X30

DIGITAL ELECTRONIC CONTROLLER FOR REFRIGERATION UNITS AND DATA ACQUISITION AND TRANSMISSION MODULE ON RS485 NETWORK

OPERATING INSTRUCTIONS

17/12 - Code:ISTR_M_X30-_E_01_--

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PREFACE

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

Ascon Tecnologic S.r.l. reserves the right to make any formal or functional changes at any moment and without any notice.

Ascon Tecnologic S.r.l. 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 features.

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

Index

1. Instrument description 2
1.1 General description 2
1.2 Instrument description 2
2. Programming 2
3. Usage warnings 2
3.1 Admitted use 2
4. Installation warnings 2
4.1 Mechanical mounting 2
4.1.1 Dimensions [mm] 3
4.2 Electrical connections 3
4.2.1 Electrical wiring diagram 3
5. Functions 3
5.1 ON/Stand-by function 3
5.2 “Normal”, “Economical” and “Turbo” operating modes 3
5.2.1 Normal-Eco mode operation 3
5.2.2 Turbo – Normal – Eco mode operation 4
5.3 Measuring and display 4
5.4 Digital inputs 5
5.5 Outputs and buzzer configuration 6
5.6 Temperature control 7
5.7 Compressor protection function and delay at Power-ON 7
5.8 Defrost control 8
5.8.1 Starting automatic defrosts 8
5.8.2 Manual defrost 9
5.8.3 End of defrosts 9
5.8.4 Defrosts in event of evaporator probe error 10
5.8.5 Defrost display lock 11
5.8.6 Hot-gas defrost in centralized systems 11
5.9 Evaporator fans control 12
5.10 Alarm functions 12
5.10.1 Temperature alarms 13
5.10.2 External alarms (digital inputs) 13
5.10.3 Open door alarm 13
5.11 HACCP function (alarm recording) 13
5.11.1 HACCP temperature alarms 14
5.11.2 HACCP power failure (black-out) alarms 14
5.11.3 HACCP alarms from digital inputs 15
5.12 Functioning of keys U and ▼/Aux 15
5.13 Events that can be programmed to occur at defined times 15
5.14 RS485 Serial Intefarce 16
6. Accessories 16
6.1 Parameters configuration by “A01” 16
6.2 TVR Y remote display 16
7. Communications protocol 17
7.1 Serial communications protocol and programmable parameter table 17
7.1.1 Variables zones 17
7.1.2 Command zone 19
7.1.3 Operating and configuration parameters zone 19
7.1.4 Zone for the events programmable by clock 23
7.1.5 Data zone related to the calendar clock 24
7.1.6 Data zone related to stored HACCP alarms 24
8. Problems, maintenance and warranty 27
8.1 Notifications 27
8.1.1 Error messages 27
8.1.2 Other messages 27
8.2 Cleaning 27
8.3 Warranty and Repairs 27
8.4 Disposal 27
9. Technical data 27
9.1 Electrical characteristics 27
9.2 Mechanical characteristics 27
9.3 Functional features 28
10. How to order 28

1. INSTRUMENT DESCRIPTION

1.1 General description

The **X30** model is a digital electronic microprocessor controller that can be used typically for refrigeration applications. It has temperature control with ON/OFF action and control of defrost at defined times (Real Time Clock Defrost), 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, moreover it can also be used in refrigeration plants equipped with HOT-GAS defrost.

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 **RS485** serial communications interface with **MODBUS-RTU** communications protocol and a calendar **clock**.

The clock allows to define the times of defrosting events, auxiliary output switching, switching of the active Set Point, instrument ON/OFF, etc. (max 14 daily and 98 weekly events).

A further feature of the calendar clock version is the HACCP function which can store the last 10 occurred alarms (alarm type, start, duration and temperature peaks).

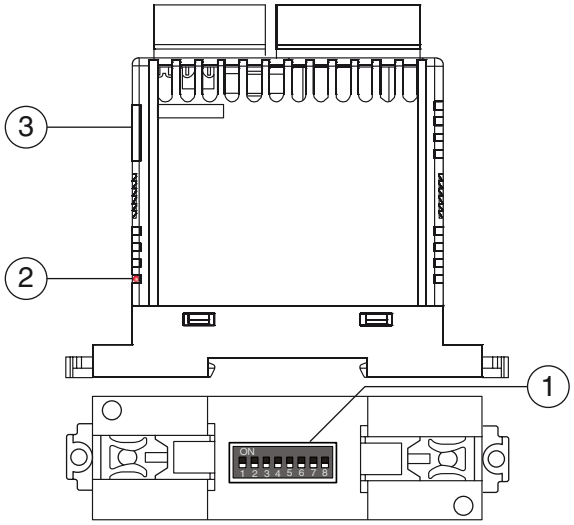
2 digital inputs are always available and 2 further digital inputs can be configured as an alternative to the **Pr3** and **Pr4** temperature probe inputs.

Using the instrument as **data acquisition module** and **output slave module**.

Deactivating the outputs (parameter ▫.▫❑ = **oF**) the instrument can be used as an **output slave module** (all the outputs can be controlled by the RS485) and as an **input for data acquisition**.

Through the serial communication port are available all the parameters, all the variables and all the commands that can be implemented on the instrument.

1.2 Instrument description



1 **DIP Switches:** Used for setting the RS485 communications parameters.

2 **LED ON (red):** Blinks to indicate the correct control unit operation. When the instrument is powered ON, it blinks faster for a few seconds to indicate that the control unit is starting and then the flashing frequency slows down.

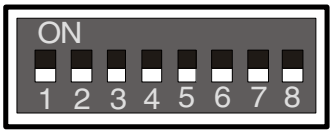
3 **TTL communications port:** This port can be used to connect:

– An **A01** device and transfer the operation parameters to/ from the instrument or for MODBUS communications through an USB interface;
– A remote display TVR Y.

2. PROGRAMMING

Configuration is made by means of DIP switches located at the bottom of the instrument and via the RS485 serial communications interface or the TTL port.

Through these DIP switches is possible to set the device address oand the communications speed.



DIP-SW	Description	Values
1	AT Lin Network Addr. selection	Do not use
2	AT Lin Network Addr. selection	
3	Bit 0 RS485 address	+1 RS485 Address
4	Bit 1 RS485 address	+2 RS485 Address
5	Bit 2 RS485 address	+4 RS485 Address
6	Bit 3 RS485 address	+8 RS485 Address
7	Bit 4 RS485 address	+16 RS485 Address
8	Baud Rate RS485	OFF = 9600 baud ON = 19200 baud

3. USAGE WARNINGS

3.1 Admitted use

The instrument has been projected and manufactured as a measuring and control device to be used according to EN61010-1 at altitudes operation below 2000 m.

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

The instrument **must not be used** in dangerous environments (flammable or explosive) without adequate protections.

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

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

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

4. INSTALLATION WARNINGS

4.1 Mechanical mounting

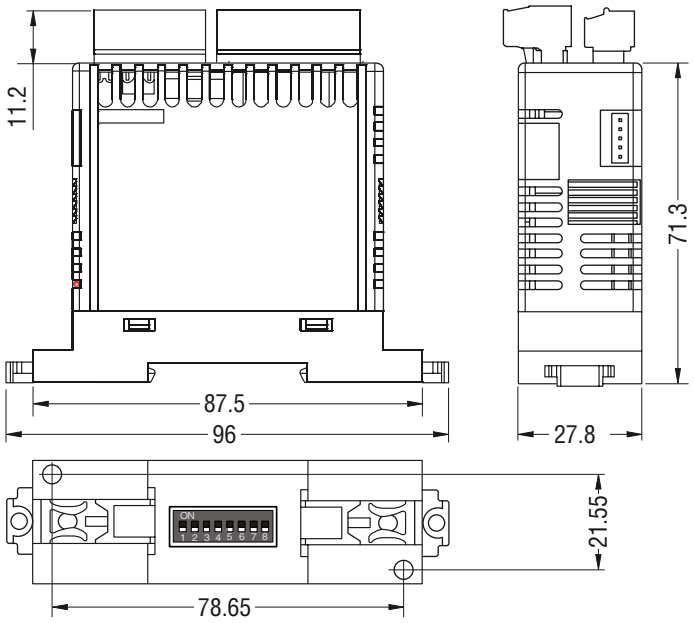
This instrument is intended for permanent installation, for indoor use only, inside an electrical panel, specific for DIN rail mounting.

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

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

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

4.1.1 Dimensions [mm]



4.2 Electrical connections

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

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

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

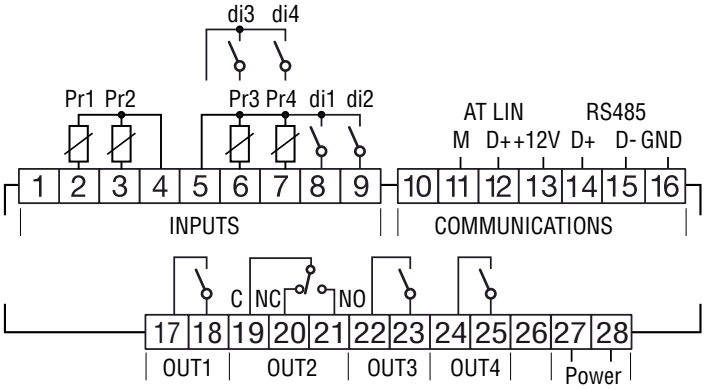
It is strongly recommended that cables with proper insulation, according to the working voltages and temperatures, be used.

Furthermore, the probes input cable must be kept separated from line voltage wiring and, if shielded cables are used, the shield must be connected to ground at only one side.

For the electrical supply of the **G** (12... 24 VDC) type instruments it is recommended to use an external TCTR transformer, or with equivalent features and to use a transformer for each instrument because there is no insulation between input and power supply.

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

4.2.1 Electrical wiring diagram



	61810 EN	60730 EN	UL
Out1:	16 (9) A	10 (4) A	12 A Res., 30LRA/5FLA
Out2:	8 (3) A	4 (4) A	10 A Res.
Out3, 4:	5 (1) A	2 (1) A	2 A Gen. Use

5. FUNCTIONS

5.1 ON/Stand-by function

The instrument, once powered ON, 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 a power interruption occurs, the the system always restarts in the condition it was before the black-out.

The ON/Stand-by function can be selected:

– Pressing the key U for at least 1 s if parameter Uuf = **3** o **5**;
– Pressing the key ▼ for at least 1 s if parameter dFb = **3** or **5**;
– Using the digital input if the parameter i❑F = **7** or **15** (the character ❑ indicates a digital input between **1** and **4**);
– By programming a programmable event through the clock (when present).

5.2 "Normal", "Economical" and "Turbo" operating modes

The instrument can be used to enter up to **3 different** Set Points: *Normal* - SP, *Economical* - SPE and *Turbo* - SPH.

Associated to each of these Set Points there is the correspondent differential (hysteresis): *Normal* - r.d, *Economical* - r.Ed and *Turbo* - r.Hd. Switching between the various modes can be automatic or manual.

5.2.1 Normal-Eco mode operation

Can be used where it is necessary to switch between two different operating temperatures (e.g. day/night or working days/holidays).

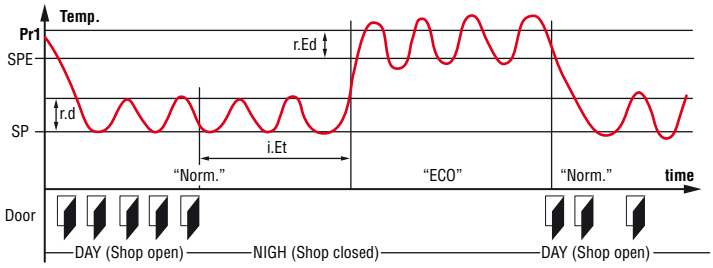
The Normal/Eco mode can be selected manually:

– Pressing the U key if parameter Uuf = **2**;
– pressing the ▼ key if parameter dFb = **2**;
– By a digital input if parameter i❑F = **6**.

The Normal/Eco mode can be selected automatically:

– After the door has been closed for time iEt (switching from Normal to Eco)
– When the door is opened if the **SPE** Set Point is active from parameter iEt (switching from Eco to Normal);

– After the door has been closed for time iEt since activation of the **SPE** Set Point from parameter **i.Et** (switching from Eco to Normal)
– 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 remains in normal mode. When the door has not been opened for time iEt, 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 i1F = **1**, **2** or **3** (door open input)

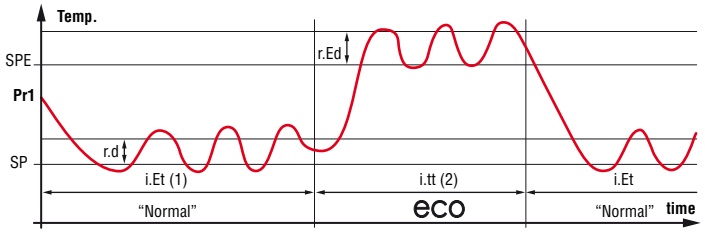
If iEt = **oF**, selection of Eco/Normal mode via the digital input configured as door, is deactivated.

If iEt = **oF**, switching the mode from Eco to Normal due to time-out is deactivated.

When in Eco mode, the label Eco is displayed.

If id5 = **Ec**, when in Eco mode the instrument displays Eco all the time. Otherwise the label Eco appears approx. every 10 s alternated with the value set at the id5 parameter (normal display).

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



Notes: 1. The time iEt resets when the door is opened. In the case shown, the door is always closed.
2. The time iEt stops when the door is opened and the instrument immediately switches to Normal mode. In the case shown, the door is always closed.

5.2.2 Turbo – Normal – Eco mode operation

Turbo mode can be selected manually:
– By pressing the U key if parameter t.UF = **4**;
– By pressing the ▼ key if parameter t.Fb = **4**;
– By a digital input if parameter i1F = **8**.

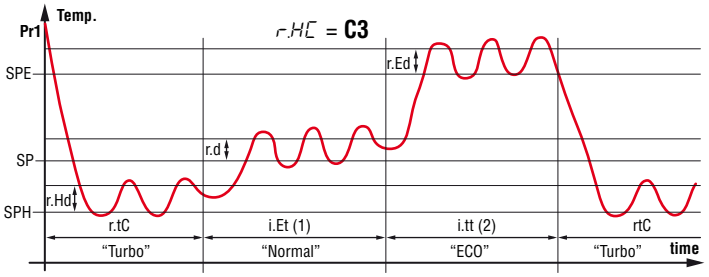
Turbo mode can be selected automatically:
– Exiting the Eco mode (only if r.HC = **C3**);
– All the times the instrument is popwered ON (only if r.HC = **C3** and Pr1 > **SPE** + r.Ed).

The instrument quits the Turbo mode automatically when r.tC times expires or manually using the programmed command (key or digital input); 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 Eco mode.

Setting r.HC = C3 gives the following operating cycle:



Notes: 1. The time iEt resets when the door is opened. In the case shown, the door is always closed.
2. The time iEt stops when the door is opened and the instrument immediately switches to **Turbo** mode. In the case shown, the door is always closed.

When powered ON, the instrument starts in the mode it was in when it was switched OFF (Normal or Eco) unless the temperature at Power ON is > **SPE** + r.Ed. In this case (see the image) a Turbo cycle is automatically initiated. After the time r.tC the instrument automatically enters in Normal mode.

If the door is opened frequently the instrument remains in Normal mode. If however the door is not opened for the time iEt 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 iEt.

Exiting the Eco mode the instrument therefore runs a Turbo cycle to restore the product temperature, after which it returns to Normal mode and so on.

Turbo mode is indicated with the label t.rb shown on the display, alternated with the normal display.

SP Set Point can be set within the values SLS < **SP** < SHS.

SPE Set Point can be set within the values **SP** < **SPE** < SHS.

SPH Set Point can be set within the values SLS < **SPH** < **SP**.

Note: In the examples that follow, the Set Point is generally indicated as **SP** and the differential (hysteresis) as r.d, however, the instrument will operate on the basis of the Set Point and the hysteresis selected as active.

5.3 Measuring and display

All the parameters concerning measuring are contained in the group In.

With parameter iSE is possible to select the type of probes in use: thermistors PTC KTY81-121 (**Pt**), NTC 103AT-2 (**nt**) or Pt1000 (**P1**).

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

The instrument allows the measure calibration to recalibrate the instrument according to application needs. The calibration is made by using parameters iC1 (**Pr1** input), iC2 (**Pr2** input), iC3 (**Pr3** input) and iC4 (**Pr4** input).

The functions carried out by **Pr2**, **Pr3** and **Pr4** probes is defined by the parameters iP2, iP3 and iP4.

These 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 /P2 and/or /P3 and/or /P4 = **oF**.

It is not possible to program more parameters for the same function (priority goes to lowest input).

With parameter /Ft is possible to set a software filter for the input values measuring in order to decrease the sensibility, by increasing the sampling time, to fast temperature changes.

Through the parameter /dS, it is possible to set what is normally displayed that can be:

- Pr1 Probe **Pr1** measurement;
- Pr2 Probe **Pr2** measurement;
- Pr3 Probe **Pr3** measurement;
- Pr4 Probe **Pr4** measurement;
- SP Active **Set Point**;
- Ec Probe **Pr1** measurement if the instrument is in Normal mode and the label Eco if the instrument is in Eco mode;
- oF Numerical display switched OFF.

If one of the measurements (/dS = **Pr1**, **Pr2**, **Pr3**, **Pr4**, **Ec**) is displayed, the parameter /CU allows to set an offset that is to be applied to the temperature shown on the display.

What is normally shown on the display is set with patrameter /dS, but is possible to display, sequentially, all the variables and the **Pr1** high and low peak values, pressing and releasing repeatedly the U key. The display alternately shows the code that identifies the variable and its value:

- Pr1 and the probe **Pr1** measurement;
- Pr2 and the probe **Pr2** measurement;
- Pr3 and the probe **Pr3** measurement (**on**/**oF** state if it is set as Digital Input);
- Pr4 and the probe **Pr4** measurement (**on**/**oF** state if it is set as Digital Input);
- Lt and minimum **Pr1** stored temperature (low peak);
- Ht and maxmum **Pr1** stored temperature (hogh peak);

and, if real time clock is enabled:

- h. + current hour;
- n. + current minutes;
- d. + current day of the week.

The temperature peak values Lt and Ht are not saved in case of power failure and can be reset pressing for about 3 s the ▼ key while the instrument shows the Lt/Ht peak values.

After 3 seconds the display shows "- - -" for an instant to notify the deletion and takes as peak temperature the one measured at that instant.

The instrument automatically returns to the normal display 15 s after the last pressing on the key U.

Please remember that what is displayed for the **Pr1** probe can be changed by the the defrost display lock function using the parameter ddL (see the defrost function).

5.4 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 are defined by the parameters /1F and /1F and whose action can be delayed by the time set at the parameters /1t and /1t.

In addition, the instrument can 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 /P3 or /P4 = **dG**.

The function performed by these digitally configured inputs is defined by parameters /3F and /4F while the action is instantaneous and cannot be delayed.

/1F, /2F, /3F, /4F can be configured for the following functions:

- 0 No function.
- 1 Cell door opening by NO contact: closing the digital input the display shows alternately oP and the variable set at parameter /dS. With this function mode, the action of the digital input also activates the countdown of the delay time set with AoA elapsed which the alarm is activated to point out that the door has been left open. Opening the door, the instrument returns to Normal operation in the event it was in Eco mode and in the case that the Eco mode insertion function should be enabled by the /Et parameter.
- 2 Cell door opening with fan stop by NO contact: similar to /❑F = 1 but with evaporator fans stop. At the AoA Open door alarm intervention the fans are restarted.
- 3 Cell door opening with compressor and fan stop by NO contact: similar to /❑F = **2** but with fans and compressor stop. At the AoA Open door alarm intervention, compressor and fans are restarted.
- 4 External alarm signal by NO contact: closing the digital input the alarm is activated and the instrument alternately shows on the display AL and the variable set with parameter /dS.
- 5 External alarm signal with the deactivation of all the control outputs by NO contact: closing the digital input all the control outputs are disabled, the alarm is activated and the instrument alternately shows on the display AL and the variable set with parameter /dS.
- 6 Normal/Eco mode selection with NO contact: closing the digital input the instrument switches to Eco mode operation (with **SPE** Set Point). Opening the digital input contact, the instrument returns Normal mode and to **SP** Set Point.
- 7 Switching ON/OFF (Stand-by) the instrument by NO contact: the instrument is switched **ON** when the digital input is closed while it is placed in **Stand-by** when opened.
- 8 Turbo cycle activation command with NO contact: closing the input the instrument starts a **Turbo** cycle.
- 9 Remote command of the **AUX** auxiliary output with NO contact: closing the input activates the auxiliary output as described at oFo = **2** operating mode of the auxiliary output.
- 10 Disable recording of **HACCP** alarms: closing the input disables the recording of HACCP alarms.
- 11 Reset of **HACCP** alarms: closing the input deletes all recorded HACCP alarms.

12 External **PrA** alarm signal and **ot** output deactivated by NO contact: closing the input the instrument deactivates the output configured as **ot**, activates the alarm and the alternately shows on the display PrA and the variable set with parameter id5.

13 External **HP** alarm signal and **ot** output deactivated by NO contact: closing the input the instrument deactivates the output configured as **ot**, activates the alarm and the alternately shows on the display HP and the variable set with parameter id5.

14 External **LP** alarm signal and **ot** output deactivated by NO contact: closing the input the instrument deactivates the output configured as **ot**, activates the alarm and the alternately shows on the display LP and the variable set with parameter id5.

15 Forcing a programmed Switch-ON/OFF (Stand-by) event: closing the input switches the instrument from the ON to the Stand-by state and vice versa. Therefore, if controller switch-ON/stand-by events are programmed using the clock, this action forces the state until the next event.

16 Defrost Start command with NO contact: closing the digital input 1 (and after the id1 time) a defrost cycle is activated.

17 Defrost End command with NO contact: closing the digital input 1 (and after the id1 time) the defrost cycle in progress is ended or if not running, defrost is inhibited.

-1, -2, -3, **etc.**
These functions are like those with positive values but with a reversed function logic (contact NC).

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).

5.5 Outputs and buzzer configuration

All the parameters concerning outputs configuration are contained in the group Out.

The instrument outputs can be configured by the relative parameters o01, o02, o03 and o04 that can be configured for the following functions:

ot To control the compressor or however, the temperature control device. In the case of neutral zone control (rHC = **nr**) for controlling the cooling control device;;

dF To control the defrosting device (1);

Fn To control the evaporator fans;

Au To control the auxiliary device;

At To control an aknowledgeable alarm device through a contact that is NO then closed when the alarm sounds;

AL To control an alarm that cannot be acknowledged through a contact that is NO then closed when the alarm sounds.

An To control an alarm with a memory function through a contact that is NO then closed when the alarm sounds.

-t To control an aknowledgeable alarm device through a contact that is NC then open when the alarm sounds.

-L To control an alarm that cannot be acknowledged through a contact that is NC then open when the alarm sounds.

-n To control an alarm with a memory function through a contact that is NC then open when the alarm sounds.

on Output ON when the instrument is ON. The output is not active (OFF) when the instrument is in OFF or Stand-by cndition. This mode can be used to control lights, non-misting resistance on room door or other utilities.

HE To control a heating device in neutral zone control mode (rHC = **nr**).

2d To control the defrost device no. 2.

L1 Shop Light output managed by Normal/Eco mode. This output will be **ON** in Normal mode and **OFF** in Eco mode operation.

L2 Internal Cell Light output managed by digital input. This output will be **ON** when door is opened (only if i1F = **1**, **2**, **3**).

oF Output disabled.

By deactivating the outputs (parameter o01 = **oF**) the outputs can be controlled from serial portto at the addresses:

Hexadecimal address	Description	Action
28E	Enable/Disable output **OUT1** when o01 = **oF**	0 = Disable output 1 = Enable output
28F	Enable/Disable output **OUT2** when o02 = **oF**	0 = Disable output 1 = Enable output
290	Enable/Disable output **OUT3** when o03 = **oF**	0 = Disable output 1 = Enable output
291	Enable/Disable output **OUT4** when o04 = **oF**	0 = Disable output 1 = Enable output

If one of the outputs is configured as auxiliary **Aux** output (**Au**), its function is defined by parameter oAo and the functioning is conditioned by the time set at parameter oEu.

The parameter oAo can be configured for the following functions:

oF Auxiliary output not active.

1 Delayed temperature control output with NO contact: the activation of the **Aux** output is delayed respect to the **ot** output of the time set at parameter oEu. The output is then turned **OFF** at the same time the **ot** output is disabled. This function mode can be used to command a second compressor or for all other working utilities according to the same **ot** output conditions, but which must be delayed after the compressor start up to avoid an excess of electricity absorption.

2 Activation with U/▼ keys or by digital input or by Real Time Clock: when suitably configured the **Aux** output is activated by pressing the keys U or ▼ (tuF or tFb = **1**), by a digital input suitably configured (i1F = **9**) or by a Real Time Clock event. The commands by keys or digital inputs have a bi-stable (toggle) function, this means that at first pressure the output is activated while at the second is disabled. In this mode, the **Aux** output can be turned OFF automatically after a certain time that can be set at parameter oEu. With oEu = **oF** the output is turned ON/OFF only manually using a front key (U or ▼). If oEu is different than **oF**, 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 **Aux** output by the Real Time Clock the keys or digital input action force output status until the next event.

3 Intake solenoid valve output. The output is used to control the Hot-Gas intake valve in centralized systems (ddt = **HG**) defrost mode. The output configured in this way is permanently activated during the temperature control operation, while it is deactivated during defrost and post-defrost to avoid the introduction of hot gas into the intake line.

The internal buzzer (when present) can be configured by parameter *obu* 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.

5.6 Temperature control

Most of the parameters for temperature control functions are found in the *rE* group.

The control method implemeted by the instrument is ON/OFF and actson the **ot** and **HE** outputs in response to:

– The **Pr1** probe temperature;

– The active set point(s) **SP** (or **SPE** and/or **SPH**);

– The intervention differential *r.d* (or *r.Ed* and/or *r.Hd*);

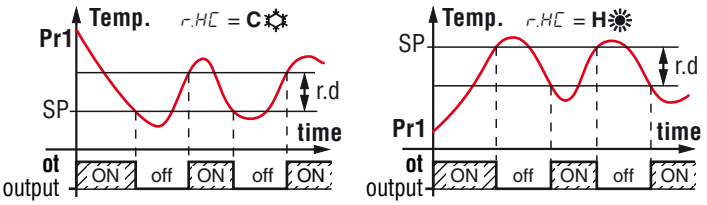
– The operating mode *r.HC*.

Via the parameter *r.HC* the following functions can be obtained:

C Cooling;

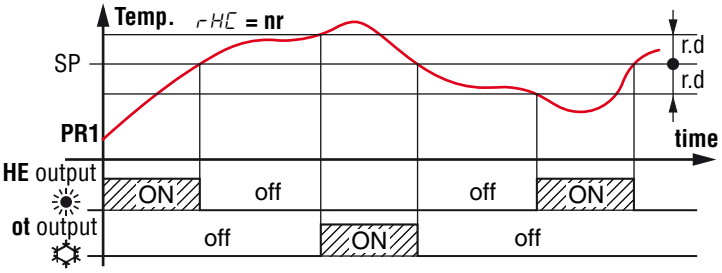
H Heating.

With relation to the operating mode programmed at *r.HC* parameter, the instrument 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 as *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 (as *r.HC* = **H**). In this case the control Set Point for both outputs is the active one between **SP**, **SPE** and **SPH** and the intervention differential (*r.d* or *r.Ed* or *r.Hd*) is automatically assumed by the instrument to have positive values for the Cooling action, negative values for the Heating action.



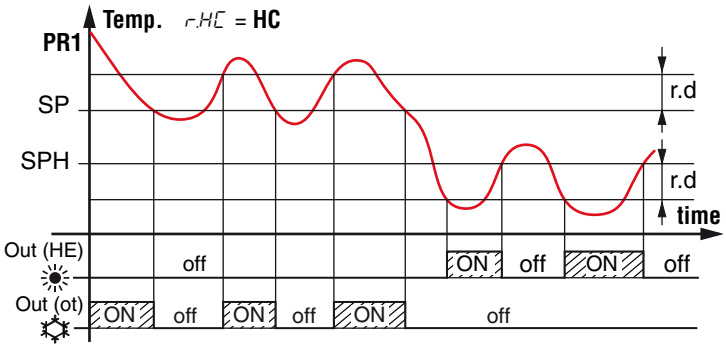
HC Cooling and Heating with two independent set points.

Similarly, if 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 (as *r.HC* = **H**).

In this case the control Set Point for the **ot** output is the active one between **SP**, **SPE** and **SPH**, whereas the Set Point for the **HE** output is **SPH**.

The intervention differential for the **ot** output will be the active one between *r.d* or *r.Ed* or *r.Hd* and the intrument automatically assumes it has positive values (when **Cooling**) whereas for the output **HE** the differential will be *r.Hd* with values assumed to be negative (when **Heating**).

In this mode, activating the Turbo cycle causes the instrument to operate with neutral-zone control with Set Point **SPH**.



C3 Cooling with three automatic modes.

The instrument works with cooling action but this selection activates automatic switching between the three modes: Normal, Eco and Turbo (already described in the “operating modes” paragraph).

All the time protections described at the next paragraph (*PP1*, *PP2* and *PP3*) always act only on the output configured as **ot**.

In the event of probe errors, it is possible to set the instrument so that the **ot** output continues to work in cycles according to the times programmed at parameter *r.t1* (activation time) and *r.t2* (deactivation time) in this way: 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, remains switched OFF.

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

Remember that the temperature control function can be conditioned by the *Compressor Protection and output delay at power-ON*, “*Defrost*”, “*Door open*” and “*External alarm with outputs disable*” functions.

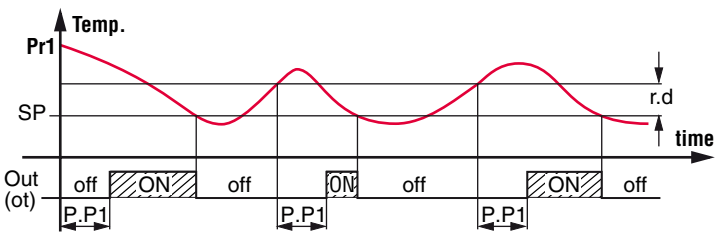
5.7 Compressor protection function and delay at power-ON

All the parameters concerning compressor protection functions are contained in the group *PrC*.

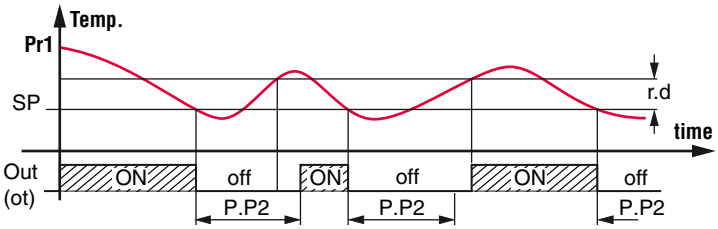
The “*Compressor Protection*” function aims to avoid repeated compressor start-ups controlled by the instrument in cooling applications.

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

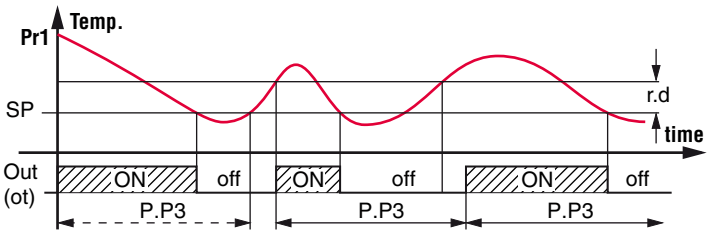
1 First control (parameter *PP1*) foresees a delay to the **ot** output activation (switching-on delay).



2 Second control (parameter .PP2) foresees an inhibition to the ot output activation by a time delay that starts at output turn OFF (delay after switching-OFF).



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



During the output inhibition the output LED (☼/☀) blinks.

It is also possible to prevent the **ot** output activation after the instrument is turned ON, for the time set at parameter Pod. During the power on delay phase, the display shows the indication od, alternated to the normal display.

All these functions are disabled setting their relative parameters = **oF**.

In case **HOT-GAS** defrost mode for centralized systems (ddt = **HG**), the parameters PP1 and PP2 are used to set the activation delay of the *Liquid* solenoid valve and the deactivation delay of the *Aspiration* solenoid valve (see "*HOT-GAS defrost operation for centralized systems*").

5.8 Defrost control

All the parameters concerning defrost control are contained in the group dF.

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

The type of defrost action that the instrument must carry out is set by the parameter ddt that can be programmed as:

EL With electrical heating (or by stopping compressor). During defrost, the output **ot** is deactivated while the output **dF** is enabled. If the **dF** output is not used, it will result in a defrost for compressor stop.

in With hot gas or cycle inversion. During defrost the outputs **ot** and **dF** are enabled.

no Without the compressor output being conditioned. During defrost, the **ot** output continues to operate in order to control the temperature while the **dF** output is enabled.

Et With electrical heating and defrosting temperature control. During defrost, the **ot** output is deactivated while the output **dF** operates as evaporator temperature control. With this selection, the end of the defrost is always timed (time ddE). During the defrost **dF** output behaves as a heating mode temperature control having Set Point = dtE, differential fixed at 1°C and with reference to evaporator probe (**EP**). In this mode, if the **EP** evaporator probe is not enabled or in error, the defrost behaves as with selection EL (therefore the output **dF** during defrosting must always remain active).

HG With hot gas in centralized systems. With this mode it is necessary to **configure 3 outputs** to control *Liquid* solenoid valve (**ot** output), *Hot gas* solenoid valve (**dF** output) and *suction* solenoid valve (**Au** outputwith configuration Fo = **3**). During defrost, only the output **dF** is activated, while before and after defrost the valves perform a sequence of timed operations described below.

5.8.1 Starting automatic defrosts

The automatic defrost control occours:

– At defined times – "*Real Time Clock Defrost*";
– By interval times (regular or dynamic);
– By Evaporator temperature;
– By continuous compressor running time.

In order to avoid useless defrosts when the evaporator temperature is high, parameter dt5 allows to establish the probe evaporator temperature (probe configured as **EP**) below which is possible to defrost the system. If the evaporator probe temperature is higher than set at parameter dt5 the defrost is inhibited.

Defrost at defined times – "Real Time Clock Defrost"

Setting ddC = **cL** disables defrost at intervals (parameters dd1 and d5d) and enables any defrost event programmed at defined times by means of 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, c.14.

In this mode the instrument can therefore manage up to a maximum of 14 daily defrost events (14 x 7 = **98** weekly defrosts with d.8 setting).

The events are freely programmable, 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 Monday, Tuesday, Wednesday, Thursday, Friday, Saturday;
d.11 Saturday and Sunday;
doF None.

These options allow to manage diversified defrosts starts, during weekdays and holidays according to user needs.

For more detailed information and programming examples, see the section on programmable events.

Note: Remember that for "*Real Time Clock Defrost*" the user must set ddC = **cL** and the internal clock must be present and enabled.

Defrost by regular interval time

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

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

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

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

cS 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).

oF When dd1 = **oF** the defrost happens only at compessor stop. This mode is used only on particular refrigerating machines in which is required the maximum evaporator efficiency at each compressor cycle.

After having set the ddC parameter between rt, ct or cS, set, with dd1 parameter, the time that must elapse between the end of a defrost and the beginning of the next one to enable automatic defrost at intervals.

The first defrost after Power ON can be set by parameter d5d. This allows to perform the first defrost at an interval different from dd1 time.

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

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

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

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

Dynamic Defrost Intervals System

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

Setting the ddC parameter between rt, ct or cS and ddd at any value, the *Dynamic Defrost Intervals System* function is operative.

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

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

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

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

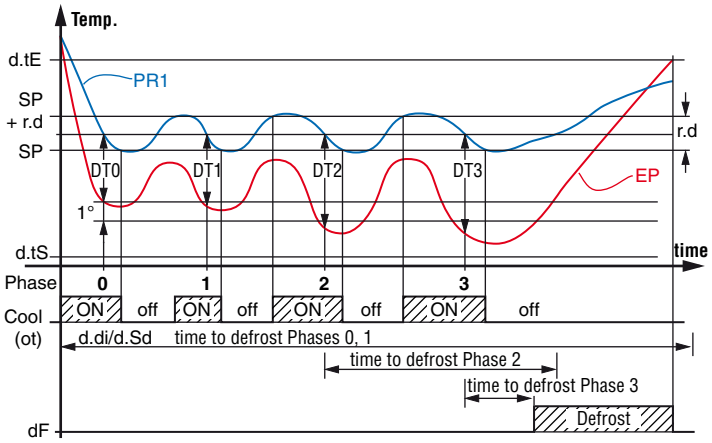
In this way, when necessary, the instrument has the possibility to anticipate the defrost or to start the cycle after the programmed time.

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

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

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

For correct functioning the instrument needs a first reference value of the temperature difference between cell and evaporator, in this way all variations to the **Active Set Point** value, to the differential r.d, the start of a continuous cycle or a defrost execution deletes this reference value and any reduction cannot be performed until the acquisition of a new reference value.



Example of *Dynamic defrost intervals system* with a reduction ddd = **40%** and end defrost by temperature.

Defrost by evaporator temperature

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

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

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

The function is operative both in the case of operation with time defrosts (ddc = **cL**) and in the case of operation with interval defrosts (ddc = **rt**, **ct**, **cS**).

Defrost by continuous compressor running time

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

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

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

The function is operative both in the case of operation with time defrosts (ddc = **cL**) and in the case of operation with interval defrosts (ddc = **rt**, **ct**, **cS**).

5.8.2 Manual defrost

To start a manual defrosting cycle, press the key ⏫/☆ when it is not in programming mode and keep it pressed for about 5 seconds after which, if the conditions are correct, the LED ☆ lights up and the instrument carries out a defrost cycle.

To stop a defrost cycle, press the key ⏫/☆ during a defrost cycle and keep it pressed for about 5 s.

5.8.3 End of defrosts

With 1 evaporator

The automatic defrost cycle can be ended by time or, if an evaporator probe is used (**Pr2** probe set as **EP**), when a temperature on the evaporator is reached.

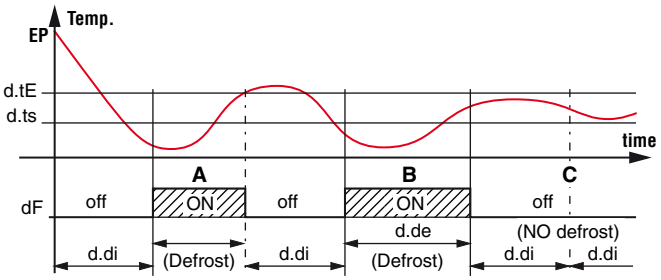
If the evaporator probe is not used the cycle duration is set with the parameter ddE (setting ddE = **oF**, the interval and the manual defrosts are disabled).

If instead the evaporator probe is used, the defrost cycle end when the temperature measured by the **EP** evaporator probe exceeds the temperature set in the parameter dtE.

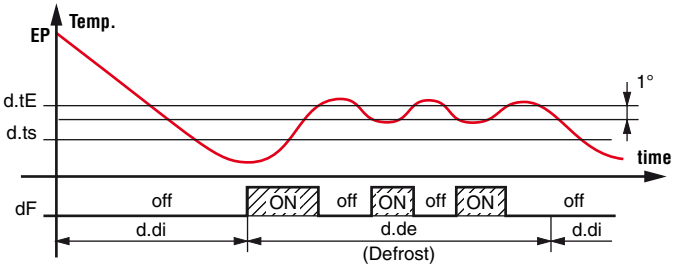
If this temperature is not reached in the time set at parameter *ddE*, defrost is interrupted.

In order to avoid unnecessary defrosts when the evaporator temperature is high, in modes *ddC* = **rt**, **ct**, **cS** the parameter *dtS* allows to establish the temperature referred to the evaporator probe **below which defrosting is possible**.

Therefore, in the modes indicated, if the temperature measured by the evaporator probe is higher than that set by parameter *dtS* and in any case at parameter *dtE* defrosts are inhibited.



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

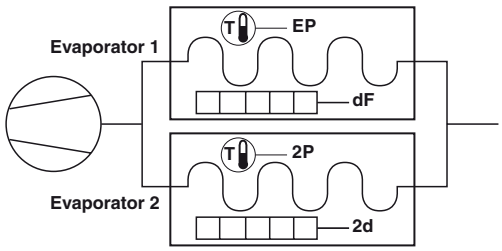


Example of electric defrost with evaporator temperature control: The defrost ends after *ddE* programmed time. During defrost the **dF** output switch ON/OFF to control evaporator temperature in heating mode with set point *dtE* and 1° differential (Hysteresis) in order to mantain the defrost temperature at the *dtE* set value.

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**.



Schematic example of a two-evaporator system with electric defrost.

If the two evaporator probes are not used, the defrost end, intended as deactivation of the defrost outputs, happens separately at the end of the times defined individually at parameters *ddE* (for output **dF** which controls evaporator 1 defroster) and *dd2* (for output **2d** which manages the evaporator 2 defroster).

In this case the instrument tries to manage defrosts according to the following criteria:

– Defrost is enabled when at least one of the two measurements is below the temperature set at parameter *dtS*;
– The temperature defrost is started when at least one of the two measurements remains below the temperature set at parameter *dtF* for the time *dSt*.
– The defrosting end, intended as deactivation of the control outputs of defrosters **dF** and **2d** in the modes *ddt* = **EL**, **in** and **no** occurs separately for the two evaporators when the respective temperatures measured by the probes, rise above the values set with *dtE* (evaporator 1 with **EP** probe) and *dt2* (evaporator 2 with probe **2E**).

If these temperatures are not reached within the times set at parameters *ddE* and *dd2*, the respective defrosting actions are in any case interrupted.

On the other hand, the defrost term intended as a controller phase, occurs when both measurements exceed the expected values (or as an alternative to failure to reach the temperature when the relative maximum duration times are expired).

If the defrost mode selected is of the type with electric heating and thermostatting (*ddt* = **Et**) the two defrost outputs **dF** and **2d** behave as temperature controllers as a function of heating with the respective Set Points = **d.tE** (evaporator 1) and **d.t2** (evaporator 2) both with fixed hysteresis at 1° and with reference to the respective temperatures measured on the two evaporators.

If one of the two evaporator probes is not enabled or is in error, the relative defrosting behaves as with selection **EL** (therefore the defrost output during defrost must always remain activated).

The *Dynamic Defrost* function and the *fan thermostatic* function always and only operate according to the probe configured as **EP** (evaporator 1). In the case double evaporator is not used, it is advisable to set *dd2* = **oF** in order to avoid unwanted influences on the total duration of the defrost.

The defrost cycle in progress is signalled by the lighting up of the LED ☆.

In order to allow evaporator dripping, at the end of the defrost is possible to delay the compressor (**ot** output) restart of the time set with parameter *dtd*. During this delay the LED ☆ flashes to indicate the dripping status.

5.8.4 Defrosts in event of evaporator probe error

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

In the case a probe error occurs when the time (normally counted) that remains to defrost start or defrost end should be shorter than the one set for the parameters related to error conditions probe, defrost start/end will take place earlier than specified.

These functions are provided because when the evaporator probe is used, the defrost endurance time is usually set longer than necessary (the time *ddE* is a security time-out) and in case is used the *Dynamic Intervals Defrost System* the interval is usually set more longer than what is normally programmed into instruments that do not have the function.

Note: In case of plants with double evaporator, the defrost duration switching function acts only on parameter d.dE relative to evaporator 1 (d.d2 remains at the same value even if the probe configured as 2P is in error).

5.8.5 Defrost display lock

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

The *ddL* parameter can assume the following values:

on Locks the display on the last **Pr1** probe temperature reading during all the defrost cycle and until, after 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 parameter *AdA*.

Lb Shows the label *dEF* during the defrost cycle and of *PdF* after the defrost, 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 parameter *AdA*.

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

5.8.6 Hot-gas defrost in centralized systems

The described operation is enable setting *ddt* = **HG**.

With this mode is necessary to configure **3 outputs** to set the functions of:

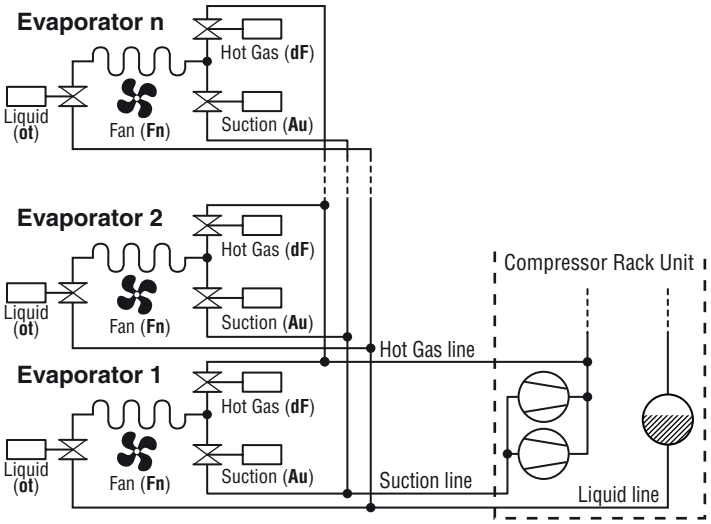
– Liquid Solenoid Valve (output **ot**);
– Hot Gas Solenoid Valve (**dF** output);
– Aspiration Solenoid Valve (**Au** output with *oFo* = **3** configuration).

In this configuration, during defrost only the **dF** output is active, while before and after defrosting, the valves **ot** and **Au** perform a sequence of timed operations described below.

As in all Hot Gas defrosts, also these systems use the heat of the compressor exhaust gas to perform the defrost.

However given the conformation of these plants in which the evaporators are all in parallel and the compressors are centralized and therefore, not controlled by the instrument (to adjust the temperature the instrument controls the *Liquid solenoid valve*) it is necessary to use an output that controls an *Aspiration solenoid valve* so that the evaporator that performs the defrost is isolated from the system.

Similarly while defrosting, the *Liquid solenoid valve* (the same used to control the temperature) **must** also **be closed to isolate** the **evaporator**.

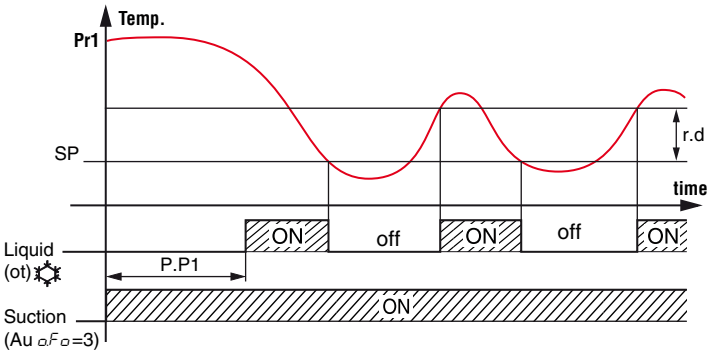


Note: For greater clarity in the diagram, some details concerning the hydraulic circuit have been deliberately omitted (non-return valves etc.) because they are not controlled by the instrument but are still necessary for the correct system operation.

To avoid sudden pressure changes in the plant, the defrost phases are performed respecting a precise sequence described below.

The system configured for the **Hot Gas defrost in centralized plants** behaves as follows:

– At start-up, the *Suction solenoid valve* is activated immediately (if set, respecting the *Pod* delay), after which, if there is a cooling request, also the *Liquid solenoid valve* is activated (respecting the *PP1* delay).
– During the controller phase, the *Suction solenoid valve* is therefore always activated while the *Liquid valve* is activated as a function of the temperature control.



A) Defrosting occurs first of all with the immediate deactivation (if active) of the *Liquid valve* (**ot** output);

B) So, after the delay set at parameter *PP2* also deactivates the *Suction valve* (output **Au** configured with *oFo* = **3**) and, if parameter *FFE* = **oF**, the fan output is also deactivated (output **Fn**);

Note: During this period of time, the fans operation and maintaining the suction valve open are necessary to facilitate the complete evaporation of the fluid contained in the evaporator.

If the defrost request occurs when the *Liquid valve* outlet is already closed and the time *PP2* has elapsed (which counting always starts when the **ot** output is turned OFF) the deactivation of the *Suction valve* and eventually of the fans is immediate.

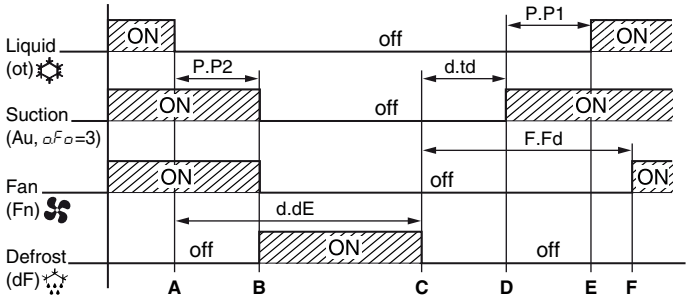
Otherwise, the defrost request happens during the *PP2* time count, the *Suction valve* and the fans deactivation occurs at the when P.P2 counting expires. At this point the *Hot Gas valve* is activated (**dF** output) and the defrost begins;

C At defrost end (always handled by the *ddE* time or by the evaporator temperature *dtE* or by the manual control), the output **dF** is deactivated and the delay times *dtd* (dripping time) and *FFd* are activated (fans delay after defrost);

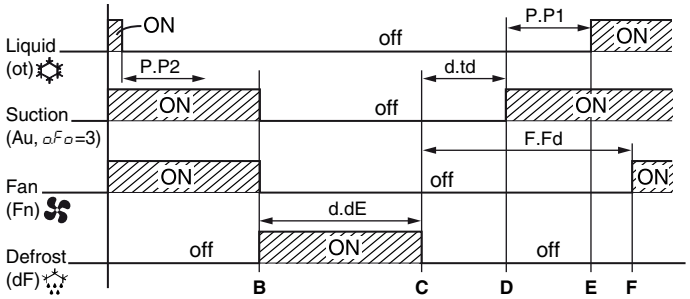
D When *dtd* time counting has elapsed, the output of the *Suction solenoid valve* is reactivated, as when the instrument is switched ON;

E In the event that, as often happens, the temperature controller should request it, after the *PP1* time the *Liquid valve* will be activated and the instrument returns to the normal temperature control mode;

F When *FFd* time counting has elapsed, fans are re-activated if the evaporator temperature is lower than the one set at parameter *FFL* ;



Example of **Hot Gas defrost for centralized systems** with defrost start when the *Liquid valve* is open.



Example of **Hot Gas defrost for centralized systems** with defrost start when the *Liquid valve* is closed hafter the PP2 time counting has expired.

5.9 Evaporator fans control

The fans control operates on the output configured as **Fn** depending on certain instrument control statuses and the temperature measured by the **EP** evaporator probe.

All parameters concerning the Evaporator fans control are contained in the group FN.

When the **EP** evaporator probe is not used or in error, the **Fn** output is activated only depending on parameters Fon, FoF and FFE.

Parameters Fon and FoF decides the fans functioning when the output configured as **ot** (compressor) is OFF.

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

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

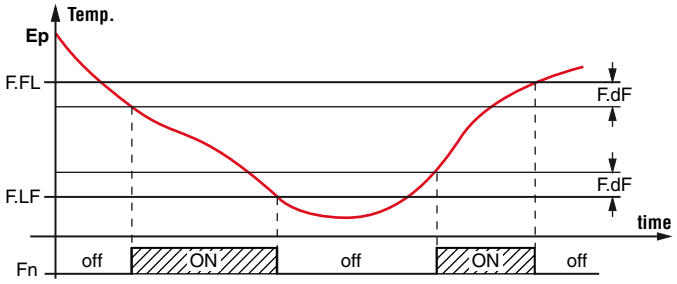
Setting Fon = **oF** the **Fn** output will be deactivated when the **ot** output is switched OFF (evaporator fans OFF when the compressor is OFF or fans run on the compressor).

Programming instead Fon = **any value** and FoF = **oF** the **Fn** output remains switched ON when **ot** output is in OFF condition (fans active with compressor OFF).

Parameter FFE instead decides whether the fans must be switched ON independently of the defrosting status (FFE=**on**) or switched OFF during defrost (FFE = **oF**); in this later case, it is possible to delay the fans re-start even after the end of the defrost by the time set at parameter Fd.

When this delay is active, the LED flashes to signal the delay in progress.

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



In fact it is possible disable the fans when the temperature measured by **EP** evaporator probe is higher than the one set at parameter FFL (temperature too hot) or lower than the one set at parameter FLF (temperature too cold).

Associated to these parameters there is the relative differential that an be set at parameter FdF.

Note: Particular attention should be paid to the proper use of fan-based temperature control functions, as in a typical refrigeration application, the evaporator fan stop blocks the heat exchange.

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

5.10 Alarm functions

All parameters concerning the Alarm functions are contained in the group AL. The alarm conditions of the instrument are:

– Probe errors E1, -E1, E2, -E2, E3, -E3, E4 and -E4;

– Temperature alarms H1, L1, and H2, L2;

– External alarms: AL, Pr-A, HP, LP;

– Open Door alarm: oP.

The alarm functions act on LED ⚠, on the internal buzzer (when present and configured with parameter obu) and on the output selected with parameters o01, o02, o03 and o04 according to the parameters set.

All alarm conditions are pointed out lighting up the ⚠ LED, while the acknowledged alarm is indicated by the flashing of LED ⚠.

The buzzer (when present) can be programmed to be activated when an alarm occurs (obu = **1** or **3**) and can be disabled (alarm silencing) manually by pressing any of the instrument keys.

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

- At When the output is to be activated in alarm condition and can be deactivated manually by pressing any key of the instrument (typical application for an acoustic signal);
- AL When the output is to be activated in alarm condition but cannot be deactivated manually; it is then deactivated only when the alarm status ceases (typical application for a light signal);
- An When the output is to be activated in alarm condition and that remains active even when the alarm status has ceased. The disabling action (recognition of stored alarm) can only be carried out manually by pressing any key when the alarm status has removed (typical application for light signal).
- -t Function is similar to At but with an inverse logic function (output active in normal condition and disabled in alarm).
- -L Function is similar to AL but with inverse logic function (output active in normal conditions, disabled in alarm).
- -n Function is similar to An but with inverse logic function (output active in normal conditions, disabled in alarm).

5.10.1 Temperature alarms

The instrument has 2 temperature alarms, fully configurable with a maximum and minimum threshold.

The temperature alarms work according to the probe measurements set at parameters AY1 and AY2, the alarm thresholds set with parameters AH1 and AH2(maximum alarm) and AL1 and AL2 (minimum alarm) and the relative differential Ad2 and Ad2.

Depending on the desired alarm operating mode, parameter AY1 and AY2 can be set as:

- 1 Absolute alarms referred to **Pr1** and display of label (H - L);
- 2 Relative alarms referred to **Pr1** and display of label (H - L);
- 3 Absolute alarms referred to **Au** and display of label (H - L);
- 4 Relative alarms referred to **Au** and display of label (H - L);
- 5 Absolute alarms referred to **CD** and display of label (H - L);
- 6 Absolute alarms referred to **Pr1**, no label displayed;
- 7 Relative alarms referred to **Pr1**, no label displayed;
- 8 Absolute alarms referred to **Au**, no label displayed;
- 9 Relative alarms referred to **Au**, no label displayed;
- 10 Absolute alarms referred to **CD**, no label displayed;
- 11 Absolute alarms referred to **EP** and display of label (H - L);
- 12 Absolute alarms referred to **EP**, no label displayed.

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

AP1, AP2 Temperature alarm intervention delay **at instrument power ON** when the instrument is in alarm status at power ON. If the instrument is not in alarm status at power ON, AP1 and AP2 are not considered.

AdA This is the time period during which temperature alarms 1 are disabled at the end of a defrost cycle.

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

At1, At2 These are the actuation delay times for temperature alarms 1 and 2.

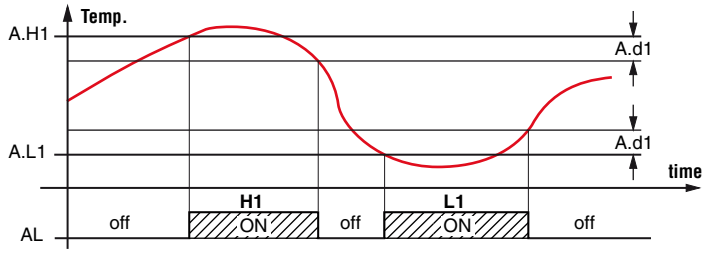
Temperature alarms 1 and 2 are enabled at the end of the alarm-disabling time periods and activated after time periods At1 and At2 when the temperature measured by the probe configured for the alarm rises above or drops below the respective maximum and minimum alarm thresholds.

Via the parameters AA1 and AA2 it is also possible to define at will the action of the alarms on control and alarm outputs (including buzzer).

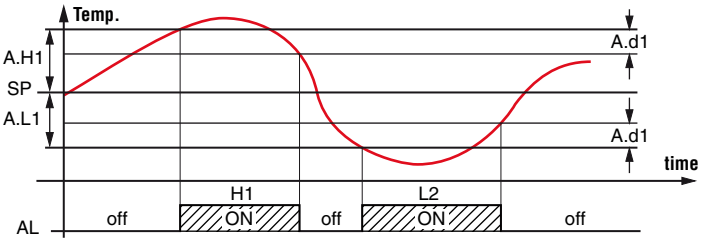
This means that, for example, is possible to change the control output directly, deactivating it if there are temperature alarms on the probes configured as **Au** (e.g. *antifreeze* function) or as **CD** (e.g. *dirty condenser* function).

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 activate the alarm output and/or the buzzer).

The alarm thresholds will be the same as those set in parameters AH❑ and AL❑ if the alarms are absolute (A❑❑ = **1**, **3**, **5**, **7**, **9**, **10**).



or will be the values [SP + AH❑] and [SP + AL❑] if the alarms are relative (A❑❑ = **2**, **4**, **6**, **8**).



The maximum and minimum temperature alarms can be disabled by setting the related parameters AH❑ and AL❑ = **oF**.

Triggering of the temperature alarms causes the ⚠ alarm signal LED to light up, activates outputs configured with an alarm function and activates the internal buzzer if present and configured.

5.10.2 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❑F = **4**, **5**, **12**, **13**, **14**.

Simultaneously to the configured alarm signal (buzzer and/or output), the instrument signals the alarm by lighting up the ⚠ LED and by displaying the label of the alarm detected (AL, PrA, HP, LP) alternated to the variable set at parameter i.dS.

The i❑F = **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 (compressor)	Other control outputs (Fn, dF, Au, HE)
AL (4)	Unchanged	
AL (5)	OFF	
PrA, HP, LP	OFF	Unchanged

5.10.3 Open door alarm

The instrument can point out an **Open door alarm** activated by the digital input with the function programmed as: i❑F = **1**, **2** or **3**.

When the digital input is activated the instrument shows oP and after the delay programmed at parameter AoA, the instrument signals the alarm via the activation of the configured alarm output (buzzer/ouput), powering up the ⚠ LED while continues displaying the label oP.

At the intervention of the open door alarm the inhibited output are immediately reactivated (fans or fans + compressor).

5.11 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 those 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:

Alarm code HACCP	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 if the correspondent enabling parameters are configured and the preset time configured in the same parameter has elapsed.

It is also possible to disable alarm recording by using a suitably configured digital input (*i❑F* = **13**) or by using the U or ⏬ keys, suitably configured (*t.UF* o *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 *HdL* 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 recognized/acknowledged).

To recognise it, simply access the parameter via the P key and display it.

The next time it is displayed, the parameter label will be shown solid (not flashing).

If the alarm is still active at the time it is displayed, the data are displayed but the alarm is not recognized and cannot be cancelled.

In the event of unrecognized (and therefore still ongoing) HACCP alarms, the instrument displays the message *HAC* alternated with the *normal display*.

Within the parameter the data will be displayed sequentially as the P key is repeatedly pressed.

The alarm can be deleted by holding down the ⏬ key for more than 5 s while one of the data of the alarm is displayed. Its deletion is confirmed by the display indicating "- - -" for approx. 1 s.

Similarly the value of the *HdL* parameter can be reset by holding down the ⏬ key for more than 5 seconds while the value is displayed.

However, if desired, all alarms can be deleted immediately by:

– Holding down the U key for 5 s if parameter *t.UF* = **6**;
– Holding down the ⏬ key for 5 s if parameter *t.Fb* = **6**;
– By a digital input if the relevant parameter *i❑F* = **11**.
– By the parameter reset function (at the password prompt *rP* enter **-48**).

5.11.1 HACCP temperature alarms

Setting parameters *Ar 1* (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.

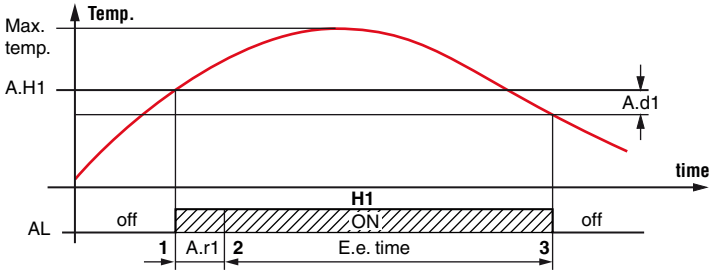
The same parameters can also be used to define the minimum alarm duration that will cause the alarm to be recorded as an HACCP alarm.

If the alarm duration is shorter than the programmed time, the alarm is not recorded.

Setting *Ar❑* = **oF**, recording is disabled.

For each recorded temperature alarm, the following data are stored:

– Alarm type (**A.** = **H1** or **L1** or **H2** or **L2**);
– HACCP alarm start time
(**y** = year, **M.** = month, **d.** =day, **h** = hours, **n.** = minutes);
– HACCP alarm duration (**E.** = hours, **e.** = minutes);
– Critical temperature 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 *AL 1* = **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 (*AP❑*) so that if the alarm is still active when the power returns it is recorded as a new alarm at the end of the power failure.

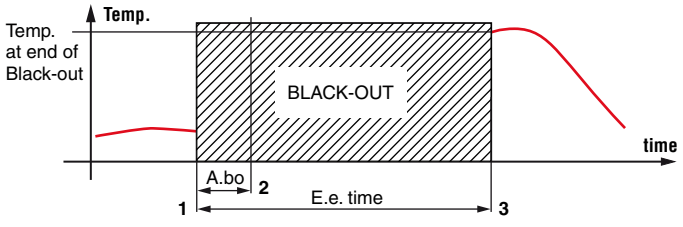
5.11.2 HACCP power failure (black-out) alarms

Thi type of alarm is recorded only if the power failure exceeds the value set at parameter *Abo*.

If *Abo* = **oF** the black-out alarm is never recorded.

For each recorded black-out alarm, the following data are recorded:

– Alarm type (*A.* = **bo**);
– Start time
(**y** = year, **M.** = month, **d.** =day, **h** = hours, **n.** = minutes);
– Black-out duration (**E.** = hours, **e.** = minutes);
– Temperature relative temperature alarm 1 probe (see parameter *AY 1*) measured at end of black-out (if available; if not available 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 supply (alarm end).

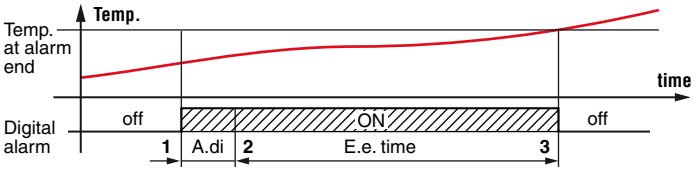
5.11.3 HACCP alarms from digital inputs

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 Ad i.

If Ad i = **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);
– Temperature relative temperature alarm 1 probe (see parameter AY i) measured at end of alarm.



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.

5.12 Functioning of keys U and ▼/Aux

All the parameters concerning keyboard functions are contained in the group tES.

Two of the instrument keys, in addition to their normal functions, can be configured to operate other commands.

The U key function can be defined by the parameter tUF while the ▼/AUX key function can be defined by the parameter tFb.

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 s, 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 s, it is possible to select, in rotation the Eco/Normal mode. Once selection has been made, the display shows the active Set Point code (**SP**, **Eco**) for about 1 s.
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 s, it is possible to switch the instrument from ON to Stand-by status and vice-versa. If switch-ON/Stand-by events are programmed using the clock, the key action has priority on the event.

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

5 Forces a programmed Switch-ON/Switch-OFF (Stand-by) event - Pressing the key for at least 1 s 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 RTC, the key action has priority on the event.

6 HACCP Alarm Reset - Pressing the key for at least 1 s resets stored HACCP alarms. The reset is confirmed by the display indicating "---" for about 1 s.

7 HACCP Alarm Recording Disabled - Pressing the key for at least 1 s disables/enables recording of stored HACCP alarms. After the selection is made the display shows for about 1 s:
Hon (HACCP alarms enabled) or
Hon (HACCP alarms disabled).

5.13 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 PcE group.

After selecting the desired parameter, press the P key repeatedly to cycle through the following:

h.❑❑ Hours (e.g. h.13);
n.❑❑ Minutes (e.g. n.45);
d.❑ Day of the week (e.g. d.1);
t.❑❑ 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;
doF 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 ddC = **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 Eco mode and is forced manually to Normal mode it will stay in Normal mode until the next event that switches it to Eco mode.

Programming example

The user wishes to set the following events:

– 4 daily defrosting weekdays at 7:00, 12:00, 17:00 and 22:00;
– 2 defrosts every Sunday at 7.00 and 19.00
(also set ddC = **cL**);
– 1 daily weekday switching from Normal to Eco mode at 20.00 and 1 switching from Eco to Normal mode at 6.00;
– No switches on Sundays;
– 1 daily weekday switching ON of the Aux output at 8.00 and 1 daily switching to OFF at 21.00;
– No switches on Sundays.

Event	Parameter	Hour	Minutes	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	doF	t.oF

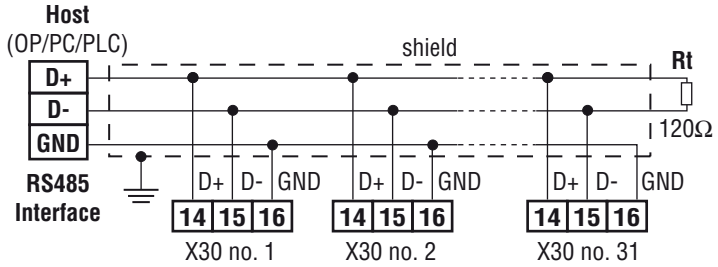
5.14 RS485 Serial Intefarce

The instrument can be equipped with a **RS485** serial communications interface, by means of which it is possible to connect the controller to a network to which other instruments (PLC controllers) are connected. All these devices typically depend on a Personal Computer that acts as a plant supervisor. Using a Personal Computer is possible to acquire all the function information and to program all the instrument configuration parameters.

The software protocol adopted for **X30** is a **MODBUS RTU** type, widely used in several PLC and supervision programs available on the market.

The instrument has two terminals called **D+** and **D-** that must be connected to all network terminals with the same label.

For wiring the line, it is advisable to adopt a 3-pole wired and shielded cable connected as shown.



The interface circuit allows the connection of up to **32** instruments on the same line.

To maintain the line in rest conditions a 120Ω resistance (**Rt**) must be connected to the end of the line.

6. ACCESSORIES

The instrument has a lateral socket which allow to connect the accessiories.

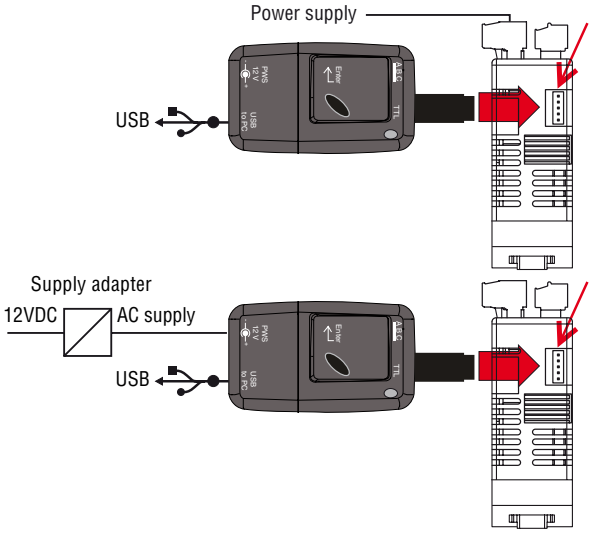
6.1 Parameters configuration by "A01"

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

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

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

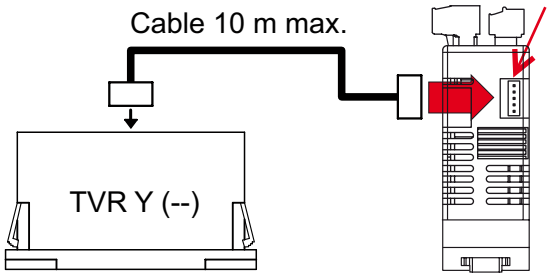
To use the **A01** device it is necessary that the device or instrument are being correctly supplied.



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

6.2 TVR Y remote display

To the instrument it is possible to connect the remote display **TVR Y** through the special cable that can have a maximum length of 10 m. The device **TVR Y**, directly supplied by the instrument, it allows to visualize the temperature measured by the probe **Pr1** through a 2½ digit display.



7. COMMUNICATIONS PROTOCOL

7.1 Serial communications protocol and programmable parameter table

⚠ Highlighted in bold the data available if the instrument is used as a simple data collector or slave module for controlling the outputs via serial communications.

7.1.1 Variables zones

The instrument variables include the measurements and the states of the instrument (regulation, outputs, etc.).
All data are Read-only.

Variable	HEX address	Description	no. of decimals	Values
Pr1	**200**	Pr1 probe input temperature	1	-99.9 ÷ 999.0
Pr2	**201**	Pr2 probe input temperature	1	-99.9 ÷ 999.0
dP	**202**	Temperature decimal point		1
Pr3	**203**	Pr3 probe input temperature	1	-99.9 ÷ 999.0
LE	**204**	Pr1 min. temperature peak	1	-99.9 ÷ 999.0
HE	**205**	Pr1 max. temperature peak	1	-99.9 ÷ 999.0
	206	Controller status		0 OFF 1 Control 2 Defrost 3 Dripping (post defrost)

	207	Alarms status (part one)		b0 Not used;
				b1 1 = Overrange Pr1 probe (E1);
				b2 1 = Underrange Pr1 probe (-E1);
				b3 1 = Overrange Pr2 probe (E2);
				b4 1 = Underrange Pr2 probe (-E2);
				b5 1 = Overrange Pr3 probe (E3);
				b6 1 = Underrange Pr3 probe (-E3);
				b7 1 = Overrange Pr4 probe (E4);
				b8 1 = Underrange Pr4 probe (-E4);
				b9 1 = High alarm H1;
				b10 1 = Low alarm L1;
				b11 1 = High alarm H2;
				b12 1 = Low alarm L2;
				b13 Not used;
				b14 1 = Alarm AL;
				b15 1 = Alarm PrA.

dE0	**208**	Dynamic Defrost - First reference	1	-99.9 ÷ 999.0
dEn	**209**	Dynamic Defrost - Last reference	1	-99.9 ÷ 999.0
	20A	Dynamic Defrost - Temperature variables detection phase		
	20B	Dynamic Defrost - Number of reductions made	0	0 ÷ 256
	20C	Time to defrost	0	0 ÷ 5989 min.
	20D	Digital input status		0 Open; 1 Close.
	20E	Clock Minutes-seconds	2	0.00 ÷ 59.59 (mm.ss)
	20F	Clock Days-Hour	2	0.00 ÷ 7.23 (d.hh)
oE	**210**	Temperature control Output		0 OFF; 1 ON.
dF	**211**	Defrost Output (1)		0 OFF; 1 ON.
d2	**212**	Defrost Output (2)		0 OFF; 1 ON.
Fn	**213**	Evaporator fans ouput		0 OFF; 1 ON.
Au	**214**	Aux Output		0 OFF; 1 ON.
AE	**215**	Acknowledgeable alarm output		0 OFF; 1 ON.
AL	**216**	Not acknowledgeable alarm output		0 OFF; 1 ON.
HE	**217**	HE Heating Output		0 OFF; 1 ON.
	218	Temperature controller request (uninhibited)		0 OFF; 1 ON.
	219	Fans Output request (uninhibited)		0 OFF; 1 ON.

Variable	HEX address	Description	no. of decimals	Values
	21A	Turbo cycle request		0 OFF; 1 ON.
	21B	Defrost request		0 OFF; 1 ON.
	21C	End defrost request		0 OFF; 1 ON.
	21D	Aux Output enabling request		0 OFF; 1 ON.
	21E	Open door fan inhibition		0 OFF; 1 ON.
	21F	Open door control output inhibition		0 OFF; 1 ON.
	220	Open door		0 OFF; 1 ON.
	221	Defrost display lock (for TVR Y)		0 OFF; 1 ON.
	222	Digital Input alarm outoput inhibition		0 OFF; 1 ON.
	223	Alarms compressor output (**ot**) inhibition		0 OFF; 1 ON.
	224	Alarms compressor (**ot**) and heating (**HE**) output inhibition		0 OFF; 1 ON.
Pr1	**225**	**Pr1 probe measure input**	**1**	**0 OFF;** **1 ON.**
Pr2	**226**	**Pr2 probe measure input**	**1**	**0 OFF;** **1 ON.**
Pr3	**227**	**Pr3 probe measure input**	**1**	**0 OFF;** **1 ON.**
Pr4	**228**	**Pr4 probe measure input**	**1**	**0 OFF;** **1 ON.**
di1	**229**	**Digital Input 1 status**		**0 OFF;** **1 ON.**
di2	**22A**	**Digital Input 2 status**		**0 OFF;** **1 ON.**
di3	**22B**	**Digital Input 3 status**		**0 OFF;** **1 ON.**
di4	**22C**	**Digital Input 4 status**		**0 OFF;** **1 ON.**
Out1	**22D**	**Out 1 status**		**0 OFF;** **1 ON.**
Out2	**22E**	**Out 2 status**		**0 OFF;** **1 ON.**
Out3	**22F**	**Out 3 status**		**0 OFF;** **1 ON.**
Out4	**230**	**Out 4 status**		**0 OFF;** **1 ON.**

	231	Alarms status (part two)		b0 1 = HP alarm;
				b1 1 = LP alarm;
				b2 1 = Power ON delay (od);
				b3 1 = Open door alarm (oP);
				b4 1 = HACCP alarm in progress or not acknowledged;
				b5 ÷ b15 Not used.

	232	Disable HACCP alarm recording		0 OFF; 1 ON.
	233	Eco mode in progress		0 OFF; 1 ON.
	234	Turbo mode in progress		0 OFF; 1 ON.

The anomaly conditions of Process Variables (measurements) are reported as special values:

Anomalous condition	Value sent back to the correspondent address	Instrument error
Measuring input short circuit	-10000	-E
Measuring input open circuit	10000	E
Overflow (A/D converter)	10001	
Variable not available	10003	---

7.1.2 Command zone

The instrument commands include the those that can be realized from the instrument keyboard in order to perform particular actions or functions. Data is Read/Write.

HEX address	Description	Writing Values Range	Redaing Values Range
280	Turbo cycle	1 Enable Turbo cycle; 0 Disable Turbo cycle.	0 Turbo cycle not active; 1 Turbo cycle in progress.
281	Start Defrost	1 Start Defrost; 0 Stop Defrost.	0 Defrost not active; 1 Defrost in progress.
282	End Defrost	1 Stop Defrost; 0 Start Defrost.	0 Defrost in progress; 1 Defrost not active.
283	Enable Aux output	1 Enable Aux output; 0 Disable Aux output.	0 Aux output not active; 1 Aux output active.
284	Stand-by	1 Instrument in Stand-by; 0 Start up the instrument.	0 Instrument ON; 1 Instrument in Stand-by.
285	Instrument start up	1 Start up the instrument; 0 Instrument in Stand-by.	0 Instrument in Stand-by; 1 Instrument ON.
286	Reset minimum value Lt	1 Reset Lt	0
287	Reset maximum value Ht	1 Reset Ht	0
288	Alarms acknowledge	1 Alarms acknowledge	0
289			
28A			
28b	Cycle/Eco mode	1 Enable Eco mode; 0 Disable Eco mode.	0 Eco mode not active; 1 Eco mode active.
28C	Enable/Disable HACCP Alarms	1 Enable recording HACCP Alarms; 0 Disable recording HACCP Alarms.	0 HACCP Alarms recording disabled; 1 HACCP Alarms recording enabled.
28d	Reset HACCP stored alarms	1 Reset HACCP Alarms	0
28E	**Enable/Disable OUT1 Output when o.o1 = oF**	**0 Disable Output;** **1 Enable Output.**	
28F	**Enable/Disable OUT2 Output when o.o2 = oF**	**0 Disable Output;** **1 Enable Output.**	
290	**Enable/Disable OUT3 Output when o.o3 = oF**	**0 Disable Output;** **1 Enable Output.**	
291	**Enable/Disable OUT4 Output when o.o4 = oF**	**0 Disable Output;** **1 Enable Output.**	

7.1.3 Operating and configuration parameters zone

The following describes all the parameters that the instrument can be equipped with. Please note that some of them may not be present because they depend on the type of instrument. Data is Read/Write.

Para-meter	HEX addr.	Description	no. of decimals	Values	Default	Note
SLS	**2800**	Min. Set Point	1	-99.9 ÷ S.HS	-50.0	
SHS	**2801**	Max. Set Point	1	S.LS ÷ 999	99.9	
SP	**2802**	Set Point	1	S.LS ÷ S.HS	0.0	
SPE	**2803**	Eco Set Point	1	SP ÷ S.HS	2.0	
SPH	**2804**	Turbo Set Point (or Heating Set Point independent in HC mode)		S.LS ÷ SP	-2.0	
iSE	**2805**	Probe types		Pt PTC; nt NTC; P1 Pt1000.	nt	nt = 0; Pt = 1; P1 = 2
iuP	**2806**	Measurement unit and resolution (decimal point)	1	C0 °C with resolution 1°; F0 °F with resolution 1°; C1 °C with resolution 0.1°; F1 °F with resolution 0.1°.	C1	C0 = 0; F0 = 1; C1 = 2; F1 = 3.
iFt	**2807**	Measuring filter	1	oF ÷ 20.0 s	2.0	oF = 0

Parameter	HEX addr.	Description	no. of decimals	Values	Default	Note
iC1	**2808**	Pr1 probe calibration	1	-30.0 ÷ 30.0°C/°F	0.0	
iC2	**2809**	Pr4 probe calibration	1	-30.0 ÷ 30.0°C/°F	0.0	
iC3	**280A**	Pr3 probe calibration	1	-30.0 ÷ 30.0°C/°F	0.0	
iC4	**280B**	Pr4 probe calibration	1	-30.0 ÷ 30.0°C/°F	0.0	
iCU	**280C**	Display Offset	1	-30.0 ÷ 30.0°C/°F	0.0	

iP2	**280D**	Pr2 probe usage		oF Not used;
				EP Evaporator probe (1);
				Au Auxiliary probe;
				cd Condenser probe;
				2E Evaporator probe (2).
						oF = 0;
						EP = 1;
						Au = 2;
						cd = 3;
						2E = 4.

iP3	**280E**	Pr2 probe usage		oF Not used;
				EP Evaporator probe (1);
				Au Auxiliary probe;
				cd Condenser probe;
				2E Evaporator probe (2);
				dG Digital Input.
					oF	oF = 0;
						EP = 1;
						Au = 2;
						cd = 3;
						2E = 4;
						dG = 5.

iP4	**280F**	Pr2 probe usage			oF	
i1F	**2810**	Function and logic functioning of digital input di1	0	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; 11 Reset HACCP alarms; 12 External PrA alarm with **ot** output disabling; 13 External HP alarm with **ot** output disabling; 14 External LP alarm with **ot** output disabling; 15 Forcing events Switch ON/OFF (Stand - by); 16 Start Defrost; 17 Stop Defrost; 18 Turbo cycle start with monostable command.	0	
i1t	**2811**	Delay in acquiring digital input di1	2	oF/ 0.01 ÷ 99.59 (min.s)	oF	oF = 0
i2F	**2812**	Function and logic functioning of digital input di2	0	See i.1F	0	
i2t	**2813**	Delay in acquiring digital input di2	2	oF/ 0.01 ÷ 99.59 (min.s)	oF	oF = 0
i3F	**2814**	Function and logic functioning of digital input di3	0	See i.1F	0	
i4F	**2815**	Function and logic functioning of digital input di4	0	See i.1F	0	
iEt	**2816**	Delay switching to Eco mode at door closing	2	oF Function disabled; 0.01 ÷ 99.59 (h.min).	oF	oF = 0
itt	**2817**	Time-out ECO mode	2	oF Function disabled; 0.01 ÷ 99.59 (h.min).	oF	oF = 0
id5	**2818**	Variable normally shown on display		P1 Pr1 probe measure; P2 Pr2 probe measure; P3 Pr3 probe measure; P4 Pr4 probe measure; Ec Pr1 probe measure in Normal mode, Label Eco in Eco mode; rE Remote display from serial communications; SP Active Set Point; oF Display OFF.	P1	P1 = 0; P2 = 1; P3 = 2; P4 = 3; Ec = 4; SP = 5; rE = 6; oF = 7.
ddt	**2819**	Defrosting Type		EL Electrical heating/stop. compressor; in Hot gas/reverse cycle; no Without compressor output condictioning; Et Electrical heating with evaporator temperature control; HG HOT-GAS defrost for centralized plants.	EL	EL = 0; in = 1 ; no = 2 ; Et = 3; HG = 4.

Parameter	HEX addr.	Description	no. of decimals	Values	Default	Note

ddC	**281A**	Defrost start mode		rt Instrument Power ON intervals;
				ct Compressor functioning intervals (**ot** output active);
				cS Defrost at every **ot** switching OFF (**ot** switch OFF at Setpoint reaching + rt intervals);
				cL By real time clock.
					rt	rt = 1;
						ct = 2;
						cS = 3;
						cL = 0.

dd1	**281B**	Defrost interval	2	oF/0.01 ÷ 99.59 (h.min)	6.00	oF = 0
dSd	**281C**	Delay first defrost at power-ON	2	oF Defrost at Power-ON; 0.01 ÷ 99.59 (h.min).	6.00	oF = 0
ddd	**281D**	Dynamic Defrost Percentage reduction	0	0 ÷ 100 %	0	
ddE	**281E**	Lenght of defrost cycle (evaporator 1) (max.)	2	oF/ 0.01 ÷ 99.59 (min.s)	20.00	oF = 0

ddL	**281F**	Defrost display Lock		oF Display free;
				on Locked on temperature **Pr1** before defrost;
				Lb Locked on label dEF during defrost and PdF during dripping/post-defrost).
					oF	oF = 0;
						on = 1;
						Lb = 2.

dtE	**2820**	End defrost temperature (evaporator 1)	1	-99.9 ÷ 999.0°C/°F	8.0	
dE1	**2821**	Defrosting interval in case of evaporator probe error	2	oF/ 0.01 ÷ 99.59 (h.min)	6.00	oF = 0
dEE	**2822**	Lengh of defrost cycle in case of evaporator probe error	2	oF/ 0.01 ÷ 99.59 (min.s)	10.0	oF = 0
dtS	**2823**	Defrost enabling evaporator temperature	1	- 99.9 ÷ 999.0°C/°F	2.0	
dtF	**2824**	Start defrost evaporator temperature	1	- 99.9 ÷ 999.0°C/°F	-99.9	
dSt	**2825**	Delay start defrost evaporator temperature	2	oF/ 0.01 ÷ 99.59 (min.s)	1.00	
dcd	**2826**	Delay start defrost by continuous compressor running time	2	oF/ 0.01 ÷ 99.59 (h.min)	oF	oF = 0
dtd	**2827**	Compressor delay after defrost (drainage time)	2	oF/ 0.01 ÷ 99.59 (min.s)	oF	
dd2	**2828**	Lenght of defrost cycle (evaporator 2) (max.)	2	oF/ 0.01 ÷ 99.59 (min.s)	oF	
dt2	**2829**	End defrost temperature (evaporator 2)	1	- 99.9 ÷ 999.0°C/°F	8.0	
rd	**282A**	Differential (Hysteresis) in Normal mode	1	0.0 ÷ 30.0°C/°F	2.0	
rEd	**282B**	Differential (Hysteresis) in Eco mode	1	0.0 ÷ 30.0°C/°F	4.0	
rHd	**282C**	Differential (Hysteresis) in Turbo mode or Heating in HC mode	1	0.0 ÷ 30.0°C/°F	1.0	
rt1	**282D**	**ot** output activation time in case of probe **Pr1** failure	2	oF/ 0.01 ÷ 99.59 (min.s)	oF	oF = 0
rt2	**282E**	**ot** output deactivation time in case of probe **Pr1** failure	2	oF/ 0.01 ÷ 99.59 (min.s)	oF	oF = 0
rHC	**282F**	Control Output/s operating mode		H Heating; C Cooling; nr Neutral Zone; HC Neutral Zone with indepentent Set points; C3 RCooling with 3 automatic switch modes.	C	H = 0; C = 1 ; nr = 2; HC = 3; C3 = 4.
rtC	**2830**	Lengh of Turbo cycle	2	oF/ 0.01 ÷ 99.59 (h.min)	oF	oF = 0
Ftn	**2831**	Fans time activation with **ot** output (compressor) OFF	2	oF/ 0.01 ÷ 99.59 (min.s)	5.00	oF = 0
FtF	**2832**	Fans time deactivation with **ot** output (compressor) OFF	2	oF/ 0.01 ÷ 99.59 (min.s)	oF	oF = 0
FFL	**2833**	High temperature fans deactivation	1	- 99.9 ÷ 999.0°C/°F	10.0	
FLF	**2834**	Low temperature fans deactivation	1	- 99.9 ÷ 999.0°C/°F	-99.9	
FdF	**2835**	Differential fans control	1	0.0 ÷ 30.0°C/°F	1.0	
FFE	**2836**	Fans status during defrost		oF/on	oF	oF = 0; on = 1.
FFd	**2837**	Fan delay after defrost	2	oF/ 0.01 ÷ 99.59 (min.s)	oF	oF = 0
PP1	**2838**	Output **ot** delay at power on	2	oF/ 0.01 ÷ 99.59 (min.s)	oF	oF = 0
PP2	**2839**	Output **ot** delay after power off	2	oF/ 0.01 ÷ 99.59 (min.s)	oF	oF = 0
PP3	**283A**	Output **ot** delay between 2 **ot** switching-on	2	oF/ 0.01 ÷ 99.59 (min.s)	oF	oF = 0
Pod	**283B**	Delay outputs at power ON	2	oF/ 0.01 ÷ 99.59 (min.s)	oF	oF = 0

Parameter	HEX addr.	Description	no. of decimals	Values	Default	Note
AY1	**283C**	Temperature alarms 1 Type	0	1 Absolute to Pr1 probe with label (H - L); 2 Relative to Pr1 probe with label (H - L); 3 Absolute to Au probe with label (H - L); 4 Relative to Au probe with label (H - L); 5 Absolute to cd probe with label (H - L); 6 Absolute to Pr1 probe with no label; 7 Relative to Pr1 probe with no label; 8 Absolute to Au probe with no label; 9 Relative to Au probe with no label; 10 Absolute to cd probe with no label; 11 Absolute to EP probe with no label; 12 Absolute to EP probe with label (H - L).	1	
AH1	**283D**	High temperature Alarm 1 threshold	1	oF / -99.9 ÷ 999.0°C/°F	oF	oF = -100.0
AL1	**283E**	Low temperature Alarm 1 threshold	1	oF / -99.9 ÷ 999.0°C/°F	oF	oF = -100.0
Ad1	**283F**	Alarms A.H1 and A.L1 Hysteresis	1	0.0 ÷ 30.0°C/°F	1.0	
At1	**2840**	Alarms A.H1 and A.L1 delay	2	oF/ 0.01 ÷ 99.59 (min.s)	oF	oF = 0
AP1	**2841**	Temperature Alarm 1 delay at Power ON	2	oF/ 0.01 ÷ 99.59 (h.min)	2.00	oF = 0
AA1	**2842**	Alarms H1 and L1 actions on control and alarm outputs		0 No action; 1 Activate alarm outputs; 2 Disable control outputs (**ot** and **HE**) but not activate alarm outputs; 3 Disable control outputs (**ot** and **HE**) and activate alarm outputs.	1	
AY2	**2843**	Temperature alarms 2 Type	0	See AY1	3	
AH2	**2844**	High temperature Alarm 2 threshold	1	oF / -99.9 ÷ 999.0°C/°F	oF	oF = -100.0
AL2	**2845**	Low temperature Alarm 2 threshold	1	oF / -99.9 ÷ 999.0°C/°F	oF	oF = -100.0
Ad2	**2846**	Alarms A.H2 and A.L2 Hysteresis)	1	0.0 ÷ 30.0°C/°F	1.0	
At2	**2847**	Alarms A.H2 and A.L2 delay	2	oF/ 0.01 ÷ 99.59 (min.s)	oF	oF = 0
AP2	**2848**	Temperature Alarm 2 delay at Power ON	2	oF/ 0.01 ÷ 99.59 (h.min)	2.00	oF = 0
AA2	**2849**	Alarms H2 and L2 actions on control and alarm outputs		0 No action; 1 Activate alarm outputs; 2 Disable control outputs (**ot** and **HE**) but not activate alarm outputs; 3 Disable control outputs (**ot** and **HE**) and activate alarm outputs.	1	
AdA	**284A**	Temperature Alarm 1 delay after defrost and unlock display delay after defrost	2	oF/ 0.01 ÷ 99.59 (h.min)	1.00	oF = 0
AoA	**284B**	Alarm delay with open door	2	oF/ 0.01 ÷ 99.59 (min.s)	3.00	oF = 0
Ar1 (#)	**284C**	A.H1 and A.L1 alarms delay for HACCP recording	2	oF The alarms are never recorded as HACCP; 0.01 ÷ 99.59 (min.s)	oF	oF = 0
Ar2 (#)	**284D**	A.H2 and A.L2 alarms delay for HACCP recording	2	oF The alarms are never recorded as HACCP; 0.01 ÷ 99.59 (min.s)	oF	oF = 0
Abo (#)	**284E**	Power failure delay for HACCP alarm	2	oF/ 0.01 ÷ 99.59 (min.s)	oF	oF = 0
Ad1 (#)	**284F**	Digital input delay for HACCP alarm (AL)	2	oF/ 0.01 ÷ 99.59 (min.s)	oF	oF = 0

o01	**2850**	OUT1 output operation configuration		oF No function;
				ot Temperature control (compressor);
				dF Defrost (1);
				Fn Fans;
				Au Auxiliary;
				At/-t Acknowledgeable alarm;
				AL/-L Not Acknowledgeable alarm;
				An/-n Stored/Latched alarm;
				on Output ON when instrument ON;
				HE Heating (Neutral zone control);
				2d Defrost (2);
				L1 Shop light ON in Eco mode (on with **SP** and OFF with **SPE**);
				L2 Cell light (OFF with door closed and ON with door opened).
					ot	oF = 0;
						ot = 1;
						dF =2;
						Fn = 3;
						Au = 4;
						At = 5;
						AL = 6;
						An = 7;
						-t = 8;
						-L = 9;
						-n = 10;
						on = 11;
						HE = 12;
						2d = 13;
						L1 = 14;
						L2 = 15.

o02	**2851**	OUT2 output operation configuration			dF	
o03	**2852**	OUT3 output operation configuration			Fn	
o04	**2853**	OUT4 output operation configuration			Au	
obu	**2854**	Buzzer function mode (if present in the operator panel)	0	oF Disabled; 1 Active alarms only; 2 Key pressed only; 3 Active alarms and Key pressed.	3	oF = 0

Para-meter	HEX addr.	Description	no. of decimals	Values	Default	Note
oFo	**2855**	Function mode auxiliary output	0	oF No Function; 1 Control output **ot** delayed; 2 Manual activation by key, digital input or clock event 3 Output Suction solenoid valve for HOT GAS defrost mode in centralized plants.	oF	oF = 0
oEu	**2856**	Time relative to auxiliary output	2	oF/ 0.01 ÷ 99.59 (min.s)	oF	oF = 0
tUF	**2857**	Function mode U key	0	oF No function; 1 Auxiliary output command; 2 Select active Set Point + turn OFF shop light; 3 Switch ON/OFF (Stand-by); 4 Turbo cycle command; 5 Manual Switch ON/OFF (Stand-by) when set by clock; 6 Reset HACCP alarms; 7 Disable HACCP alarms.	oF	oF = 0
tFb	**2858**	Function mode ▼/Aux key	0		oF	
tLo	**2859**	Keyboard lock function delay	2	oF/ 0.01 ÷ 30.00 (min.s)	oF	oF = 0
tEd	**285A**	Set Visibility with fast procedure by key P	0	oF None; 1 SP; 2 SPE; 3 SP e SPE; 4 Active SP; 5 SP and SPH; 6 SP, SPE and SPH.	4	oF = 0
tPP	**285B**	Access Password to parameter functions	0	oF ÷ 999	oF	oF = 0
tHA (#)	**285C**	HACCP alarms visibility	0	1 Visible as protected parameters; 2 Visible as unprotected parameters.	1	

7.1.4 Zone for the events programmable by clock

In this zone are present, grouped in single words, the data related to the programmable events in the X34 family instruments. Instrument events can be read and written via serial communication.

Parameter	HEX addr.	Description	Data type	no. of decimals	Values range	Note
c01	**2C00**	Hour Programmable Event 1	N	0	0 ÷ 23	
c01	**2C01**	Minutes Programmable Event 1	N	0	0 ÷ 59	
c01	**2C02**	Day Programmable Event 1	N	0	0 ÷ 11	
c01	**2C03**	Type of Programmable Event 1	N	0	1 ÷ 7	
c02	**2C04**	Hour Programmable Event 2	N	0	0 ÷ 23	
c02	**2C05**	Minutes Programmable Event 2	N	0	0 ÷ 59	
c02	**2C06**	Day Programmable Event 2	N	0	0 ÷ 11	
c02	**2C07**	Type of Programmable Event 2	N	0	1 ÷ 7	
c03	**2C08**	Hour Programmable Event 3	N	0	0 ÷ 23	
c03	**2C09**	Minutes Programmable Event 3	N	0	0 ÷ 59	
c03	**2C0A**	Day Programmable Event 3	N	0	0 ÷ 11	
c03	**2C0B**	Type of Programmable Event 3	N	0	1 ÷ 7	
c04	**2C0C**	Hour Programmable Event 4	N	0	0 ÷ 23	
c04	**2C0D**	Minutes Programmable Event 4	N	0	0 ÷ 59	
c04	**2C0E**	Day Programmable Event 4	N	0	0 ÷ 11	
c04	**2C0F**	Type of Programmable Event 4	N	0	1 ÷ 7	
c05	**2C10**	Hour Programmable Event 5	N	0	0 ÷ 23	
c05	**2C11**	Minutes Programmable Event 5	N	0	0 ÷ 59	
c05	**2C12**	Day Programmable Event 5	N	0	0 ÷ 11	
c05	**2C13**	Type of Programmable Event 5	N	0	1 ÷ 7	
c06	**2C14**	Hour Programmable Event 6	N	0	0 ÷ 23	
c06	**2C15**	Minutes Programmable Event 6	N	0	0 ÷ 59	
c06	**2C16**	Day Programmable Event 6	N	0	0 ÷ 11	
c06	**2C17**	Type of Programmable Event 6	N	0	1 ÷ 7	
c07	**2C18**	Hour Programmable Event 7	N	0	0 ÷ 23	
c07	**2C19**	Minutes Programmable Event 7	N	0	0 ÷ 59	
c07	**2C1A**	Day Programmable Event 7	N	0	0 ÷ 11	
c07	**2C1B**	Type of Programmable Event 7	N	0	1 ÷ 7	

Parameter	HEX addr.	Description	Data type	no. of decimals	Values range	Note
c.08	**2C1C**	Hour Programmable Event 8	N	0	0 ÷ 23	
c.08	**2C1D**	Minutes Programmable Event 8	N	0	0 ÷ 59	
c.08	**2C1E**	Day Programmable Event 8	N	0	0 ÷ 11	
c.08	**2C1F**	Type of Programmable Event 8	N	0	1 ÷ 7	
c.09	**2C20**	Hour Programmable Event 9	N	0	0 ÷ 23	
c.09	**2C21**	Minutes Programmable Event 9	N	0	0 ÷ 59	
c.09	**2C22**	Day Programmable Event 9	N	0	0 ÷ 11	
c.09	**2C23**	Type of Programmable Event 9	N	0	1 ÷ 7	
c.10	**2C24**	Hour Programmable Event 10	N	0	0 ÷ 23	
c.10	**2C25**	Minutes Programmable Event 10	N	0	0 ÷ 59	
c.10	**2C26**	Day Programmable Event 10	N	0	0 ÷ 11	
c.10	**2C27**	Type of Programmable Event 10	N	0	1 ÷ 7	
c.11	**2C28**	Hour Programmable Event 11	N	0	0 ÷ 23	
c.11	**2C29**	Minutes Programmable Event 11	N	0	0 ÷ 59	
c.11	**2C2A**	Day Programmable Event 11	N	0	0 ÷ 11	
c.11	**2C2B**	Type of Programmable Event 11	N	0	1 ÷ 7	
c.12	**2C2C**	Hour Programmable Event 12	N	0	0 ÷ 23	
c.12	**2C2D**	Minutes Programmable Event 12	N	0	0 ÷ 59	
c.12	**2C2E**	Day Programmable Event 12	N	0	0 ÷ 11	
c.12	**2C2F**	Type of Programmable Event 12	N	0	1 ÷ 7	
c.13	**2C30**	Hour Programmable Event 13	N	0	0 ÷ 23	
c.13	**2C31**	Minutes Programmable Event 13	N	0	0 ÷ 59	
c.13	**2C32**	Day Programmable Event 13	N	0	0 ÷ 11	
c.13	**2C33**	Type of Programmable Event 13	N	0	1 ÷ 7	
c.14	**2C34**	Hour Programmable Event 14	N	0	0 ÷ 23	
c.14	**2C35**	Minutes Programmable Event 14	N	0	0 ÷ 59	
c.14	**2C36**	Day Programmable Event 14	N	0	0 ÷ 11	
c.14	**2C37**	Type of Programmable Event 14	N	0	1 ÷ 7	

7.1.5 Data zone related to the calendar clock

In this zone are present, grouped in single words, the data related to the clock/calendar of the instruments of the X34 family . The data related to the clock/calendar of the instrument can be read and written via serial communication.

Parameter	HEX addr.	Description	Data type	no. of decimals	Values range	Note
c.dt	**2D00**	Year	N	0	0 ÷ 99	
c.dt	**2D01**	Month	N	0	1 ÷ 12	
c.dt	**2D02**	Day (date)	N	0	1 ÷ 31	
c.CL	**2D03**	Day of the week	N	0	1 ÷ 7	
c.CL	**2D04**	Hours	N	0	0 ÷ 23	
c.CL	**2D05**	Minutes	N	0	0 ÷ 59	
	2D06	Seconds	N	0	0 ÷ 59	

7.1.6 Data zone related to stored HACCP alarms

In this zone are grouped all the data related to HACCP alarms of the X34 family instruments.

HACCP data can only be read via serial communication.

If the alarm is not memorized, all the addresses relating to the alarm are set to the value 10003.

Parameter	HEX addr.	Description	Data type	no. of decimals	Values range	Note
H.01	**2E00**	Stored Alarm n. 1: A. = Alarm type	N	0	0 ÷ 5	0 = H1; 1 = L1; 2 = H2; 3 = L2; 4 = bo; 5 = AL.
H.01	**2E01**	Stored Alarm n. 1: y.= Start Year	N	0	00 ÷ 99	
H.01	**2E02**	Stored Alarm n. 1: M.= Start Month	N	0	1 ÷ 12	
H.01	**2E03**	Stored Alarm n. 1: d.= Start Day (date)	N	0	1 ÷ 31	
H.01	**2E04**	Stored Alarm n. 1: h. = Start Hour	N	0	0 ÷ 23	
H.01	**2E05**	Stored Alarm n. 1: n. = Start Minutes	N	0	0 ÷ 59	
H.01	**2E06**	Stored Alarm n. 1: E. = duration (hours)	N	0	0 ÷ 99	

Parameter	HEX addr.	Description	Data type	no. of decimals	Values range	Note
H.01	**2E07**	Stored Alarm n. 1: e. = duration (minutes)	N	0	0 ÷ 59	
H.01	**2E08**	Stored Alarm n. 1: _ = peak max./min. °C/°F	N	1	- 99.9 ÷ 999.0	
H.02	**2E09**	Stored Alarm n. 2: A. = Alarm type	N	0	0 ÷ 5	
H.02	**2E0A**	Stored Alarm n. 2: y.= Start Year	N	0	0 ÷ 99	
H.02	**2E0B**	Stored Alarm n. 2: M.= Start Month	N	0	1 ÷ 12	
H.02	**2E0C**	Stored Alarm n. 2: d.= Start Day (date)	N	0	1 ÷ 31	
H.02	**2E0D**	Stored Alarm n. 2: h. = Start Hour	N	0	0 ÷ 23	
H.02	**2E0E**	Stored Alarm n. 2: n. = Start Minutes	N	0	0 ÷ 59	
H.02	**2E0F**	Stored Alarm n. 2: E. = duration (hours)	N	0	0 ÷ 99	
H.02	**2E10**	Stored Alarm n. 2: e. = duration (minutes)	N	0	0 ÷ 59	
H.02	**2E11**	Stored Alarm n. 2: _ = peak max./min. °C/°F	N	1	- 99.9 ÷ 999.0	
H.03	**2E12**	Stored Alarm n. 3: A. = Alarm type	N	0	0 ÷ 5	
H.03	**2E13**	Stored Alarm n. 3: y.= Start Year	N	0	0 ÷ 99	
H.03	**2E14**	Stored Alarm n. 3: M.= Start Month	N	0	1 ÷ 12	
H.03	**2E15**	Stored Alarm n. 3: d.= Start Day (date)	N	0	1 ÷ 31	
H.03	**2E16**	Stored Alarm n. 3: h. = Start Hour	N	0	0 ÷ 23	
H.03	**2E17**	Stored Alarm n. 3: n. = Start Minutes	N	0	0 ÷ 59	
H.03	**2E18**	Stored Alarm n. 3: E. = duration (hours)	N	0	0 ÷ 99	
H.03	**2E19**	Stored Alarm n. 3: e. = duration (minutes)	N	0	0 ÷ 59	
H.03	**2E1A**	Stored Alarm n. 3: _ = peak max./min. °C/°F	N	1	- 99.9 ÷ 999.0	
H.04	**2E1B**	Stored Alarm n. 4: A. = Alarm type	N	0	0 ÷ 5	
H.04	**2E1C**	Stored Alarm n. 4: y.= Start Year	N	0	0 ÷ 99	
H.04	**2E1D**	Stored Alarm n. 4: M.= Start Month	N	0	1 ÷ 12	
H.04	**2E1E**	Stored Alarm n. 4: d.= Start Day (date)	N	0	1 ÷ 31	
H.04	**2E1F**	Stored Alarm n. 4: h. = Start Hour	N	0	0 ÷ 23	
H.04	**2E20**	Stored Alarm n. 4: n. = Start Minutes	N	0	0 ÷ 59	
H.04	**2E21**	Stored Alarm n. 4: E. = duration (hours)	N	0	0 ÷ 99	
H.04	**2E22**	Stored Alarm n. 4: e. = duration (minutes)	N	0	0 ÷ 59	
H.04	**2E23**	Stored Alarm n. 4: _ = peak max./min. °C/°F	N	1	- 99.9 ÷ 999.0	
H.05	**2E24**	Stored Alarm n. 5: A. = Alarm type	N	0	0 ÷ 5	
H.05	**2E25**	Stored Alarm n. 5: y.= Start Year	N	0	0 ÷ 99	
H.05	**2E26**	Stored Alarm n. 5: M.= Start Month	N	0	1 ÷ 12	
H.05	**2E27**	Stored Alarm n. 5: d.= Start Day (date)	N	0	1 ÷ 31	
H.05	**2E28**	Stored Alarm n. 5: h. = Start Hour	N	0	0 ÷ 23	
H.05	**2E29**	Stored Alarm n. 5: n. = Start Minutes	N	0	0 ÷ 59	
H.05	**2E2A**	Stored Alarm n. 5: E. = duration (hours)	N	0	0 ÷ 99	
H.05	**2E2B**	Stored Alarm n. 5: e. = duration (minutes)	N	0	0 ÷ 59	
H.05	**2E2C**	Stored Alarm n. 5: _ = peak max./min. °C/°F	N	1	- 99.9 ÷ 999.0	
H.06	**2E2D**	Stored Alarm n. 6: A. = Alarm type	N	0	0 ÷ 5	
H.06	**2E2E**	Stored Alarm n. 6: y.= Start Year	N	0	0 ÷ 99	
H.06	**2E2F**	Stored Alarm n. 6: M.= Start Month	N	0	1 ÷ 12	
H.06	**2E30**	Stored Alarm n. 6: d.= Start Day (date)	N	0	1 ÷ 31	
H.06	**2E31**	Stored Alarm n. 6: h. = Start Hour	N	0	0 ÷ 23	
H.06	**2E32**	Stored Alarm n. 6: n. = Start Minutes	N	0	0 ÷ 59	
H.06	**2E33**	Stored Alarm n. 6: E. = duration (hours)	N	0	0 ÷ 99	
H.06	**2E34**	Stored Alarm n. 6: e. = duration (minutes)	N	0	0 ÷ 59	
H.06	**2E35**	Stored Alarm n. 6: _ = peak max./min. °C/°F	N	1	- 99.9 ÷ 999.0	
H.07	**2E36**	Stored Alarm n. 7: A. = Alarm type	N	0	0 ÷ 5	
H.07	**2E37**	Stored Alarm n. 7: y.= Start Year	N	0	0 ÷ 99	
H.07	**2E38**	Stored Alarm n. 7: M.= Start Month	N	0	1 ÷ 12	
H.07	**2E39**	Stored Alarm n. 7: d.= Start Day (date)	N	0	1 ÷ 31	
H.07	**2E3A**	Stored Alarm n. 7: h. = Start Hour	N	0	0 ÷ 23	
H.07	**2E3B**	Stored Alarm n. 7: n. = Start Minutes	N	0	0 ÷ 59	
H.07	**2E3C**	Stored Alarm n. 7: E. = duration (hours)	N	0	0 ÷ 99	
H.07	**2E3D**	Stored Alarm n. 7: e. = duration (minutes)	N	0	0 ÷ 59	
H.07	**2E3E**	Stored Alarm n. 7: _ = peak max./min. °C/°F	N	1	- 99.9 ÷ 999.0	
H.08	**2E3F**	Stored Alarm n. 8: A. = Alarm type	N	0	0 ÷ 5	
H.08	**2E40**	Stored Alarm n. 8: y.= Start Year	N	0	0 ÷ 99	
H.08	**2E41**	Stored Alarm n. 8: M.= Start Month	N	0	1 ÷ 12	

Parameter	HEX addr.	Description	Data type	no. of decimals	Values range	Note
H.08	**2E42**	Stored Alarm n. 8: d.= Start Day (date)	N	0	1 ÷ 31	
H.08	**2E43**	Stored Alarm n. 8: h. = Start Hour	N	0	0 ÷ 23	
H.08	**2E44**	Stored Alarm n. 8: n. = Start Minutes	N	0	0 ÷ 59	
H.08	**2E45**	Stored Alarm n. 8: E. = duration (hours)	N	0	0 ÷ 99	
H.08	**2E46**	Stored Alarm n. 8: e. = duration (minutes)	N	0	0 ÷ 59	
H.08	**2E47**	Stored Alarm n. 8: _ = peak max./min. °C/°F	N	1	- 99.9 ÷ 999.0	
H.09	**2E48**	Stored Alarm n. 9: A. = Alarm type	N	0	0 ÷ 5	
H.09	**2E49**	Stored Alarm n. 9: y.= Start Year	N	0	0 ÷ 99	
H.09	**2E4A**	Stored Alarm n. 9: M.= Start Month	N	0	1 ÷ 12	
H.09	**2E4B**	Stored Alarm n. 9: d.= Start Day (date)	N	0	1 ÷ 31	
H.09	**2E4C**	Stored Alarm n. 9: h. = Start Hour	N	0	0 ÷ 23	
H.09	**2E4D**	Stored Alarm n. 9: n. = Start Minutes	N	0	0 ÷ 59	
H.09	**2E4E**	Stored Alarm n. 9: E. = duration (hours)	N	0	0 ÷ 99	
H.09	**2E4F**	Stored Alarm n. 9: e. = duration (minutes)	N	0	0 ÷ 59	
H.09	**2E50**	Stored Alarm n. 9: _ = peak max./min. °C/°F	N	1	- 99.9 ÷ 999.0	
H. 10	**2E51**	Stored Alarm n. 10: A. = Alarm type	N	0	0 ÷ 5	
H. 10	**2E52**	Stored Alarm n. 10: y.= Start Year	N	0	0 ÷ 99	
H. 10	**2E53**	Stored Alarm n. 10: M.= Start Month	N	0	1 ÷ 12	
H. 10	**2E54**	Stored Alarm n. 10: d.= Start Day (date)	N	0	1 ÷ 31	
H. 10	**2E55**	Stored Alarm n. 10: h. = Start Hour	N	0	0 ÷ 23	
H. 10	**2E56**	Stored Alarm n. 10: n. = Start Minutes	N	0	0 ÷ 59	
H. 10	**2E57**	Stored Alarm n. 10: E. = duration (hours)	N	0	0 ÷ 99	
H. 10	**2E58**	Stored Alarm n. 10: e. = duration (minutes)	N	0	0 ÷ 59	
H. 10	**2E59**	Stored Alarm n. 10: _ = peak max./min. °C/°F	N	1	- 99.9 ÷ 999.0	

8. PROBLEMS, MAINTENANCE AND WARRANTY

8.1 Notifications

8.1.1 Error messages

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 (P) key
Err	Fatal memory error	Replace the instrument or ship to factory for repair

8.1.2 Other messages

Message	Reason
od	Delay at power-on in progress
Ln	Keyboard 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 open
dEF	Defrosting in progress with ddL = **Lb**
PdF	Post-defrosting in progress with ddL = **Lb**
Eco	Eco mode active
trb	Turbo mode active
HAC	Not acknowldged HACCP alarms present
---	Reset/delete peak values and HACCP alarms
Hon	Enable HACCP Alarms recording
HoF	Disable HACCP Alarms recording

The red ON LED inside the instrument flashes to indicate that the unit is functioning correctly.

When the unit is powered ON the LED falashes more quickly for a few seconds, to indicate that the unit is starting, while it blinks with a slower frequency during normal operation.

8.2 Cleaning

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

8.3 Warranty and Repairs

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

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

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

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

8.4 Disposal

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

9. TECHNICAL DATA

9.1 Electrical characteristics

Power supply: 12 ÷ 24 VAC/VDC, 100 ÷ 240 VAC ± 10%;

AC frequency: 50/60 Hz;

Power consumption: about 6 VA;

Inputs: 4 **inputs** for **temperature probes**:

NTC (103AT-2, 10 kΩ @ 25°C);

PTC (KTY 81-121, 990Ω @ 25°C) or

Pt1000 (1000Ω @ 0°C);

+ **2** free of voltage digital inputs;

Output: Up to **4 relay outputs**;

	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/Out 4 - SPST-NO - 5A - 1/10HP 125/250 V	5 (1) A	2 (1) A	2 A Gen.Use

12 A per contact for the model with removable terminals;

Relay output Electrical life (EN60730)**:** Out 1 and 2: 30000 operations, Out3 and 4: 60000 operations;

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

Overvoltage category: II;

Protection class: Class II;

Isolation: Reinforced insulation between the low voltage part (type H supply type and relays output) and front panel; Reinforced insulation between the low voltage section (type H supply type and relay outputs) and the extra low voltage section (inputs), Reinforoced between power supply and relay outputs.

9.2 Mechanical characteristics

Housing: Self-extinguishing plastic, UL 94 V0;

Heat and fire resistance category: D;

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

Dimensions: 87.5 x 28 mm, depth 71.3 mm (+12.5 or +14.5 mm depending on the terminal block type);

Weight: about 150 g;

Mounting: Rear panel on Omega DIN rail;

Connections:

Inputs: removable terminal block for 0.14 ÷ 1.5 mm^2/ AWG 28 ÷ 16 cables;

Power supply and Outputs: fixed or removable terminal block for 0.2 ÷ 2.5 mm^2/AWG 24 ÷ 14 cables;

Pollution degree: 2;

Operating temperature: 0 ÷ 50°C;

Operating humidity: < 95 RH% with no condensation;

Storage temperature: -25 ÷ +60°C.

9.3 Functional features

Temperature control method: ON/OFF;

Defrost control method: Interval cycles, at set times, or evaporator temperature by Electric Heating, by hot-gas/reverse cycle or stopping compressor;

Measurement range: NTC: -50... +109°C/-58... +228°F,
PTC: -50 ÷ +150°C/-58 ÷ +302°F,
Pt1000: -99.9 ÷ +300°C/-99.9 ÷ +572°F;

Overall accuracy: ±(0.5% fs + 1 digit);

Sampling rate: 800 ms;

Clock accuracy at 25°C: ±15.8 minutes/year;

Maintaining the internal clock without power supply:
About 5 years (with internal lithium battery);

Type of Communications Interface: Isolated RS485;

Interface Communications protocol: MODBUS RTU (JBUS);

Serial communications speed:
Selectable: 9600 ÷ 19200 baud;

Software class and structure: Class A;

Compliance: Directive 2004/108/CE (EN55022: class B; EN61000-4-2: 8 kV air, 4 kV cont.; EN61000-4-3: 10V/m; EN61000-4-4: 2 kV supply and relay outputs, 1 kV inputs; EN61000-4-5: supply 2 kV com. mode, 1 kV\diff. mode; EN61000-4-6: 3V), Directive 2006/95/CE (EN 60730-1, EN 60730-2-9); Regulation 37/2005/CE (EN13485 air/air, S, A, 1, -50°C +90°C if used with NTC 103AT11 probe or Pt1000 class B or better).

10. HOW TO ORDER

MODEL
X30 - = Instrument

a: POWER SUPPLY
H = 100 ÷ 240 VAC
G = 12 ÷ 24 VAC/VDC,

b: OUT1 + OUT2 OUTPUTS
R = Out1 Relay SPST-NO 16A + Out2 Relay SPDT 8A (for resistive loads)
- = Not present

C: OUT3 + OUT4 OUTPUTS
R= Out3 and Out4 Relay: SPST-NO 5A (for resistive loads)
- = Not present

d: Buzzer
- = Not present

c: TERMINALS
- = Fixed Screw terminals (standard);
E = Removable screw terminals with 5 mm pitch;
N = Removable screw terminals without 5 mm pitch(the fixed part only).

f: LIN
- = Not present
L = LIN

g: Clock
- = Not present
C = Clock

h: Serial interface
- = Not present
S = RS485

X30	-	a	b	c	-	e	-	-	h	i	j	k	ll	mm

i, j, k: RESERVED CODES;
ll, mm: SPECIAL CODES.