the auxiliary output as described in the "o.Fo" = 2 operating mode of the auxiliary output.
= 10 - Disable recording of HACCP alarms: closing the input disables the recording of HACCP alarms.
= 11 - Reset recording of HACCP alarms: closing the input deletes all recorded HACCP alarms.
= 12 - External "PrA" alarm notified and "ot" output deactivated by normally-open contact: closing the input deactivates the output configured as "ot" and activates the alarm, and the instrument display shows **PrA** alternating with the variable defined by the "i.dS" parameter.
= 13 - External "HP" alarm notified and "ot" output deactivated by normally-open contact: closing the input deactivates the output configured as "ot" and activates the alarm, and the instrument display shows **HP** alternating with the variable defined by the "i.dS" parameter.
= 14 - External "LP" alarm notified and "ot" output deactivated by normally-open contact: closing the input deactivates the output configured as "ot" and activates the alarm, and the instrument display shows **LP** alternating with the variable defined by the "i.dS" parameter.
= 15 - Forcing a programmed Switch-on/Switch-off (Stand-by) event - closing the input switches the instrument from the ON state to the Stand-by state and vice versa, until the next event. Therefore, if switch-on/stand-by events are programmed using the clock, action by this mode forces the state until the next event.
= 16 - Defrosting start command with contact normally open: on closing the digital input 1 (and after the "i.ti" time) a defrosting cycle is activated.
= 17 - Defrosting end command with contact normally open: on closing the digital input 1 (and after the "i.ti" time) a defrosting cycle is ended if in progress or defrosting is inhibited.
= -1, -2, -3, etc. - Like function with positive values but with function logic reversed (contact normally closed)
Note: Where multiple digital inputs are configured for the same function, the instrument will treat the contacts as if they were parallel (and consequently regard the result as an OR function).

4.5 - OUTPUTS AND BUZZER CONFIGURATION

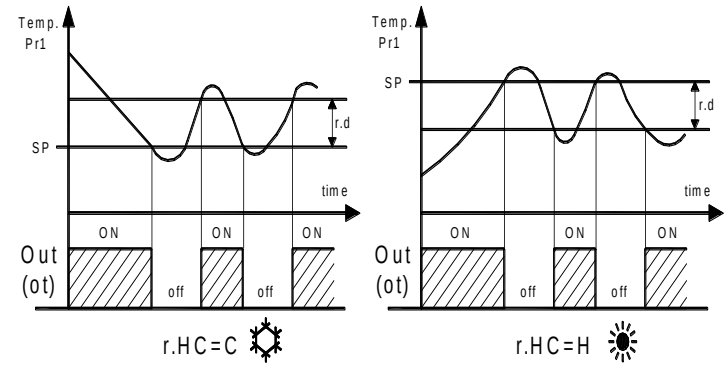
All the parameters concerning outputs configuration are contained in the group **"[]Ou".**
The instrument outputs can be configured by the relative parameters **"o.o1" , "o.o2", "o.o3", "o.o4".**

The outputs can be configured for the following functions:
= ot - to control the compressor or however, the temperature control device
= dF - to control the defrosting device (1)
= Fn - to control the evaporator fans
= Au - to control the auxiliary device
= At - to control a silenceable alarm device through a contact that is normally open, and then closed when the alarm sounds
= AL - to control an alarm that cannot be silenced through a contact that is normally open and closed when the alarm sounds.
= An - to control an alarm with a memory function through a contact that is normally open and closed when the alarm sounds.
= -t - to control a silenceable alarm device through a contact that is normally closed, and then open when the alarm sounds.
= -L - control an alarm that cannot be silenced through a contact that is normally closed and open when the alarm sounds.
= -n - to control an alarm with a memory function through a contact that is normally closed and open when the alarm sounds.
= on - Output on when the instrument is in on state. This mode can be used to control lights, non-misting resistance on room door or other utilities
= HE - to control an heating device in neutral zone control mode ("r.HC" = nr).
= 2d - to control the defrosting device n. 2
= L1 - Light output managed by Normal / Economy mode.
This output will be on in Normal mode and off in Economy mode operation.
= L2 - Internal Light output managed by digital input. This output will be on when door is opened (only if "i.xF"= 1, 2, 3).
= oF - Disabled output
The function carried out for auxiliary output (par. desired output = Au) is defined by the parameter **"o.Fo"** and the function is conditioned by the time set in parameter **"o.tu".**
The parameter "o.Fo" can be configured for the following functions:
= oF - Auxiliary output not active
= 1 - Temperature control output delayed with contact normally open: the auxiliary output is activated with delay that can be set on the parameter "o.tu" compared 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 (STAND-BY or DOWN/AUX) or by digital input or by Real Time Clock : the output is activated by pressing the keys STAND-BY or DOWN/AUX suitably configured ("t.UF" or "t.Fb" = 1), by a digital input suitably configured ("i.xF" = 9) or by Real Time Clock event. The commands by keys or digital inputs have a bi-stable function. Which means that when first pressed, the output is activated while the second is disabled. In this mode, the AUX output can be turned off automatically after a certain time that can be set on the parameter "o.tu". With "o.tu" = oF the output is activated and deactivated only manually, using the key (STAND-BY or DOWN/AUX). Differently, the output, once activated, is turned off automatically after the set time. This function can be used, for example, as a cell light command, for non-misting resistance or other utilities.
If are programmed activation / deactivation events of the auxiliary output by Real Time Clock the action of the keys or digital input mode force output status until the next event.
The internal buzzer (if present) can be configured by par. **"o.bu"** for the following functions:
oF = Buzzer always disable
1 = Buzzer signal active alarms only
2 = Buzzer signal key pressed only (no alarm)
3 = Buzzer signal active alarms and key pressed

4.6 - TEMPERATURE CONTROL

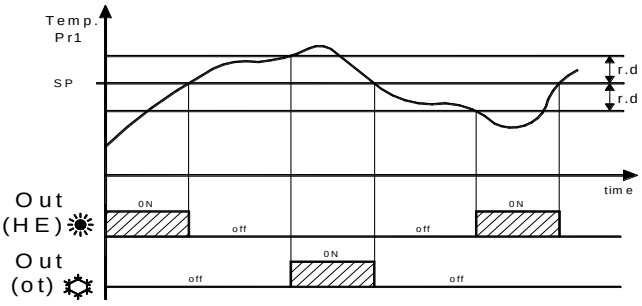
Most of the parameters for temperature control functions are found in the **"rE"** group.
The instrument's method of regulation is of ON/OFF type acting on the "ot"- and "HE"-configured outputs in response to: the reading of the Pr1 probe; the active set point(s) **"SP"** (or **"SPE"** and/or **"SPH"**); the intervention differential **"r.d"** (or **"r.Ed"** and/or **"r.Hd"**); and the operating mode **"r.HC"**.

Via the parameter **"r.HC"** the following functions can be obtained:
= C (Cooling) or = H (Heating)



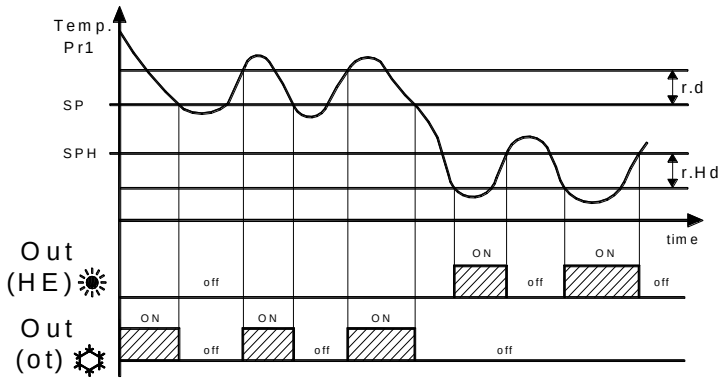
As regards the operating mode programmed in the "r.HC" parameter, the regulator automatically assumes that the differential has positive values for a Refrigeration control ("r.HC"=C), negative values for the Heating control ("r.HC"=H).

= nr (Neutral Zone or Cooling and Heating a single set point)



If the parameter "r.HC" is programmed such that "r.HC" = nr the output configured as "ot" operates with a cooling action (as "r.HC" = C) whereas the output configured as "HE" operates with a heating action. In this case the regulating set point for both outputs is whichever of SP, SPE and SPH is active, and the intervention differential ("r.d" or "r.Ed" or "r.Hd") is automatically assumed by the regulator to have positive values for the cooling action, negative values for the heating action.

= HC (Cooling and Heating with two independent set points)



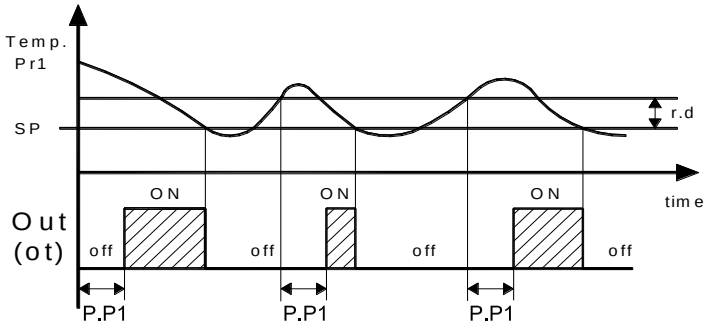
r.HC=HC

Similarly, if the parameter "r.HC" is programmed such that "r.HC" = HC, the output configured as "ot" operates with a cooling action (as "r.HC" = C) whereas the output configured as "HE" operates with a heating action.
In this case the regulating set point for the "ot" output is whichever of SP, SPE and SPH is active, whereas for the output "HE" the set point is SPH.
The intervention differential for the "ot" output will be whichever is active ("r.d" or "r.Ed" or "r.Hd") and the regulator will automatically assume it has positive values (in the case of Cooling) whereas for the output "HE" it will be "r.HD" with values assumed to be negative (in the case of Heating).
In this mode, activating the "turbo" cycle causes the instrument to operate with neutral-zone regulation with set point SPH.
= C3 (Cooling with three automatic modes)

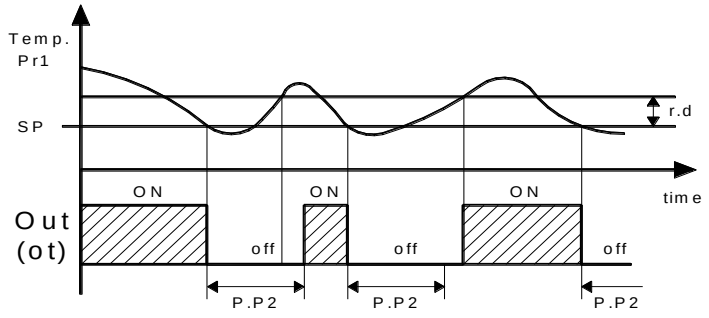
The instrument still cools but this selection activates automatic switching between the three modes, Normal, Eco and Turbo, as already described in the section on operating modes.
All time protections described in the next paragraph (P.P1, P.P2, P.P3) always act only on the output configured as “ot”.
In the event of probe error, it is possible to set the instrument so that that the output “ot”continues to work in cycles according to the times programmed in the parameter **“r.t1”** (activation time) and **“r.t2”** (deactivation time).
If an error occurs on the probe the instrument activates the output for the time “r.t1”, then deactivates it for the time “r.t2” and so on whilst the error remains.
Programming “r.t1” = oF the output in probe error condition will remain switched off.
Programming instead “r.t1” to any value and “r.t2” = oF the output in probe error condition will remain switched on.
Remember that the temperature regulation function can be conditioned by the “Compressor Protection and output delay at power-on”, “Defrost”, “Door open” and “external alarm with outputs disable” functions.

4.7 - COMPRESSOR PROTECTION FUNCTION AND DELAY AT POWER-ON

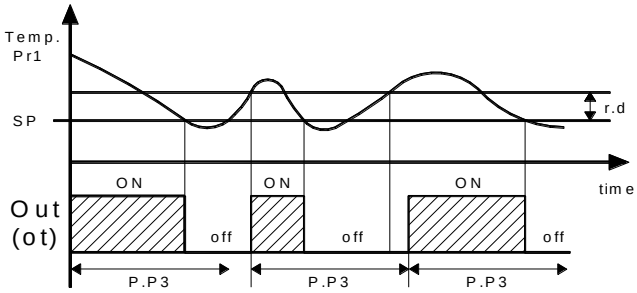
All the parameters concerning compressor protection functions are contained in the group **“]Pr”.**
The function “Compressor Protection” aims to avoid close start ups of the compressor controlled by the instrument in cooling applications.
This function foresees 3 time controls on the switching on of the output configured as “ot” associated with the temperature regulation request.
The protection consists of preventing the output being switched on during the times set in the parameters “P.P1”, “P.P2” and “P.P3” and therefore that any activation occurs only after all the times has finished.
First control (par. **“P.P1”**) foresees a delay to the output activation (switching-on delay).



Second control (par. **“P.P2”**) 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).



Third control (par. **“P.P3”**) foresees an inhibition to the activation of the output "Out" by a time delay that starts when the output was turning on last time (delay between switching-on).



During the output inhibition the led OUT (Cool o Heat) blinking.
It is also possible to prevent activation of the output after the instrument is turned on, for the time set in the parameter **“P.od”**.
During the power on delay phase, the display shows the indication **od,** alternating with the normal visualisation.
All the functions are disabled by relative parameters = oF.

4.8 - DEFROST CONTROL

The defrosting control acts on the outputs configured as “ot” and “dF”**.**
All the parameters concerning defrost control are contained in the group **“]dF”.**
The type of defrosting that the instrument must carry out is set by the parameter **“d.dt”** that can be programmed:
= EL - WITH ELECTRICAL HEATING (or BY STOPPING COMPRESSOR): during 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 INVERSION OF CYCLE:
during defrosting the outputs “ot” and “dF” are enabled
= no - WITHOUT COMPRESSOR OUTPUT CONDITIONING: during defrosting, the output “ot” continuous to operate in order to temperature controller while 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 "d.dE"). During the defrost "dF" output it behaves as an heating mode temperature control with Set = "d.tE" and fixed differential at 1°C and operate in order to evaporator probe (EP).

4.8.1 - STARTING AUTOMATIC DEFROSTS

The automatic control of defrost occours:
- Defrosting at defined times – “Real Time Clock Defrosting”
- By interval times (regular or dynamic)
- By Evaporator temperature
- By continuous compressor running time
In order to avoid pointless defrosting the parameter **“d.tS”** in “d.dC” = rt, ct, cS mode is foreseen that sets the enablement temperature for defrosting
If the temperature measured by the probe is higher than set in the parameter “d.tS” the defrosting is inhibited.

- Defrosting at defined times – “Real Time Clock Defrosting”
Setting the parameter **“d.dC” = cL** disables defrosting at intervals (parameters “d.di” and “d.Sd”) and enables any defrosting events programmed for defined times by means of the parameters **“c.01”, “c.02”, “c.03”, “c.04”, “c.05”, “c.06”, “c.07”, “c.08”, “c.09”, “c.10”, “c.11”, “c.12”, “c.13”** and **“c.14”**.
In this mode the instrument can therefore manage up to a maximum of 14 daily defrosting events (14x7 = 98 weekly defrosts with d.8).
The events are programmable at will, including daily, using the following settings:
d.1 = Monday ... d.7 = Sunday
d. 8 = every day
d. 9 = Mon, Tue, Wed, Thur, Fri
d.10 = Mon, Tue, Wed, Thur, Fri, Sat
d.11 = Sat and Sun
d.oF = none

These options make it possible to control the starting of differing defrosts for working days and non-working days to suit one's own requirements.
For further detailed information and programming examples, see the section on programmable events.

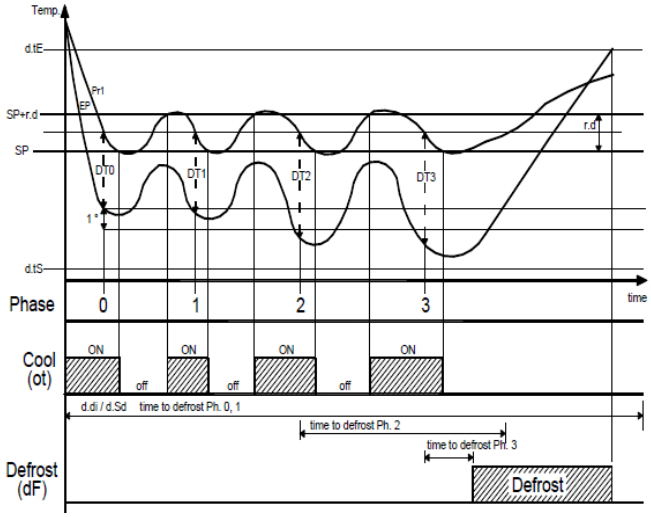
Note: Remember that for "Real Time Clock Defrosting" the user must set "d.dC" = cL and the internal clock must be present and enabled.

- Defrost by regular interval time
Counting mode interval and automatic defrost starts is set through the parameter **"d.dC"** that can be programmed:
= rt - intervals with counts the total function time (instrument on)
This mode results that currently used in the refrigerators systems.
= ct - intervals with counts only the compressor function time (output "ot" switched on)
Mode typically used in the positive temperature refrigerators system with defrost by stopping compressor.
= cS - the instrument carries out a defrosting cycle at each compressor stop (i.e. at each deactivation of the output "ot") or however at defrost interval end with counts the total function time (instrument on).
If "d.di" = oF the defrost happens only to the compressor stop.
This mode is used only on particular refrigerator system in which is desired to always have the evaporator to the maximum efficiency conditions every compressor cycle.
The automatic defrost function is activate when at the parameter **"d.di"** is set the defrost interval time.
The first defrost after swiching on can be set by par. **"d.Sd"**
This allows to perform the first defrost to a different interval from "d.di." time.
If it is desired that to every instrument power on a defrost cycle is realized (as long as the conditions set in the parameters "d.tS" and "d.tE" apply) program the par. "d.Sd" = 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.
Instead if is desired all defrost to the same interval program "d.Sd" = "d.di."
Automatic defrost function by interval is disable when "d.di" = oF.

"Dynamic Defrost Intervals System".
If "d.dd" = 0 the Dynamic defrost is disable.

***Note:** For this function is necessary to use the evaporator probe, program "d.dC" = rt, ct or cS and set "d.dd" = any value (not 0)*

This mode allows to dynamically reduce in progress the defrost interval counting ("d.di" or "d.Sd" if is the first defrost), anticipating so the execution of a defrost when it was necessary, in order to an algorithm that allows to notice a decrease performances of refrigerator thermal exchange.
Besides it maintains activates the defrost by evaporator temperature mode that it allows a further possibility of control of the defrost in order to notice a decrease performances of refrigerator thermal exchange.
The algorithm allows to esteem a reduction of thermal exchange in base to the increase of the difference of temperature between Pr1 (controlled temperature) and evaporator ("EP" probe) that is memorized by the instrument in proximity of the Set Point.
The advantage of the "Dynamic Defrost Interval" is the possibility to program a defrost interval time more longer than normal.
The instrument will have the possibility to anticipate the defrost if necessary or to start the cycle after the programmed time.
If the system results set correctly is possible to to avoid many non necessary defrosting cycles (and therefore to obtain an energy saving) that could instead happens in the normal operation when, to guarantee with greater certainty the system efficency , the defrost interval is programmed at a too low time.



Example "dynamic defrost intervals system" with a reduction "d.dd" = 40 % and end defrost by temperature.

By par.: **"d.dd"** - 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 par. "d.dd" = 100% at the first increase of the memorized difference of temperature between cell (Pr1) and evaporator (> 1 °) a defrost start immediately
For correct functioning the instrument needs a first reference value of the temperature difference between cell and evaporator.
Every variation of the value of the Active Set Point, of the differential "r.d", the start of a continuous cycle or the a defrost execution delete this reference value and any reduction will 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 **"d.tF"** programmed temperature for **"d.St"** programmed time.
This system can be used in heat pump defrost system (in this case the defrosting intervals are usually disabled) or 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.
If "d.tF" = -99.9 the function is disable.
The function is active in all modes of defrost operation ("d.dC" = cL, rt, ct, cS).

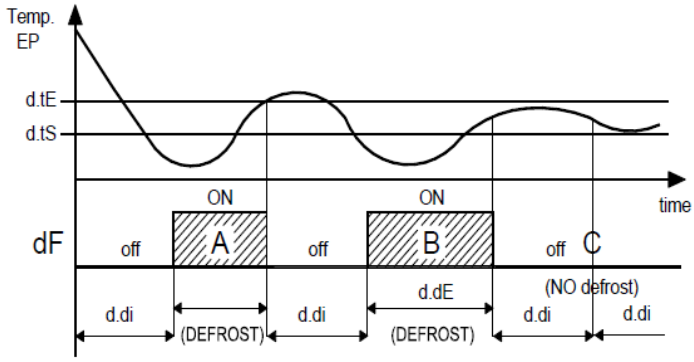
- Defrost by continuous compressor running time
The instrument start a defrost cycle when the compressor is turned on continuously for the time **"d.cd".**
This function is used because the continuous operation of the compressor for an extended period is usually symptomatic of a bad thermal exchange in comparison to the normal working conditions.
If "d.cd" = oF the function is disabled.
The function is active in all modes of defrost operation ("d.dC" = cL, rt, ct, cS).

4.8.2- MANUAL DEFROST
To start up a manual defrosting cycle, press the key UP/DEFROST when it is not in programming mode and keep it pressed for about 5 seconds after which, if the conditions are correct, the led Defrost will light up and the instrument will carry out a defrosting cycle.
To stop a defrosting cycle, press the key UP/DEFROST during a defrost cycle and keep it pressed for about 5 sec.

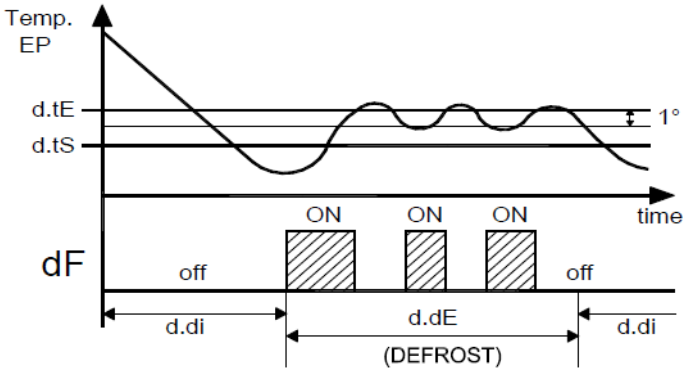
4.8.3 - DEFROST ENDS

With 1 evaporator
The automatic defrosting cycle can be ended by time or, if an evaporator probe is used ("EP" probe), when a temperature on the evaporator is reached.

If the evaporator probe is not used the duration cycle is set by the parameter **“d.dE”.**
If instead the evaporator probe is used the defrost cycle end when the temperature measured by the evaporator probe exceeds the temperature set in the parameter **“d.tE”.**
If this temperature is not reached in the time set in the parameter “d.dE”, defrosting is interrupted.
If the temperature measured by the probe is higher than the temperature set in the parameter "d.tS" and “d.tE” the defrosting is inhibited.

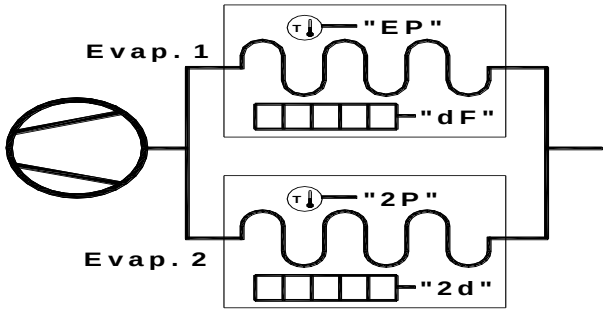


Examples: *defrosting A ends due to reaching of temperature “dtE”, defrosting B ends at the end of the “d.dE” time as the temperature “d.tE” is not reached, defrosting C does not take place as the temperature is higher than “d.tS”.*



Example of electric defrost with evaporator temperature control: The defrost end after "d.dE" programmed time. During defrost the “dF” output switch on/off to control evaporator temperature in heating mode with set point “d.tE” and 1° differential (Hysteresis).

With 2 evaporators
The instrument can also be used to control defrosts in twin-evaporator systems (and in single evaporators large enough to require two defrost control areas) by means of two defrost outputs and two probe inputs for the two evaporators.
Defrosts are always launched simultaneously for both evaporators and therefore the output configured as **“2d”** is always activated jointly with the output configured as **“dF”**.
If the two evaporator probes are not used, the end of a defrost, in the sense of deactivation of the defrosting outputs, happens separately at the end of the times defined individually in the parameters **"d.dE"** (for output "dF" which controls evaporator 1 defroster) and **"d.d2"** (for output "2d" which controls evaporator 2 defroster). The instrument can also be used to control defrosts in twin-evaporator systems (and in single evaporators large enough to require two defrost control areas) by means of two defrost outputs and two probe inputs for the two evaporators.



Schematic example of plant with two evaporators with electric defrosting.

However, the end of a defrost as a controller phase always occurs when both times come to an end.
If the user wishes each of the two evaporators to have a probe, one input must be configured as evaporator 1 probe (“i.Px” = EP) and one input as evaporator 2 probe (“i.Px” = 2E).
In this case the instrument controls defrosting using the following criteria:
– defrosting is enabled when at least one of the two readings is below the temperature set in parameter “d.tS”
– defrosting by temperature starts when at least one of the two readings remains below the temperature set in parameter “d.tF” for time “d.St”
– the end of defrosting, in the sense of deactivation of the defroster command outputs "dF" and "2d" in modes "d.dt" = EL, in, does not occur separately for the two evaporators when their respective temperatures sensed by the probes rise above the values set in parameter **“d.tE”** (evaporator 1 with probe EP) and **“d.t2”** (evaporator 2 with probe 2E).
If these temperatures are not reached within the times set in parameters “d.dE” and “d.d2” their respective defrosting actions are interrupted.
However, the end of defrosting as a controller phase occurs when both readings exceed the intended values (or, if the temperatures are not reached, when their maximum durations are reached).
If the selected defrosting mode is of the type employing electric heating and thermostatting (“d.dt” = Et), the two defrosting outputs “dF” e “2d” behave as temperature regulators with heating function with the respective set points = “d.tE” (evaporator 1) and “dt2” (evaporator 2), both with hysteresis fixed at 1°C and with reference to the respective temperatures read at both evaporators.
If one of the two evaporator probes is not enabled or has an error, its defrosting behaves as with selection EL (so the defrosting output during defrosting must remain activated throughout).
Notes: The "Dynamic Defrost" function and the thermostatting function of the fans operate always and only as a function of the probe configured as EP (evaporator 1). If the control with the twin evaporator is not used, it is recommended to set “d.d2 = oF in order to avoid undesirable influences on total defrost duration.

The active defrost is shown on the instrument display with the lighting up of the DEFROST led
At the end of defrosting, it is possible to delay the new start up of the compressor (output “ot”) at the time set in parameter **“d.td”** to allow the evaporator to drain.
During this delay, the led Defrost flashes to indicate the draining state.

4.8.4 - DEFROSTS IN EVENT OF EVAPORATOR PROBE ERROR
In event of evaporator probe error the defrosts occur at intervals **"d.Ei"** and duration **"d.EE”.**
In case an error occurs when the time remaining to the start or the end of defrost it’s lower than that normally set the parameters related to error conditions probe, the start or the end take place with the shortest time.
The functions are provided because when the evaporator probe is used the defrost endurance time is usually set longer than necessary (the time “d.dE” 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.

Notes: If the control with the twin evaporator is used, in case of error probe 2P the time "d.d2" not switch and remain operative at programmed value)

4.8.5 - DEFROST DISPLAY LOCK

Through par. **"d.dL"** and **"A.dA"** it's possible to define the display behaviour during defrost.

The "d.dL" parameter pemits the display visualization lock on the last Pr1 emperature reading ("d.dL" = on) during all the defrost cycle until, at the end of defrost, the temperature has not reached the lock value or the value ["SP" + "r.d"] or is elapsed the time setted on par. "A.dA".

Or it permits only the visualization of label **"dEF"** ("d.dL" = Lb) during the defrost cycle and, after the defrost, of label **"PdF"** until, at the end of defrost, the Pr1 temperature has not reached the lock value or the value ["SP" + "r.d"] or is elapsed the time setted on par. "A.dA".

The display will otherwise ("d.dL"= oF) continue to visualize the Pr1 temperature measured by the probe during the defrost cycle.

4.9 - EVAPORATOR FANS CONTROL

All the parameters concerning fans control are contained in the group **"Fn".**

The control of the fans on the output configured as "Fn" depending on determined 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 output Fn is activated only depending on the parameters "F.tn", "F.tF" and "F.FE".

The parameters **"F.tn"** e **"F.tF"** decides the funs functioning when the output configured as "ot" (compressor) is off.

When output "ot" is off , it is possible to set the instrument so that that the output "Fn"continues to work in cycles according to the times programmed in the parameter **"F.tn"** (fan activation time) and **"F.tF"** (fan deactivation time).

When output "ot" is switched off the instrument activates the output "Fn for the time "F.tn", then deactivates it for the time "F.tF" and so on whilst the otuput "ot" remains off.

Programming "F.tn" = oF the output "Fn" in "ot" off condition will remain switched off.

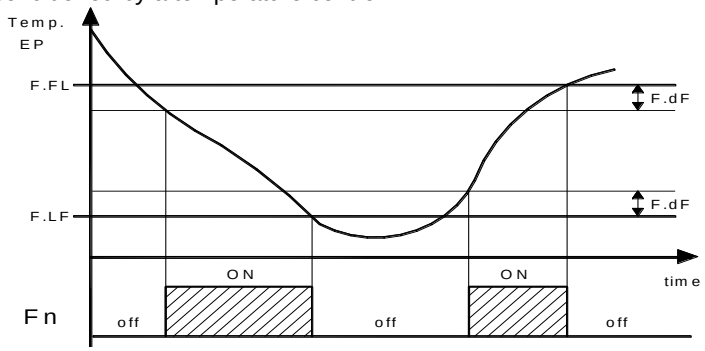
Programming instead "F.tn" to any value and "F.tF" = oF the output "Fn" in "ot" off condition will remain switched on.

The parameter **"F.FE**" instead decides whether the fans must always be switched on independently of the defrosting status ("F.FE"=on) or switched off during defrosting ("F.FE"=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.Fd".**

When this delay is active the led FAN flashing to signal the delay in progress.

When the evaporator probe is used the fans, as well as being conditioned by the parameters "F.tn", "F.tF and "F.FE", are also conditioned by a temperature control.



It is possible to set the disablement of the fans when the temperature measured by the evaporator probe is higher than the one set in the parameter **"F.FL"** (temperature too hot) or when it is lower than the one set in the parameter **"F.LF"** (temperature too cold).

Notes: 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 fans evaporator stops thermal exchange.

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

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

4.10 - ALARM FUNCTIONS

The alarm conditions of the instrument are:

- Probe errors : "**E1", "-E1", "E2, "-E2", "E3", "-E3", "E4, "-E4"**
- temperature alarms: **"H1", "L1", "H2", "L2"**
- External alarm: **"AL", "PrA", "HP", LP"**
- Open door alarm: **"oP"**

The alarm functions of the instrument work on the ALARM led, on internal buzzer (if present and programmed by par. "o.bu") and on output desired, if configured by the parameters "o.o1", "o.o2", "o.o3" ,"o.o4",, depending on what is set on the said parameters.

Any active alarm is shown on the instrument display with the lighting up of the ALARM led, the silenced or memorized alarm status is shown by the ALARM led flashing .

The buzzer (if "o.bu" = 1 or 3) is activated in alarm and can be disabled (alarm silencing) manually by pressing any key of the instrument.

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

= At - when one wants the output to be activated in alarm and can be disabled (alarm silencing) manually by pressing any key of the instrument (typical application for sound signal).

= AL - when one wants the output to be activated in alarm status but cannot be disabled manually and are therefore only disabled when the alarm status ceases (typical application for a light signal).

= An - when one wants the output to be activated in alarm status and that they remain activated even when the alarm has ceased (Alarm memory). Disablement (recognition of memorised alarm) can only be carried out manually by pressing any key when the alarm has ended (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 - when one wants the function described as AL but with inverse logic (output activated in normal conditions and disabled in alarm status).

= -n - when one wants the function described as An but with inverse working logic (output activated in normal conditions and disabled in alarm status).

4.10.1 - TEMPERATURE ALARMS

The instrument has two fully configurable temperature alarms, each with a maximum and minimum threshold.

The temperature alarm functions act in response to the readings of the probes set in parameters **"A.y1"** e **"A.y2"**, alarm thresholds set in parameters **"A.H1"**, **"A.H2"** (maxima alarms), **"A.L1"**, **"A.L2"** (minima alarms) and the differentials for these, **"A.d1"**, **"A.d2"**

Via the parameters "A.y1" and "A.y2" it is also possible to define whether the alarm thresholds "A.H1", "A.H2 ", "A.L1", "A.L2" are absolute or relative to the set point.

Depending on the desired operation, parameters "A.y1" and "A.y2" can be given the following values:

= 1: Absolute values based on Pr1 with display of label (H – L)
= 2: Relative values based on Pr1 with display of label (H – L)
= 3: Absolute values based on probe Au with display of label (H – L)
= 4: Relative values based on probe Au with display of label (H – L)
= 5: Absolute values based on probe cd with display of label (H – L)
= 6: Absolute values based on Pr1 without display of label
= 7: Relative values based on Pr1 without display of label
= 8: Absolute values based on probe Au without display of label
= 9: Relative values based on probe Au without display of label
= 10: Absolute values based on probe cd without display of label

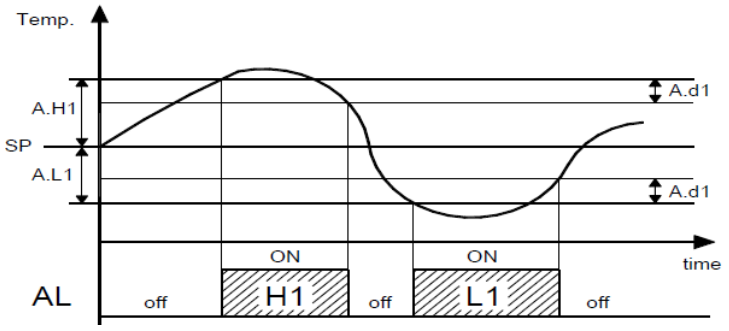
Certain parameters also allow the user to delay the enabling and intervention of these alarms. These parameters are:

"A.P1" and **"A.P2"**- these are the time periods during which temperature alarms are disabled beginning with instrument start-up if the instrument is in an alarm condition on start-up.

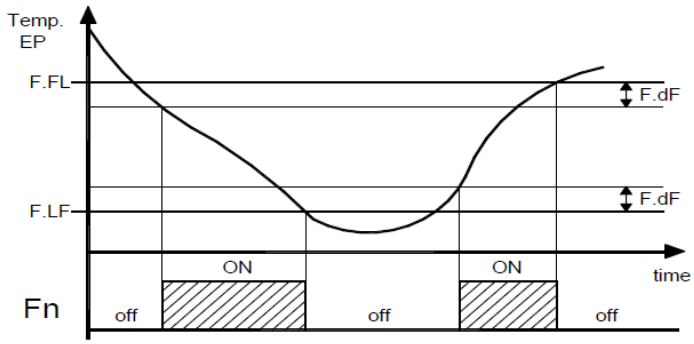
If there are no alarm conditions on start-up, the time period “A.Px” is ignored.
“A.dA” - this is the time period during which temperature alarms 1 are disabled following the end of a defrost.

Note: During defrosts, and for time period “A.dA” after defrosts, alarm 1 is disabled, whereas during defrosts alarm 2 is always enabled.

“A.t1”, “A.t2” - these are the actuation delay times for temperature alarms 1 and 2.
Temperature alarms 1 and 2 are enabled at the end of the alarm-disabled time periods and activated after time periods “A.t1” and “A.t2” when the temperature measured by the probe configured for the alarm rises above or drops below the respective maximum and minimum alarm thresholds.
Via the parameters **“A.A1”** and **“A.A2”** it is also possible to define at will the action of the alarms on the regulating output and on the alarm outputs (including buzzer).
This means for example that it is possible to change the regulating output directly, deactivating it if there are temperature alarms on the probes configured as “Au” (e.g. “antifreeze” function) or as “cd” (e.g. condenser “dirty” function).
If both alarms are configured with reference to the same probe, the instrument also allows the user to control pre-alarm notifications (e.g. notifications that do not activate the alarm output and/or the buzzer) and alarm notifications (which do activate the alarm output and/or the buzzer).
The alarm thresholds will be the same as those set in parameters “A.Hx” and “A.Lx” if the alarms absolute (“A.yx” = 1, 3, 5, 7, 9, 10).



Or will be the values [”SP”+”A.Hx”] and [”SP”+”A.Lx”] if the alarms are relative (“A.yx” = 2, 4, 6, 8).



The maxima and minima temperature alarms can be disabled by setting the relevant parameters "A.Hx" and "A.Lx" = oF.
Triggering of the temperature alarms causes the AL alarm signal LED to light up, activates outputs configured with an alarm function, and activates the internal buzzer if configured.

4.10.2 - EXTERNAL ALARMS (DIGITAL INPUTS)

The instrument can notify alarms external to the instrument by activating one or more digital inputs configured with functions programmed as “i.xF” = 4, 5, 12, 13, 14.
Simultaneously with the configured alarm notification (buzzer and/or output), the instrument notifies the alarm by iluminating the ALARM led and displaying on the display the label defined for the alarm **(AL, PrA , HP, LP)** alternating with the variable defined in parameter “i.dS”.
The “i.xF”= 4 mode produces no action on the control outputs whereas the other modes deactivate the “ot” output or deactivate all control outputs when the digital input intervenes.

Alarm	“ot” output (compr.)	other control outputs (“Fn”, “dF”, “Au”, “HE”).
AL (4)	unchanged	
AL (5)	OFF	
PrA	OFF	unchanged
HP	OFF	unchanged
LP	OFF	unchanged

4.10.3 - OPEN DOOR ALARM

The instrument can signal an open door alarm by activating the digital input with the function programmed as “i.xF” = 1, 2 or 3.
When the digital input is activated the instrument show **oP** and after the delay programmed in parameter **“A.oA”,** the instrument signals the alarm via the activation of the configured alarm output (buzzer/ouput).
At the intervention of the open door alarm the inhibited output will reactivated (fans or fans + compressor).

4.11 - HACCP FUNCTION (ALARM RECORDING)

The HACCP (Hazard Analysis and Critical Control Points) function causes the instrument to record the last 10 alarms that have occurred together with information that is useful for determining the criticality of the alarm.
The function is available only for instruments that have the calendar clock.
The parameters associated with displaying HACCP alarms are contained in the **“]HA”** group, while those associated with the configuration are contained in the **“]AL”** group.
The following HACCP alarms can be stored in memory:

HACCP alarm code	Alarm
H1	Maximum temperature alarm H1
L1	Minimum temperature alarm L1
H2	Maximum temperature alarm H2
L2	Minimum temperature alarm L2
bo	Power failure (black-out) alarm
AL	Alarm from digital input

HACCP alarms are stored provided the associated enabling parameters are configured and the preset time configured in the same parameter has lapsed.
It is also possible to disable alarm recording by using a suitably configured digital input (i.xF=13) or by using the STAND-BY or DOWN/AUX keys, suitably configured (“t.UF” or “t.Fb” = 7).
These alarms are displayed by the same display procedure as for the programming parameters by accessing parameters **“H.01” ... “H.10”** contained in the **]HA** group.

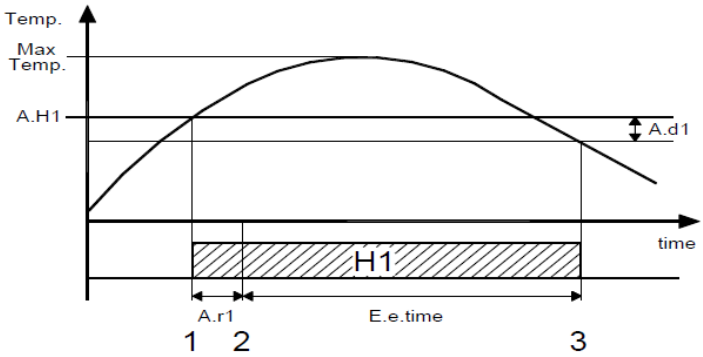
Note: see section on HACCP alarm display in chapter 2

The instrument automatically sorts these parameters from most recent (H.01) to oldest (H.10) whenever an alarm is recorded or deleted.
If more than 10 alarms occur, the instrument deletes the information about the oldest alarm by overwriting it with the most recent alarm.
When this occurs the instrument increments by one the value of the **“H.dL”** parameter by which it is possible to display the number of alarms the instrument has been forced to delete when these exceeded the permitted memory.
After selecting the parameter for the alarm which the user wishes to display, if the label flashes this indicates that the alarm has never been displayed (therefore not recognised).
To recognise it, simply access the parameter via the SET key and display it.
The next time it is displayed, the parameter label will be shown solid (not flashing).
If the alarm is still ongoing at the time of its display, the data are displayed but the alarm is not recognised and cannot be cancelled.

In the event of unrecognised (and therefore still ongoing) HACCP alarms, the instrument displays the message **"HAC"** alternating with the normal display.
Within the parameter the data will be displayed sequentially as the SET key is repeatedly pressed.
The alarm can be deleted by holding down the Down key for more than 5 seconds while one of the data of the alarm is displayed.
Its deletion is confirmed by the display indicating "---" for approx. 1 sec.
Similarly the value of the "H.dL" parameter can be reset by holding down the Down key for more than 5 seconds while the value is displayed.
However, if desired, all alarms can be deleted immediately by:
– holding down the STAND-BY key for 5 sec if parameter **"t.UF"** = 6
– holding down the DOWN key for 5 sec if parameter **"t.Fb"** = 6
– by a digital input if the relevant parameter **"i.xF"** = 11
– by the parameter reset function (at the password prompt r.P enter -48).

4.11.1 - HACCP TEMPERATURE ALARMS

Via the parameters **"A.r1"** (for alarms H1 and L1) and **"Ar.2"** (for alarms H2 and L2) it is possible to enable recording of temperature alarms as HACCP alarms.
The same parameters can also be used to define the minimum alarm duration that will cause the alarm to be recorded as an HACCP alarm.
If the alarm duration is shorter than the programmed duration, the alarm is not recorded.
If the parameters are set as = oF , recording is disabled.
For each recorded temperature alarm, the following data are stored:
- Alarm type (**A. = H1** or **L1** or **H2** or **L2**)
- Alarm start time HACCP (**y.** =year, **M.** =month, **d.** =day, **h.** =hours, **n.** =minutes)
- HACCP alarm duration (**E.** = hours, **e.** = minutes)
- Critical temp. reached (max. peak if Hi alarm or min. peak if Lo alarm)

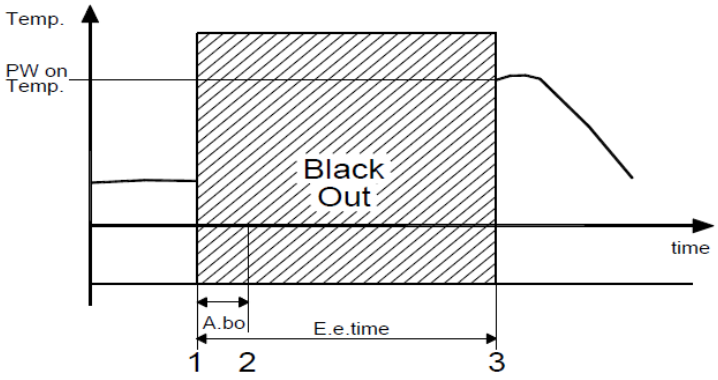


Example of HACCP maximum temperature alarm H1
1 = configured alarm start (in this case with A.t1 = oF)
2 = HACCP alarm recording start
3 = alarm end

Note: If there is a power failure during a temperature alarm, the instrument records the duration of the alarm up until the moment the power failure began.
In order to capture correct information on the temperature conditions which the user wishes to monitor, it is recommended to set a black-out alarm and if necessary disable the on-startup alarm delays (parameters A.P1 and A.P2) so that if the alarm is still ongoing when the power returns it is recorded as a new alarm on the return of power.

4.11.2 - HACCP POWER FAILURE (BLACK-OUT) ALARMS

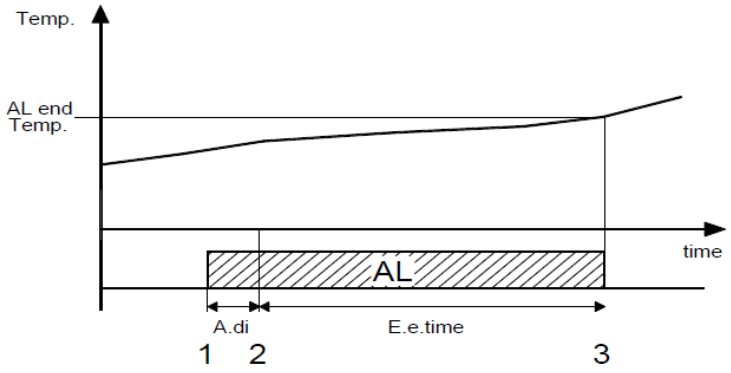
Is recorded only if the power failure exceeds the value set in parameter **"A.bo"**.
If "A.bo" = oF the black-out alarm is never recorded.
For each recorded black-out alarm, the following data are stored:
- Alarm type (**A. = bo**)
- Start time (**y.** =year, **M.** =month, **d.** =day, **h.** =hours, **n.** =minutes)
- Black-out duration (**E.** = hours, **e.** = minutes)
– Temp. relative to the probe configured for temperature alarm 1 (see parameter "A.y1") measured at end of black-out (if available; if unavailable the display shows "---").



Example of HACCP black-out alarm
1 = power failure
2 = min. power failure duration that will enable HACCP black-out alarm recording
3 = return of power (alarm end)

4.11.3 - HACCP ALARMS FROM DIGITAL INPUTS

This is recorded only if the generic alarm (AL) from a digital input configured in modes 4 or 5 continues for longer than the time set in parameter **"A.di".**
If "A.di" = oF, an alarm from a digital input is never recorded.
For each recorded alarm from a digital input, the following data are stored:
- Alarm type (**A. = AL**)
- Start time (**y.** =year, **M.** =month, **d.** =day, **h.** =hours, **n.** =minutes)
- Alarm duration (**E.** = hours, **e.** = minutes)
– Temp. relative to the probe configured for temperature alarm 1 (see parameter "A.y1") measured at end of black-out (if available; if unavailable the display shows "---").



Note: If the power fails during an alarm from a digital input, the instrument records the duration of the alarm up until the moment the power failure began.

4.12 - FUNCTIONING OF KEYS "STAND-BY" AND "DOWN/AUX"

All the parameters concerning keyboard functions are contained in the group **"tS".**
Two of the instrument keys, in addition to their normal functions, can be configured to operate other commands.
The STAND-BY key function can be defined by the parameter **"t.UF"** while the DOWN/AUX key function can be defined by the parameter **"t.Fb"**
Both the parameters have the same possibilities and can be configured for the following functions:
=oF - The key carries out no function.
= 1 - Pressing the key for at least 1 second, it is possible to enable/disable the auxiliary output if configured ("o.Fo"=2).
If are programmed activation / deactivation events of the auxiliary output by Real Time Clock the action of the keys force output status until the next event.
= 2 - Pressing the key for at least 1 second, it is possible to select the mode Economic/Normal in rotation. Once selection has been

made, the display will flash the active set point code for about 1 sec. (SP, Eco).
If are programmed switch mode events by Real Time Clock the action of the keys force status until the next event.
= 3 - Pressing the key for at least 1 second, it is possible to switch the instrument from the ON status to Stand-by status and vice versa. If switch-on/stand-by events are programmed using the clock, action by this mode has priority over the event.
= 4 - Pressing the key for at least 1 sec activates/deactivates a "Turbo" cycle.
= 5 - Forcing a programmed Switch-on/Switch-off (Stand-by) event - Pressing the key for at least 1 sec switches the instrument from the ON state to the Stand-by state and vice versa, until the next event. Therefore, if switch-on/stand-by events are programmed using the clock, action by this mode forces the state until the next event.
= 6 - HACCP Alarm Reset - Pressing the key for at least 1 sec resets stored HACCP alarms. The reset is confirmed by the display indicating "---" for approx. 1 sec.
= 7 - HACCP Alarm Recording Disabled - Pressing the key for at least 1 sec disables/enables recording of stored HACCP alarms. After the selection is made the display will flash "Hon" (HACCP alarms enabled) or "HoF" (HACCP alarms disabled) for approx. 1 sec.

4.13 - EVENTS THAT CAN BE PROGRAMMED TO OCCUR AT DEFINED TIMES

All events are programmable using the 14 parameters **"c.01" ... "c.14"** contained in the **"]cE"** group.
After selecting the desired parameter, press the SET key repeatedly to cycle through the following:
"h." and the hours (e.g. "h.13")
"n." and the minutes (e.g. "n.45")
"d." and the day of the week (e.g. "d.1")
"t." and the type of event to be performed at the programmed time (e.g. t.1).

Note: see section on programming event-related parameters in chapter 2

The days are numbered as follows:
d. 1 = Monday
d. 2 = Tuesday
d. 3 = Wednesday
d. 4 = Thursday
d. 5 = Friday
d. 6 = Saturday
d. 7 = Sunday
d. 8 = every day
d. 9 = Monday, Tuesday, Wednesday, Thursday, Friday
d. 10 = Monday, Tuesday, Wednesday, Thursday, Friday, Saturday
d.11 = Saturday and Sunday
d.oF = no day (event disabled)
The 14 event-programming parameters allow a maximum of 14 x 7 = 98 weekly events to be scheduled (using d.8).
The following events can be programmed:
t.1 = switch instrument ON
t.2 = put instrument in Stand-by
t.3 = switch auxiliary output ON
t.4 = switch auxiliary output OFF
t.5 = Start defrost (to enable scheduled defrosting, also program "d.dC" = cL)
t.6 = Switch to Eco mode (SPE)
t.7 = Switch to normal mode (SP)
A manual intervention, e.g. to change the mode (eco or normal) or activate/deactivate the auxiliary output, is effective only until the next scheduled event.
For example, if the instrument is in economical mode and is forced manually to normal mode it will stay in normal mode until the next event that switches it to economical mode.

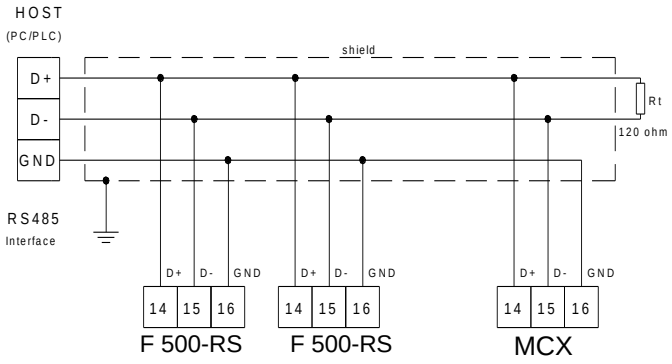
Programming example

The user wishes to set the following:
– 4 defrosts every working day at 7.00, 12.00, 17.00 and 22.00
– 2 defrosts every Sunday at 7.00 and 19.00
(also program "d.dC" = cL)
– 1 switch every working day from normal to economical mode at 20.00 and 1 switch from economical to normal mode at 6.00.
– no switches on Sundays
– 1 switch of the auxiliary output to ON every working day at 8.00 and 1 switch every day to OFF at 21.00.
– no switches on Sundays.

Event	Par.	hour	min.	days	event
work day defrost. 1	**c.01**	**h.07**	**n.00**	**d.10**	**t.5**
work day defrost. 2	**c.02**	**h.12**	**n.00**	**d.10**	**t.5**
work day defrost. 3	**c.03**	**h.17**	**n.00**	**d.10**	**t.5**
work day defrost. 4	**c.04**	**h.22**	**n.00**	**d.10**	**t.5**
sunday defrost 1	**c.05**	**h.07**	**n.00**	**d.7**	**t.5**
sunday defrost 2	**c.06**	**h.19**	**n.00**	**d.7**	**t.5**
ECO mode	**c.07**	**h.20**	**n.00**	**d.10**	**t.6**
nomal mode	**c.08**	**h.06**	**n.00**	**d.10**	**t.7**
Aux on	**c.09**	**h.08**	**n.00**	**d.10**	**t.3**
Aux off	**c.10**	**h.21**	**n.00**	**d.10**	**t.4**
	c.11... c.14	**h.00**	**n.00**	**d.oF**	**t.oF**

4.14 - RS 485 SERIAL INTERFACE

The instrument can be equipped with a RS 485 serial communication interface, by means of which it is possible to connect the regulator with a net to which other instruments (regulators of PLC) are connected, all depending typically on a personal computer used as plant supervisor.
Using a personal computer it is possible to acquire all the function information and to program all the instrument's configuration parameters. The software protocol adopted is a MODBUS-RTU type, widely used in several PLC and supervision programs available on the market (F 500 / F 500-RS series protocol manual is available on request).
The instrument is equipped with two terminals called D+ and D- which have to be connected with all the namesake terminals of the net. For the wiring operation it is advisable to adopt a screened cable wired as in the drawing.



The interface circuit allows the connection of up to 32 instruments on the same line.
To maintain the line in rest conditions a 120 Ohm resistance (Rt) must be connected to the end of the line.
If the instrument is equipped with a serial interface, the parameter to be programmed are the following present in the parameters group **"]tS"** :
"t.AS" : Address of the station. Set a different number for each station, from 1 to 255.

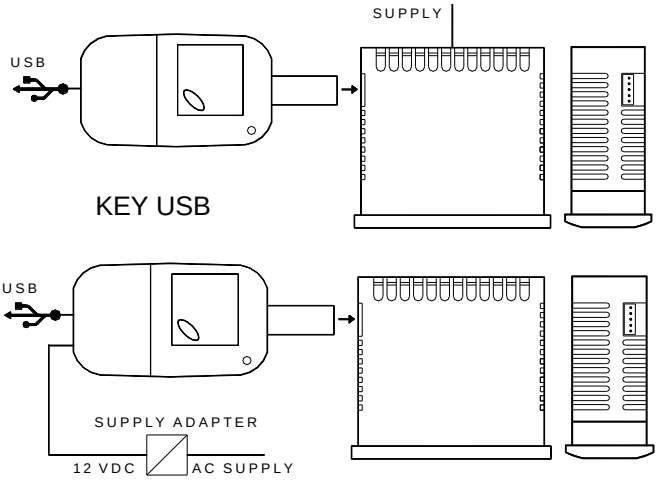
Note: The baud-rate are fixed at 9600 baud.

4.15 - ACCESSORIES

The instrument is equipped with a connector that allows the connection of some accessories described as follow.

4.15.1 - PARAMETERS CONFIGURATION BY "KEY USB"

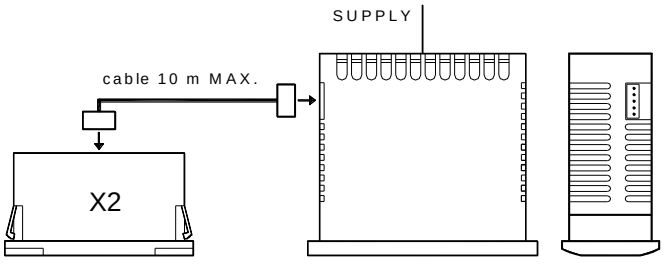
The device has a connector that allows you to transfer the operating parameters from the "**KEY USB**" device equipped with a 5-pin connector. The "**KEY USB**" device is used for serial programming of devices must have the same configuration parameters, or to save a copy of the programming device and to transfer it quickly. The device has a USB input, allowing connection to a PC, with which, through the software configuration "**Universal Conf**" or "**Osaka Set Up**" is possible to configure operating parameters.



For more information, see the "KEY USB" device manual.

4.15.2 - "X2" REMOTE DISPLAY

The device is possible to connect a remote display device via a cable X2 can be up to 10 m start. The X2 device is powered directly from equipment, displays temperature measured by the probe Pr1 by a 2-digit display and a half.



Refer to the user manual regarding X2 device for more information.

5 - PROGRAMMABLE PARAMETERS TABLE

Par.		Description	Range	Def.	Note
	]SP	**S. - parameters relative to Set Point**			
1	**S.LS**	Minimum Set Point	-99.9 ÷ S.HS	-50.0	
2	**S.HS**	Maximum Set Point	S.LS ÷ 999	99.9	
3	**SP**	Set Point	S.LS ÷ S.HS	0.0	
4	**SPE**	Eco Set Point	SP ÷ S.HS	2.0	
5	**SPH**	"Turbo" Set Point (or ind. Heating Set Point mod. HC)	S.LS ÷ SP	-2.0	
	]In	**i. -parameters relative to inputs**			
6	**i.SE**	Probes Type Pt = PTC nt = NTC P1 = Pt1000	Pt / nt / P1	nt	
7	**i.uP**	Unit of measurement and resolution (decimal point) C0 = °C with 1° res. F0 = °F with 1° res. C1 =°C with 0,1° res. F1 = °F with 0,1° res.	C0 / F0 / C1 / F1	C1	
8	**i.Ft**	Measurement filter	oF ÷ 20.0 sec	2.0	
9	**i.C1**	Pr1 Probe Calibration	-30.0 ÷ 30.0 °C/°F	0.0	
10	**i.C2**	Pr2 Probe Calibration	-30.0 ÷ 30.0 °C/°F	0.0	
11	**i.C3**	Pr3 Probe Calibration	-30.0 ÷ 30.0 °C/°F	0.0	
12	**i.C4**	Pr4 Probe Calibration	-30.0 ÷ 30.0 °C/°F	0.0	
13	**i.CU**	Measure offset on the display	-30.0 ÷ 30.0 °C/°F	0.0	
14	**i.P2**	Pr2 input function: oF = No function EP = Evaporator (1) Au = Aux cd = condenser 2E = Evaporator 2	oF / EP / Au / cd / 2E	EP	
15	**i.P3**	Pr3 input function: oF = No function EP = Evaporator (1) Au = Aux cd = condenser 2E = Evaporator 2 dG = digital input	oF / EP / Au / cd / 2E / dG	oF	
16	**i.P4**	Pr3 input function: see i.P3	oF / EP / Au / cd / 2E / dG	oF	
17	**i.1F**	Function and function logic of digital input di1: 0 = No function 1= Door open 2= Door open with fan stop 3= Door open with fan and compressor stop 4= External "AL" alarm 5= External "AL" alarm with deactivation of control outputs 6=Selection of active Set Point (SP-SPE) 7= Switch on/ off (Stand - by) 8= "Turbo" cycle activation 9= Remote command of AUX output 10= Disable recording of HACCP alarms	-17 / -16/ -15 / -14 / -13 / -12 / -11 / -10 / -9 / -8 / -7 / -6 / -5 / -4 / -3 / -2 / -1 / 0 / 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10 / 11 / 12 / 13 / 14 / 15 /16 /17	0	

		11= Reset of HACCP alarms 12= External "PrA" alarm 13= External “HP” alarm 14= External “LP” alarm 15= Forcing events Switch on/off (Stand-by) 16= Start Defrost 17= Stop Defrost			
18	**i.1t**	Delay in acquiring digital input di1	oF/ 0.01 ÷ 9.59 (min.sec) ÷ 99.5 (min.sec.x10)	oF	
19	**i.2F**	Function and function logic of digital input di2: see i.1F	-17 ... 0 ... 17	0	
20	**i.2t**	Delay in acquiring digital input di2	oF/ 0.01 ÷ 9.59 (min.sec) ÷ 99.5 (min.sec.x10)	oF	
21	**i.3F**	Function and function logic of digital input Pr3: see i.1F	-17 ... 0 ... 17	0	
22	**i.4F**	Function and function logic of digital input Pr4: see i.1F	-17 ... 0 ... 17	0	
23	**i.Et**	Delay to Eco mode with door closed oF = No function	oF/ 0.01 ÷ 9.59 (hrs.min.) ÷ 99.5 (hrs.min.x10)	oF	
24	**i.tt**	Time-out ECO mode. oF = No function	oF/ 0.01 ÷ 9.59 (hrs.min.) ÷ 99.5 (hrs.min.x10)	oF	
25	**i.dS**	Variable visualized normally on display: P1 = meas. probe Pr1 P2 = meas. probe Pr2 P3 = meas. probe Pr3 P4 = meas. probe Pr4 Ec = Pr1 in normal mode, Eco in Eco mode SP= Active Set Point rE = No function oF = Display off	P1 / P2 / P3 / P4 / Ec / SP / rE / oF	P1	
	]dF	**d. - parameters relative to defrosting control**			
26	**d.dt**	Defrosting Type: EL= Electrical heating/stop. compr. in= hot gas/reverse cycle no= without compr. output condictioning Et= Electrical heating with evaporator temperature control	EL / in / no / Et	EL	
27	**d.dC**	Defrosting starting mode: rt = real time intervals ct = “ot” output on time intervals cS = defrost every “ot” switching off (+ rt intervals) cL = by real time clock	rt / ct / cS / cL	rt	
28	**d.di**	Defrosting interval	oF/ 0.01 ÷ 9.59 (hrs.min.) ÷ 99.5 (hrs.min.x10)	6.00	
29	**d.Sd**	Delay first defrost after power-on (oF = Defrost at power-on)	oF/ 0.01 ÷ 9.59 (hrs.min.) ÷ 99.5 (hrs.min.x10)	6.00	
30	**d.dd**	Dynamic Defrost Percentage reduction	0 ÷ 100 %	0	
31	**d.dE**	Lenght (max.) of defrost cycle (evap. 1)	oF/ 0.01 ÷ 9.59 (min.sec) ÷ 99.5 (min.sec.x10)	20.0	
32	**d.dL**	Defrost display Lock oF= display free on= Lock on temperature Pr1 before defrost Lb= Lock on label “dEF” (during defrosting) and “PdF” (during post-defrosting)	oF - on - Lb	oF	
33	**d.tE**	Defrost stop temperature (evap. 1)	- 99.9 ÷ 999 °C/°F	8.0	
34	**d.Ei**	Defrosting interval for evaporator probe error	oF/ 0.01 ÷ 9.59 (hrs.min.) ÷ 99.5 (hrs.min.x10)	6.00	
35	**d.EE**	Lengh of defrost cycle for evaporator probe error	oF/ 0.01 ÷ 9.59 (min.sec) ÷ 99.5 (min.sec.x10)	10.0	
36	**d.tS**	Defrost enable temperature	- 99.9 ÷ 999 °C/°F	2.0	
37	**d.tF**	Defrost start temperature	- 99.9 ÷ 999 °C/°F	-99.9	
38	**d.St**	Defrost start delay for evaporator temperature	oF/ 0.01 ÷ 9.59 (min.sec) ÷ 99.5 (min.sec.x10)	1.00	
39	**d.cd**	Delay start Defrost by continuous compressor running time	oF/ 0.01 ÷ 9.59 (hrs.min.) ÷ 99.5 (hrs.min.x10)	oF	
40	**d.td**	Compressor delay after defrost (drainage time)	oF/ 0.01 ÷ 9.59 (min.sec) ÷ 99.5 (min.sec.x10)	oF	
41	**d.d2**	Lenght (max.) of defrost cycle evaporator 2	oF/ 0.01 ÷ 9.59 (min.sec) ÷ 99.5 (min.sec.x10)	oF	
42	**d.t2**	Defrost stop temperature evaporator 2	- 99.9 ÷ 999 °C/°F	8.0	
	]rE	**r. - parameters relative to temperature control**			
43	**r.d**	Differential (Hysteresis)	0.0 ÷ 30.0 °C/°F	2.0	
44	**r.Ed**	Differential (Hysteresis) in Eco mode	0.0 ÷ 30.0 °C/°F	4.0	
45	**r.Hd**	Differential (Hysteresis) in Eco mode in “turbo” mode or Heating HC mode.	0.0 ÷ 30.0 °C/°F	1.0	
46	**r.t1**	Output activation time for probe error	oF/ 0.01 ÷ 9.59 (min.sec) ÷ 99.5 (min.sec.x10)	oF	
47	**r.t2**	Output deactivation time for probe error	oF/ 0.01 ÷ 9.59 (min.sec) ÷ 99.5 (min.sec.x10)	oF	

48	**r.HC**	Output operating mode: H= Heating C= Cooling nr = Neutral Zone HC =Neutral Zone with ind. Set point C3 = Cooling with 3 aut. switch modes	H / C / nr / HC / C3	C	
49	**r.tC**	Lengh of “turbo” cycle	oF/ 0.01 ÷ 9.59 (hrs.min.) ÷ 99.5 (hrs.min.x10)	oF	
	]Fn	**F. parameters relative to evaporator fans control**			
50	**F.tn**	Fan time activation with ot output (compressor) off	oF/ 0.01 ÷ 9.59 (min.sec) ÷ 99.5 (min.sec.x10)	5.00	
51	**F.tF**	Fan time deactivation with ot output (compressor) off	oF/ 0.01 ÷ 9.59 (min.sec) ÷ 99.5 (min.sec.x10)	oF	
52	**F.FL**	High temperature fan deactivation	- 99.9 ÷ 999 °C/°F	10.0	
53	**F.LF**	Low temperature fan deactivation	- 99.9 ÷ 999 °C/°F	-99.9	
54	**F.dF**	Differential fan control	0.0 ÷ 30.0 °C/°F	1.0	
55	**F.FE**	Fan status during defrost	oF - on	oF	
56	**F.Fd**	Fan delay after defrost	oF/ 0.01 ÷ 9.59 (min.sec) ÷ 99.5 (min.sec.x10)	oF	
	]Pr	**P. parameters relative to compressor protection and power on delay**			
57	**P.P1**	Output “ot” delay at switch on	oF/ 0.01 ÷ 9.59 (min.sec) ÷ 99.5 (min.sec.x10)	oF	
58	**P.P2**	Output “ot” delay after switch off	oF/ 0.01 ÷ 9.59 (min.sec) ÷ 99.5 (min.sec.x10)	oF	
59	**P.P3**	Output “ot” delay between switching-on	oF/ 0.01 ÷ 9.59 (min.sec) ÷ 99.5 (min.sec.x10)	oF	
60	**P.od**	Delay outputs at power on	oF/ 0.01 ÷ 9.59 (min.sec) ÷ 99.5 (min.sec.x10)	oF	
	]AL	**A. - parameters relative to alarms**			
61	**A.y1**	Temperature alarms 1 Type: 1 =Pr1 absolute with label (H - L) 2 =Pr1 Relative with label (H - L) 3 = “Au” absolute with label (H - L) 4 =“Au” Relative with label (H - L) 5 = “cd” absolute with label (H - L) 6 = Pr1 absolute without label 7 = Pr1 relative without label 8 = “Au” absolute without label 9 = “Au” relative without label 10 = “cd” absolute without label	1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10	1	
62	**A.H1**	High temperature Alarm 1 threshold	oF / -99.9 ÷ 999 °C/°F	oF	
63	**A.L1**	Low temperature Alarm 1 threshold	oF / -99.9 ÷ 999 °C/°F	oF	
64	**A.d1**	Alarms A.H1 and A.L1 Hysteresis)	0.0 ÷ 30.0 °C/°F	1.0	
65	**A.t1**	Alarms A.H1 and A.L1 delay	oF/ 0.01 ÷ 9.59 (min.sec) ÷ 99.5 (min.sec.x10)	oF	
66	**A.P1**	Temperature Alarms 1 delay at power on	oF/ 0.01 ÷ 9.59 (hrs.min.) ÷ 99.5 (hrs.min.x10)	2.00	
67	**A.A1**	Alarms H1 e L1 actions 0 = no actions 1 = activate alarm outputs 2 = disable control outputs (ot e HE) but not activate alarm outputs 3 = disable control outputs (ot e HE) and activate alarm outputs	0 / 1 / 2 / 3	1	
68	**A.y2**	Temperature alarms 2 Type: see “A.y1”	1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10	3	
69	**A.H2**	High temperature Alarm 2 threshold	oF / -99.9 ÷ 999 °C/°F	oF	
70	**A.L2**	Low temperature Alarm 2 threshold	oF / -99.9 ÷ 999 °C/°F	oF	
71	**A.d2**	Alarms A.H2 and A.L2 Hysteresis)	0.0 ÷ 30.0 °C/°F	1.0	
72	**A.t2**	Alarms A.H2 and A.L2 delay	oF/ 0.01 ÷ 9.59 (min.sec) ÷ 99.5 (min.sec.x10)	oF	
73	**A.P2**	Temperature Alarms 2 delay at power on	oF/ 0.01 ÷ 9.59 (hrs.min.) ÷ 99.5 (hrs.min.x10)	2.00	
74	**A.A2**	Alarms H2 e L2 actions 0 = no actions 1 = activate alarm outputs 2 = disable control outputs (ot e HE) but not activate alarm outputs 3 = disable control outputs (ot e HE) and activate alarm outputs	0 / 1 / 2 / 3	1	
75	**A.dA**	Temperature Alarms 1 delay after defrost, and unlock display delay after defrost	oF/ 0.01 ÷ 9.59 (hrs.min.) ÷ 99.5 (hrs.min.x10)	1.00	
76	**A.oA**	Alarm delay with door open	oF/ 0.01 ÷ 9.59 (min.sec) ÷ 99.5 (min.sec.x10)	3.00	
77	**A.r1 (#)**	A.H1 and A.L1 delay to be recorded as an HACCP alarm (se =oF gli allarmi non sono mai registrati come HACCP)	oF/ 0.01 ÷ 9.59 (min.sec) ÷ 99.5 (min.sec.x10)	oF	
78	**A.r2 (#)**	A.H2 and A.L2 delay to be recorded as an HACCP alarm (=oF HACCP rec. disable)	oF/ 0.01 ÷ 9.59 (min.sec) ÷ 99.5 (min.sec.x10)	oF	

79	**A.bo (#)**	Black out alarm delay to be recorded as an HACCP alarm (=oF HACCP rec. disable)	oF/ 0.01 ÷ 9.59 (min.sec) ÷ 99.5 (min.sec.x10)	oF	
80	**A.di (#)**	Digital input alarm AL delay to be recorded as an HACCP alarm (=oF HACCP rec. disable)	oF/ 0.01 ÷ 9.59 (min.sec) ÷ 99.5 (min.sec.x10)	oF	
	]Ou	**o. - parameters relative to configuration of outputs and buzzer**			
81	**o.o1**	OUT1 function: oF= No function ot= Temperature control (compressor) dF=Defrosting(1) Fn= fan Au= Auxiliary At/-t= Silenceable alarm AL/-L= Not silenceable Alarm An/-n= Memorised alarm on = on when instrument switch on HE= Heating (Neutral zone control) 2d = Defrosting 2 L1 = light with economy mode (on with “SP” and off with “SPE”) L2 = internal light (off with door closed and on with door opened)	oF/ot/dF/ Fn/Au/At/ AL/An/ -t/ -L/ -n/on/HE/2d/ L1/L2	ot	
82	**o.o2**	OUT2 function: see “o.o1”	oF/ot/dF/ Fn/Au/At/ AL/An/ -t/ -L/ -n/on/HE/2d/ L1/L2	dF	
83	**o.o3**	OUT3 function: see “o.o1”	oF/ot/dF/ Fn/Au/At/ AL/An/ -t/ -L/ -n/on/HE/2d/ L1/L2	Fn	
84	**o.o4**	OUT4 function: see “o.o1”	oF/ot/dF/ Fn/Au/At/ AL/An/ -t/ -L/ -n/on/HE/2d/ L1/L2	Au	
85	**o.bu**	Buzzer function mode oF = disable 1 = active alarms only 2 = key pressed only 3 = active alarms and key pressed	oF / 1 / 2 / 3	3	
86	**o.Fo**	Function mode auxiliary output: oF= No Function 1= control output “ot” delayed 2= manual activation by key or digital input.	oF / 1 / 2	oF	
87	**o.tu**	Time relative to auxiliary output	oF/ 0.01 ÷ 9.59 (min.sec) ÷ 99.5 (min.sec.x10)	oF	
	]tS	**t. -parameters relative to configuration of the keyboard and serial communication**			
88	**t.UF**	Function mode Key STAND-BY: oF= No function 1= Auxiliary output command 2= Norm. / Eco mode Selection 3= Switch on/off (Stand-by) 4= “Turbo” cycle command 5 = Manual Switch on/off (Stand-by) when set by clock 6= HACCP Alarms Reset 7= HACCP Alarms rec. disable/enable	oF / 1 / 2 / 3 / 4 / 5 / 6 / 7	oF	
89	**t.Fb**	Function mode key Down/Aux: see “t.UF”	oF / 1 / 2 / 3 / 4 / 5 / 6 / 7	oF	
90	**t.Lo**	Keyboard lock function delay	oF/ 0.01 ÷ 9.59 (min.sec) ÷ 30.0 (min.sec.x10)	oF	
91	**t.Ed**	Set Visibility with fast procedure by Key SET: oF = None 1 = SP 2 = SPE 3 = SP e SPE 4 = Active SP 5 = SP and SPH 6 = SP, SPE and SPH	oF / 1 / 2 / 3 / 5 / 6	4	
92	**t.PP**	Access Password to parameter functions	oF ÷ 999	oF	
93	**t.HA (#)**	HACCP Alarms Parameters level 1 = protected parameters 2 = unprotected parameters	1 / 2	1	
94	**t.AS**	MODBUS Station address (for serial communication)	0 ÷ 255	1	
	]cL	**c. - parameters relative to clock setting**			
95	**c.CL (#)**	Current time and current day of the week: h = hour n = min. d = day of the week *(d.1 = Monday ... d.7 = Sunday)* d.oF = clock disable	h. = 0 ÷ 23 n. = 0 ÷ 59 d. = oF-1 ÷ 7		
96	**c.dt (#)**	Current date: y = year M = month d = date	y. = 10 ÷ 99 n. = 1 ÷ 12 d. = 1 ÷ 31		
	]cE	**c. parameters relative to events occour at defined times**			
97	**c.01 (#)**	Event 1 h = hour n = min. d = day of the week *(d.1 = Monday ... d.7 = Sunday* *d. 8 = every day* *d. 9 = from Monday to Friday* *d.10 = from Monday to Saturday* *d.11 = Sat. and Sun.* *d.oF = no day (event disabled)* *t = event type* *t.1 = Switch on* *t.2 = Stand-by*	h. = 0 ÷ 23 n. = 0 ÷ 50 d. = oF-1 ÷ 11 t. = oF-1 ÷ 10	h.0 n.0 d.oF t.oF	

		t.3 = Switch on Aux output *t.4 = Switch off Aux output* *t.5 = Start defrost* *t.6 = Switch to Eco mode (SPE)* *t.7 = Switch to normal mode (SP)*			
98	**c.02 (#)**	Event 2			
99	**c.03 (#)**	Event 3			
100	**c.04 (#)**	Event 4			
101	**c.05 (#)**	Event 5			
102	**c.06 (#)**	Event 6			
103	**c.07 (#)**	Event 7			
104	**c.08 (#)**	Event 8			
105	**c.09 (#)**	Event 9			
106	**c.10 (#)**	Event 10			
107	**c.11 (#)**	Event 11			
108	**c.12 (#)**	Event 12			
109	**c.13 (#)**	Event 13			
110	**c.14 (#)**	Event 14			
	]HA	**H. - parameters relative HACCP stored alarms (read only parameters)**			
111	**H.01 (#)**	Stored Alarm n. 1: *A. = Alarm type* *y.= start year* *M.= start month* *d.= start date* *h. = start hour* *n. = start min.* *E. = duration(hrs)* *e. = duration (min.)* *_= peak max./min. (critical temp.) °C/°F*	A. = H1/ L1/ H2/ L2/ bo/ AL y. = 10 ÷ 99 M. = 1 ÷ 12 d. = 1 ÷ 31 h. = 0 ÷ 23 n. = 0 ÷ 59 E. = 0 ÷ 99 e. = 0 ÷ 59 _ = - 99.9 ÷ 999		
112	**H.02 (#)**	Stored Alarm n. 2			
113	**H.03 (#)**	Stored Alarm n. 3			
114	**H.04 (#)**	Stored Alarm n. 4			
115	**H.05 (#)**	Stored Alarm n. 5			
116	**H.06 (#)**	Stored Alarm n. 6			
117	**H.07 (#)**	Stored Alarm n. 7			
118	**H.08 (#)**	Stored Alarm n. 8			
119	**H.09 (#)**	Stored Alarm n. 9			
120	**H.10 (#)**	Stored Alarm n. 10			
121	**H.dL (#)**	Number of HACCP alarms deleted because exceeded	0 ÷ 100	0	

(#) : Only in models with Real Time Clock

6 - PROBLEMS, MAINTENANCE AND GUARANTEE

6.1 - SIGNALLING

Error	Reason	Action
E1 -E1 **E2 -E2** **E3 -E3** **E4 -E4**	The probe may be interrupted (E) or in short circuit (-E), or may measure a value outside the range allowed	Check the correct connection of the probe with the instrument and check the probe works correctly
EPr	Internal EEPROM memory error	Press Key SET
Err	Fatal memory error	Replace the instrument or ship to factory for repair

Other Signalling:

Message	Reason
od	Delay at power-on in progress
Ln	Keyboard lock
H1	Maximum temperature alarm 1 in progress
L1	Minimum temperature alarm 1 in progress
H2	Maximum temperature alarm 2 in progress
L2	Minimum temperature alarm 2 in progress
AL	Digital input alarm in progress
PrA	Digital input alarm PrA in progress
HP	Digital input alarm HP in progress
LP	Digital input alarm LP in progress
oP	Door opened
dEF	Defrosting in progress with "d.dL"=Lb
PdF	Post-defrosting in progress with "d.dL"=Lb
Eco	Eco mode active
trb	"turbo" mode active
HAC	As-yet unrecognised HACCP alarms occurring
---	Reset/delete peak values and HACCP alarms
Hon	HACCP Alarms rec. enable
HoF	HACCP Alarms rec. disable

6.2 - CLEANING

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

6.3 - GUARANTEE 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 - TECHNICAL DATA

7.1 - ELECTRICAL DATA

Power supply: 100...240 VAC +/- 10%
Frequency AC: 50/60 Hz
Power consumption: 6 VA approx.
Input/s: 4 inputs for temperature probes: PTC (KTY 81-121, 990 Ω @ 25 °C) or NTC (103AT-2, 10KΩ @ 25 °C) or Pt1000 (1000 Ω @ 0° C); 2 digital inputs for free voltage contacts
Output/s: up to 4 relay outputs (Out1 and Out2 are always present)

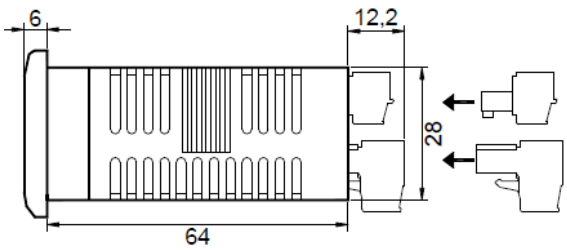
	EN 61810	EN 60730	UL 60730
Out1 - SPST-NO - 16A - 1HP 250V	16 (9) A	10 (4) A	12 A Res., 30 LRA, 5 FLA
Out2 - SPDT - 8A - 1/2HP 250 V	8 (3) A	4 (4) A	10 A Res.
Out3 - SPST-NO - 5A - 1/10HP 125/250 V	5 (1) A	2 (1) A	2 A Gen.Use
Out4 - SPST-NO - 5A - 1/10HP 125/250V	5 (1) A	2 (1) A	2 A Gen.Use

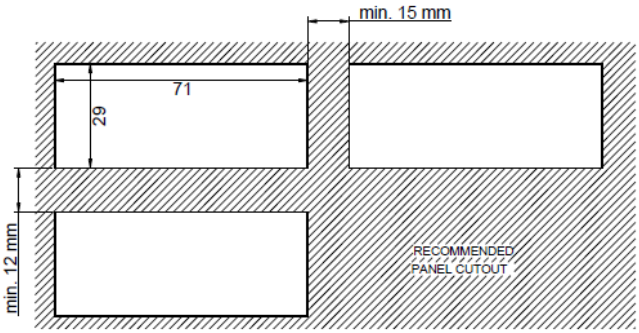
12 A Max. for extractable terminal block model
Electrical life for relay outputs: 100000 op. (EN60730)
Action type: type 1.B (EN 60730-1)
Overvoltage category: II
Protection class : Class II
Insulation: Reinforced insulation between the low voltage part (supply H type and relay output) and front panel; Reinforced insulation between the low voltage section (supply H type and relay output) and the extra low voltage section (inputs); Reinforced between supply and relay output.

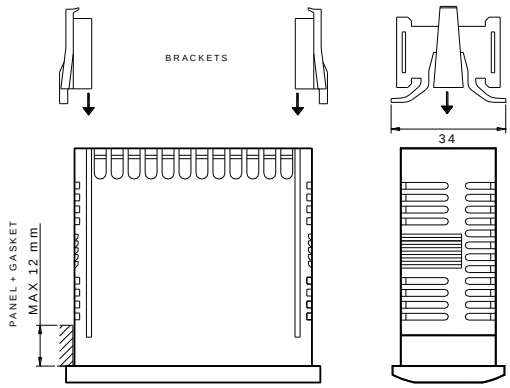
7.2 - MECHANICAL DATA

Housing: Self-extinguishing plastic, UL 94 V0
Heat and fire resistance category : D
Ball Pressure Test secondo EN60730: acessible parts 75 °C; support live parts 125 °C
Dimensions: 78 x 35 mm, depth 64 (+12,5 or +14,5) mm depending on terminal block type
Weight: 150 g approx.
Mounting: Incorporated Flush in panel (thickness max. 12 mm) in 71 x 29 mm hole
Connections: Inputs: extractable screw terminals block for 0,14...1,5 mm^2 / AWG 28...16; Supply and relay outputs 2,5 mm^2 screw terminals block or 2,5 mm^2 extractable screw terminals block for 0,2...2,5 mm^2 / AWG 24...14 cables.
Degree of front panel protection : IP65 (NEMA 3S) mounted in panel with gasket
Pollution situation: 2
Operating temperature: 0 T 50 °C
Operating humidity: < 95 RH% without condensation
Storage temperature: -25 T +60 °C

7.3 - MECHANICAL DIMENSIONS, PANEL CUT-OUT AND MOUNTING [mm]







7.4 - FUNCTIONAL FEATURES

Temperature regulation: ON / OFF
Defrost control: at a fixed time interval or electric heating temperature mode, hot / cold cycle, gas compressor off.
Range: NTC: -50 ... 109 ° C / -58 ... 228 ° F; PTC: -50 ... 150 ° C / -58 ... 302 ° F; PT1000: -99.9 ... 300 ° C / 572 ° F -99.9 ...
Screen Resolution: 1 or 0.1 ° (-99.9 field..99.9 °) Total Accuracy: +/- (0.5% FS + 1 digit)
Sampling measurement time: 800 ms
Accuracy of time at 25 ° C: +/- 15.8 min. / Year
Internal clock length without power: about 5 years by the internal lithium battery
Serial interface type: isolated RS 485
Communication protocol: MODBUSRTU (JBUS) Serial transmission
Speed: 9600 baud
Display: 3 Digit blue h 15.5 mm
Class and software structure: Class A
Conformity : Directive 2004/108 / EC (EN55022: type B; EN61000-4-2: air of 8 kV, 4KV suite; EN61000-4-3: 10 V / m; EN61000-4-4: 2KV power supply, inputs, outputs; EN61000-4-5: 2KV power supply com. Mode 1 KV \ diff. Fashion; EN61000-4-6: 3V), 2006/95 / EC (EN 60730-1, EN 60730-2-7, EN 60730-2-9)
Directive 37/2005 / EC (13485 aria / air, S, A, 1, - 50 ° C + 90 ° C when used with model 103AT11 NTC or PT1000 probe class B or better.