e31-

DIGITAL ELECTRONIC TEMPERATURE CONTROLLER WITH DEFROSTING FUNCTION



OPERATING INSTRUCTIONS

22/12 - Code: ISTR_M_e31-_E_04_--

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PREFACE

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

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1. INSTRUMENT DESCRIPTION

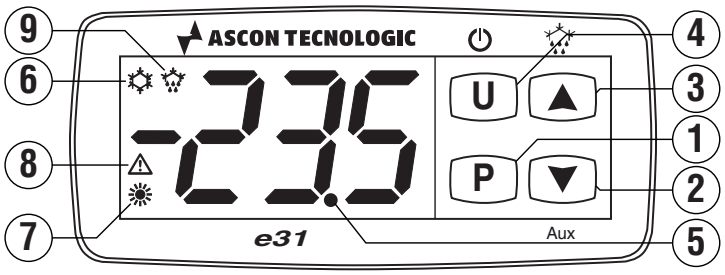
1.1 General description

The model **e31** is a microprocessor based digital electronic temperature controller that is typically used in cooling applications with **ON/OFF temperature control** and **defrost control** with intervals time by **stopping compressor**

The instrument has **1 relay output** and **2 NTC temperature probes** inputs **one of which** can be **configured as digital input**; it can also be equipped with a **built-in buzzer** for **acoustic report** of the **alarms**.

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

1.2 Front panel pescription



1. **P:** Used for setting the Set point (short press) and for programming the function parameters (pressed for 5 s). In programming mode is used to enter in parameters edit mode and confirm the values. In programming mode can be used together with the ▲ key to change the programming level of the parameters. When the keyboard is locked, the keys P and ▲ used together (hold pressed for 5 s), unlock the keyboard.
2. **▼/Aux:** In programming mode is used for decreasing the values to be set and for selecting the parameters. If programmed with parameter *tFb* can perform, when pressed for 1 s during normal operation mode, other functions as **switching** between **Normal/Eco** mode and **turn ON/OFF** (Stand by) the controller (see "Functions of keys U/⏻ and ▼/Aux").
3. **▲/☆:** In normal mode (pressed for 5 s) can be used to **start/stop manual defrosting** (☆). In programming mode is used for increasing the values to be set and for selecting the parameters. In programming mode can be used together with P key to change parameters level. Pressed together with the P key for 5 s allows the keyboard unlock.
4. **U/⏻:** Used (short press) for displaying the instrument variables (measured temperatures etc.). In programming mode can be used to return in normal mode (hold for 2 s). If programmed with parameter *tFb* can perform, when pressed for 1 s during normal operation mode, other functions as **switching** between **Normal/Eco** mode and **turn ON/OFF** (Stand by) the controller (see "Functions of keys U/⏻ and ▼/Aux").
5. **LED dp/Stand by:** When the instrument is placed in Stand by mode, this is the only lighted LED. During the normal operation is the decimal point In programming mode, while the parameter code is displayed, the dot indicates the parameter protection level: **not protected** (lit up), **protected** (flashing) and **hidden** (turned OFF).
6. **LED ☼**: Indicates the output status (compressor or temperature control device) when the instrument is programmed for **cooling operation**; **ON** (lit up), **OFF** (turned OFF) or **inhibited** (flashing).
7. **LED ☀:** Indicates the output status (compressor or temperature control device) when the instrument is programmed for **heating operation**; **ON** (lit), **OFF** (turned OFF) or **inhibited** (flashing).
8. **LED ⚠:** Indicates the **alarm status**: **ON** (lit), **OFF** (turned OFF) or **silenced** (flashing).
9. **LED ☆:** Indicates that the **defrost** is **in progress**.

2. PROGRAMMING

2.1 Fast Set point programming

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

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

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

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

The parameter can have the following values:

oF SP/SPE cannot be changed with the P key rapid procedure (pressing/releasing the P key, nothing happens);
1 Only SP can be set with this procedure ("normal" Set Point);
2 Only SPE can be set with this procedure ("economic"/ Eco Set Point);
3 Both SP and SPE can be set with this procedure;
4 To select the Active Setpoint (SP or SPE).

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

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

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

If also the "Economic" Set Point (*tEd* = **3**) can be set, pressing and releasing again the P button the display shows *SPE* alternated to its programmed value.

To change the value use the ▲ and ▼ keys as for the *SP* Set Point value. Once the desired value is correctly set, press the P button to exit the fast Set Point change.

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

2.2 Standard mode parameters programming

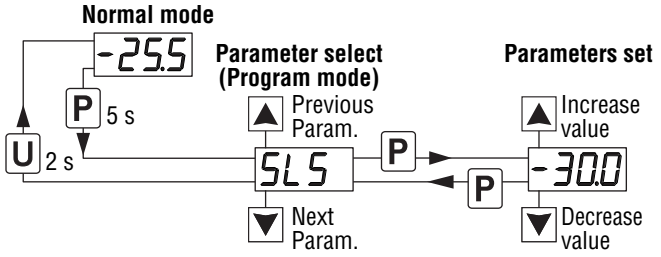
To access the instrument function parameters when password protection is disabled, press the key P and keep it pressed for about 5 seconds, after which the display shows the code that identifies the first programmable parameter

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

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

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

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



2.3 Parameter protection using the password

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

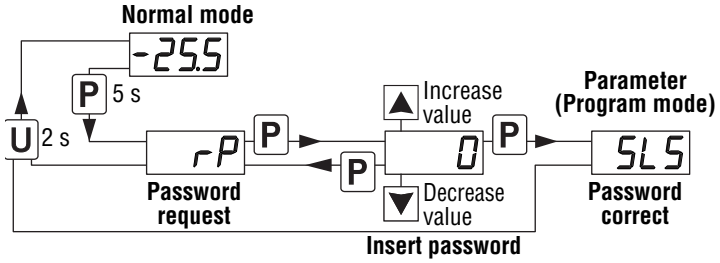
To protect the parameters, set the desired password number in the parameter EPP.

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

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

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

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



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

2.4 Customized mode parameter programming (parameters programming level)

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

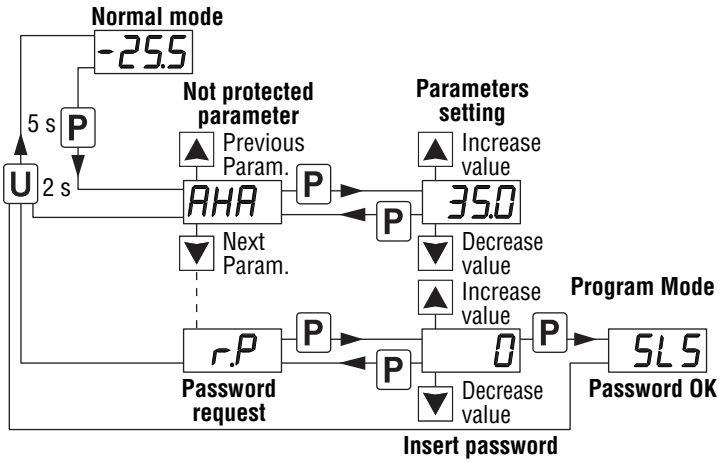
Enter the program mode using the EPP Password and select the parameter that must be accessible (no password protection).

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

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

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

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



2.5 Reset parameters to default value

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

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

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

2.6 Keyboard lock function

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

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

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

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

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

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

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

3. USAGE WARNINGS

3.1 Admitted use

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

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

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

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

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

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

4. INSTALLATION WARNINGS

4.1 Mechanical mounting

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

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

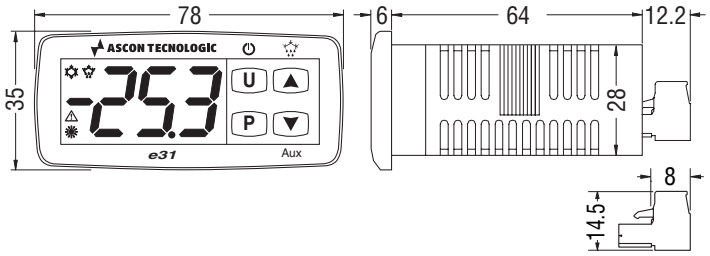
Avoid placing the instrument in environments with very high humidity levels or dirt that may create condensation or introduction of conductive substances into the instrument

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

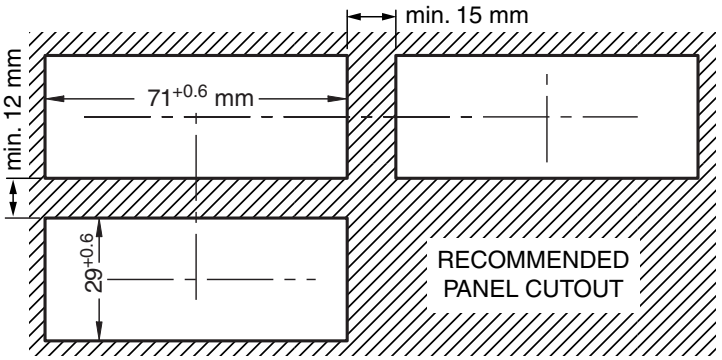
Connect the instrument as far away as possible from sources of electromagnetic disturbances such as motors, power relays, relays, solenoid valves, etc..

4.2 Dimensions [mm]

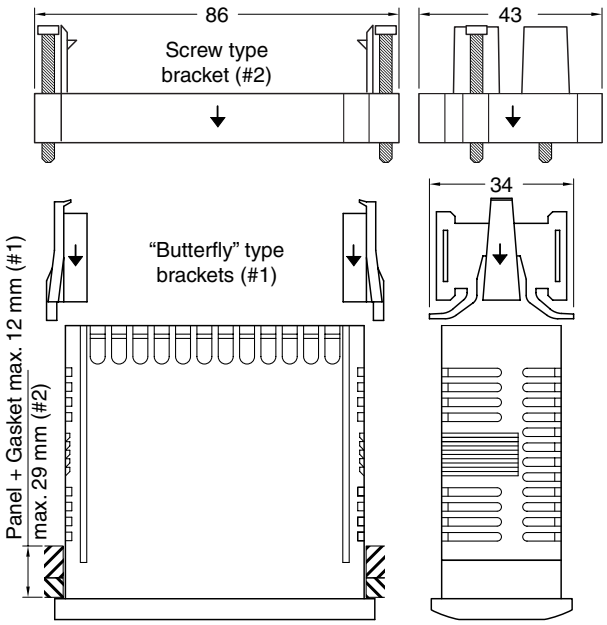
4.2.1 Mechanical dimensions



4.2.2 Panel cut-out



4.2.3 Mounting brackets



4.3 Electrical connections

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

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

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

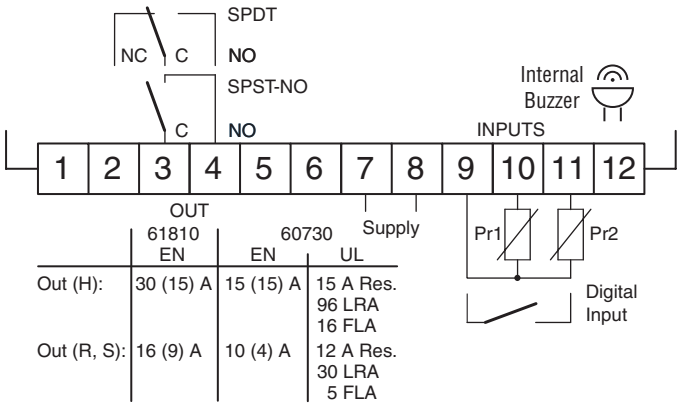
It is strongly recommended that cables with proper insulation, according to the working voltages and temperatures, be used.

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

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

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

4.3.1 Electrical wiring diagram



	61810 EN	60730 EN	60730 UL
Out (H):	30 (15) A	15 (15) A	15 A Res. 96 LRA 16 FLA
Out (R, S):	16 (9) A	10 (4) A	12 A Res. 30 LRA 5 FLA

(12 A max. for models with removable terminals)

5. FUNCTIONS

5.1 ON/Stand-by function

Once powered the instrument can assume 2 different conditions:

ON: Means that the controller uses the control functions.

STAND-BY:
Means that the controller uses no control function and the display is turned OFF except for the Stand-by LED.

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

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

The ON/Stand-by function can be selected:

– With the key U/⏻ pressed for 1 s if tUF = **3**;
– With the key ▼**/Aux** pressed for 1 s if tFb = **3**;
– Using the Digital Input if parameter iF1 = **7**;

5.2 Normal and economic operation

This tool allows to pre-set two different Setpoints, one **Normal** - SP and one **Economic** - SPE.

Associated with each Setpoint there is the relative differential (hysteresis): **Normal** - rd and **Economic** - rEd.

Switching between the two modes can be **automatic** or **manual**.

5.2.1 Normal/Economic operation selection

This function can be used when you need to switch two functional temperatures (eg. Day/Night or week-day/week-end). The Normal/Economic operation can be selected in manual mode:

– With the key U/⏻ pressed for 1 s if tUF = **2**;
– With the key ▼**/Aux** pressed for 1 s if tFb = **2**;
– Using the Digital Input if parameter iF1 = **6**.

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

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

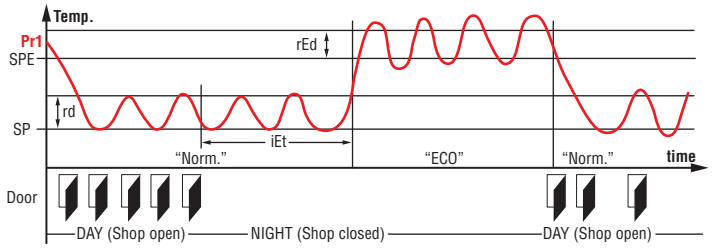
To use this function, it is necessary to set the Digital Input as: iF1 = **1**, **2** or **3**.

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

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

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

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



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

5.3 Measure and display configuration

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

The instrument allows the measure calibration, which can be used to recalibrate the instrument according to application needs, The calibration is made by using parameters C1 (input Pr1) and C2 (Pr2 input).

Parameter P2 allows to select the instrument usage of Pr2 measure as:

Au Auxiliary probe;

DG Digital Input (see the Digital input functions).

If **Pr2** input is not used, set P2 = **oF**.

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

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

P1: **Pr1** probe measurement;

P2: **Pr2** probe measurement;

SP: Active Set Point;

EC: Probe measure if the instrument is in Normal Mode, the label Eco if the instrument is in (**Eco mode**);

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

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

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

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

Pr1 Probe 1 measurement;

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

Lt Minimum stored Pr1 temperature;

Ht Maximum stored Pr1 temperature.

The peak (min./max.) temperature values of Pr1 probe are not stored in case of power failure and can be reset pressing the ▼ for 3 s elapsed which, the display shows "- - -" for an instant to indicate that the min./max. values have been erased and the new peak is the temperature read in that moment

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

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

5.4 Digital input configuration

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

0. Digital input not active;

1. Cell door opening with NO contact: at input closure (and after the it) the instrument displays alternately oP and the variable set at dS parameter With this mode of operation of the digital input activates also the time set with parameter AoA elapsed which the alarm is activated to warn that the door has been left open. In addition, at door opening, the instrument returns to normal operation if it was in Eco mode and the Eco mode activation was enabled through parameter EE

2. Similar to iF = **1**;

3. Cell door opening with output lock and NO contact: similar to iF = **1** but with output lock. At alarm door open intervention AoA also the output is re-activated.

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

5. External alarm signal with Control output disabled and NO contact: at input closing (and after the it time) the control output is is disabled, the alarm is activated and the instrument shows on the display alternatively AL and the variable set with parameter dS;

6. Normal/Economic mode selection with NO contact: at input closing (and after the it time) the instrument switches to Economic operation mode. Opening the digital input, the instrument returns in Normal operation mode.

7. Instrument On/Off (stand-by) selection with NO contact: at input closing (and after the it time) the instrument is switched ON while it is placed in Stand-by mode when the digital input is open;

8. Do not use;

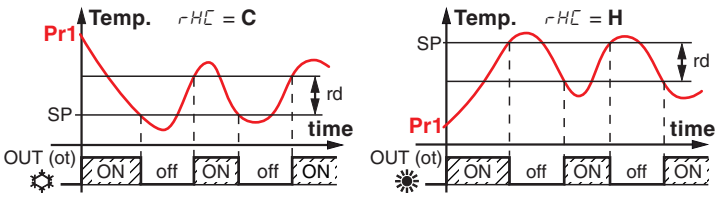
9. **Defrost activation** command with NO contact: at input closing (and after the it time) the instrument starts a defrost cycle;

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

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

5.5 Temperature control

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



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

In the event of a probe error, it is possible to set the instru-

ment so that that the output continues to work in cycles according to the times programmed with parameter rt1 (activation time) and rt2 (deactivation time).

If an error occurs on the probe the instrument activates the output for the time rt1, then deactivates it for the time rt2 and so on whilst the error remains.

Programming rt1 = **oF** the output in probe error condition remains switched off.

Programming instead rt1 to any value and rt2 = **oF** the output in probe error condition remains switched ON.

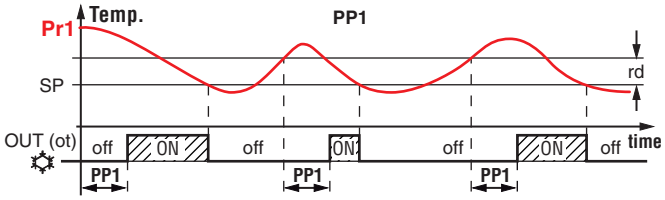
Remember that the temperature regulation function can be conditioned by the *Compressor Protections*, *Delay at power ON* and *Defrost functions*.

5.6 Compressor protection function and power-on delay

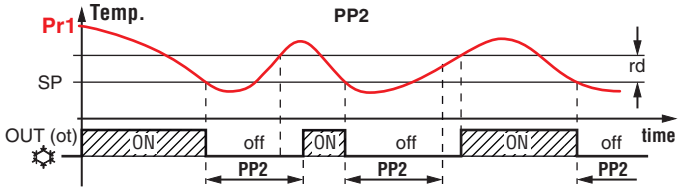
The "**Compressor Protection**" function aims to avoid repeated compressor start-ups controlled by the instrument in cooling applications or otherwise can be used to add a timed control on the actuator control output.

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

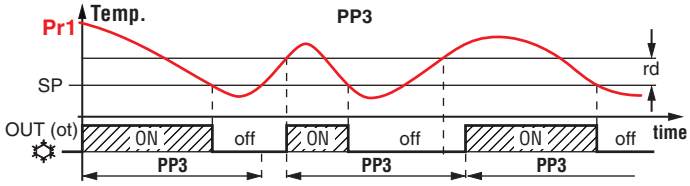
1. First control (parameter PP1) foresees a delay to output activation (switching-ON delay).



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



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



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

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

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

5.7 Defrost control

The automatic defrost control is made with the *stopping compressor* method; it occurs by interval times or after a certain time of continuous compressor functionning.

The automatic defrost function is activated when at parameter dd1 is set the defrost interval time between 2 defrost cycles.

The first defrost after power on can be set by parameter d5d.

This allows to perform the first defrost to a different interval from dd1 time.

When the instrument must perform a defrost cycle at all power ON, set parameter d5d = **oF**.

If all defrost cycles must be performed after the same interval time, program d5d = dd1.

Automatic defrost function is totally disabled when dd1 = **oF** (including the first, regardless the time set at d5d parameter).

The instrument provides to switch OFF the output for the ddE period of time every time expires the dd1 time (or d5d in case of first defrost after power ON).

Moreover, the instrument starts a defrost cycle when the compressor is activated continuously for the time dcd.

This function is used as the continuous operation of the compressor for a long period is normally a symptom of a low heat exchange typically caused by the frost on the evaporator.

By setting dcd = **oF** the function is disabled.

5.7.1 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 s after which, if the conditions are correct, the LED ☼ will light up and the instrument performs out a defrosting cycle.

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

5.7.2 Display lock during Defrost

Through parameters ddL and RdA it is possible to define the display behaviour during defrost. The ddL parameter can assume the following values.

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

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

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

5.8 Alarm functions

The alarm conditions of the instrument are:

– Probe errors E1, -E1 and E2, -E2;

– Temperature alarms H1 and Lo;

– External alarm AL;

– Door open oP.

All active alarms are pointed out on the instrument display lighting up the LED ⚠ and, if configured with parameter obu, also with the internal buzzer

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

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

5.8.1 Temperature alarms

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

Through parameter AAY it is possible to set the alarm thresholds AHA and ALA as absolute or relative to the active Set Point, must be related to Pr1 or Au probes and if the message H1 (High alarm) and Lo (Low Alarm) are to be displayed at alarm intervention.

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

1 Absolute alarms referred to probe Pr1, displays H1/Lo;

2 Relative Alarms referred to probe Pr1, displays H1/Lo;

3 Absolute alarms referred to probe Au, displays H1/Lo;

4 Relative Alarms referred to probe Au, displays H1/Lo;

5 Absolute alarm referred to probe Pr1, displays no labels;

6 Relative alarm referred to probe Pr1, displays no labels;

7 Absolute alarm referred to probe Au, displays no labels;

8 Relative alarm referred to probe Au, displays no labels.

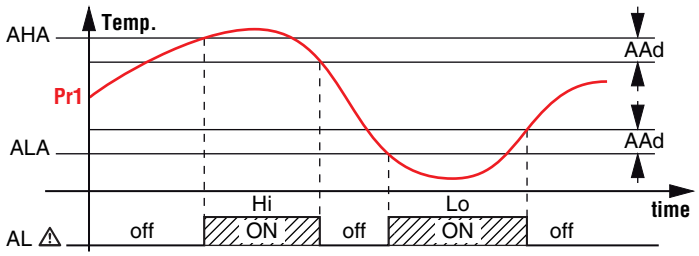
Using some parameters it is also possible to delay the enabling and the intervention of these alarms.

These parameters are:

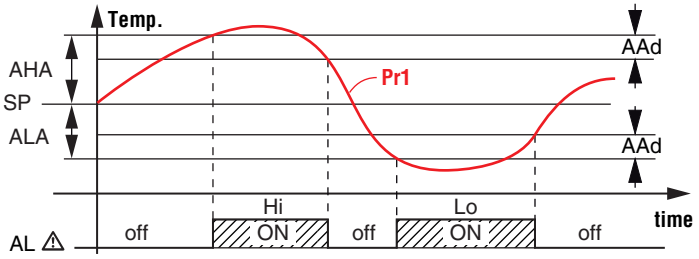
APA Temperature alarm exclusion time on switching ON the instrument if the instrument is in alarm status when it is switched ON. If the instrument is not in alarm status when it is switched on the time APA it is not considered.

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

AAt Temperature alarms delay activation time. Temperature alarms are enabled at the end of the exclusion times and are activated after the AAt time when the temperature measured by the probe exceeds or goes below the respective maximum and minimum alarm thresholds. The alarm thresholds are those set at parameters AHA and ALA when the alarms are set as absolute (AAY = **1**, **3**, **5**, **7**).



or they assume the values [SP + AHA] and [SP + ALA] if the alarms are relative (AAY = **2**, **3**, **6**, **8**).



The maximum and minimum temperature alarms can be disabled by setting the related parameters AHA and ALA = **oF**.

The temperature alarms are signalled lighting up the alarm LED (⚠) and, if configured, also with the buzzer

5.8.2 External alarm from digital input

The instrument can signal an alarm external to the instrument using the digital input setting iF1 = **4** or **5**. The instrument signals the alarm turning ON the alarm LED (⚠) and displaying AL label alternated to the variable set with parameter id5.

Mode iF1 = **4** operates no action on the control output, while iF1 = **5** deactivates the control output at digital input intervention.

5.8.3 Open door alarm

The instrument can signal the open door alarm condition using the digital input setting iF1 = **1**, **2** and **3**. As the Digital input is activated, the instrument signals that the door is open showing on the display the **oP** label alternated to the variable set with parameter id5.

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

5.9 Function of keys U/⏻ and ▼/Aux

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

The U/⏻ key function can be defined using the tUF parameter while the ▼/**Aux** key via parameter tFb. Both parameters have the same possibilities and can be configured to perform the following functions:

oF The key carries out no function;

1. Do not use;

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

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

4. Do not use.

6. ACCESSORIES

6.1 Parameters configuration by A01

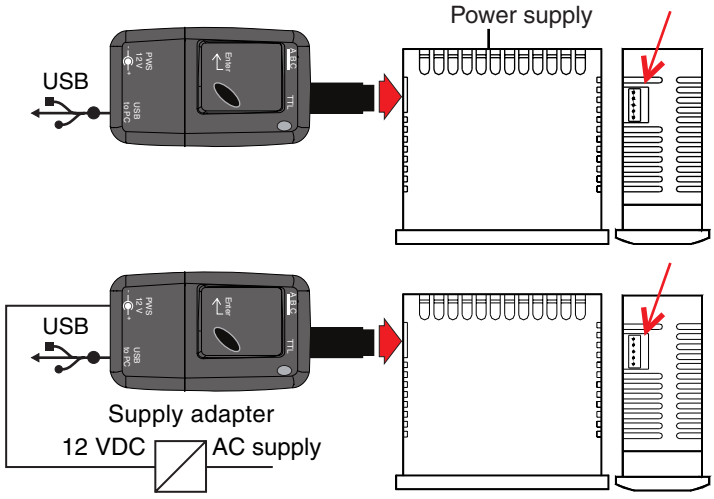
The instrument is equipped with a connector that allows the transfer from and toward the instrument of the functioning parameters through the device **A01** with 5 poles connector.



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

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

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



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

6.2 Parameters configuration by AFC1

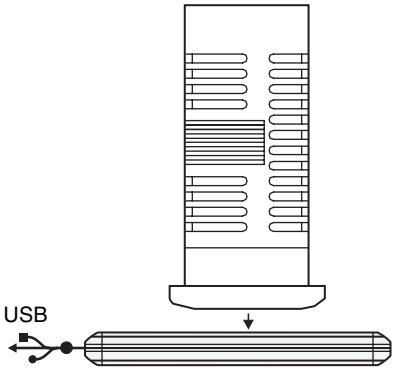
The **AFC1** is a contactless **NFC** (**N**ear **F**ield **C**ommunications) connection device that allows to **Upload/Daownload** the operating parameters **From/To** the instruments.

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



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

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



7. PROGRAMMABLE PARAMETERS TABLE

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

Parameter		Description	Range	Def.	Note
1	SLS	Minimum Set Point	-99.9 ÷ HS	-50.0	
2	SHS	Maximum Set Point	LS ÷ 999	99.9	
3	SP	Set Point	LS ÷ HS	0.0	
4	SPE	Set Point Eco	SP ÷ SHS	0.0	
5	uP	Unit of measurement and resolution (decimal point)	**C0** °C, resolution 1°; **F0** °F, resolution 1°; **C1** °C, resolution 0.1°; **F1** °F, resolution 0.1°.	C1	
6	Ft	Measurement filter	**oF** Filter disabled; 0.1 ÷ 20.0 s	2.0	
7	C1	Pr1 Probe Calibration	-30.0 ÷ +30.0°C/°F	0.0	
8	C2	Pr2 Probe Calibration	-30.0 ÷ +30.0°C/°F	0.0	
9	CU	Display offset	-30.0 ÷ +30.0°C/°F	0.0	
10	P2	Input Pr2 usage	**oF** Unused; **EP** Do not use; **Au** Auxliary probe; **dG** Digital Input.	dG	
11	F1	Function and logic functioning of the Digital Input (adding the "-" minus sign the logic is inverted)	**0** No function; **1, 2** Open Door; **3** Open Door with Output Lock; **4** External Alarm; **5** External alarm with output disabling; **6** Normal/Eco select; **7** On/Stand by select; **8** Do not use; **9** Defrost cycle start; **10** Defrost cycle end.	0	
12	it	Digital Input Delay	**oF** Disabled; -1 ÷ -59 (s) ÷ 1 ÷ 99 (min).	oF	
13	iEt	Eco Mode activation delay at Door closed	**oF** Disabled; -1 ÷ -59 (min) ÷ 1 ÷ 99 (h).	oF	
14	itt	Max. time functioning in Eco Mode	**oF** Disabled; -1 ÷ -59 (min) ÷ 1 ÷ 99 (h).	oF	
15	dS	Variable normally displayed	**P1** Probe Pr1 measure; **P2** Probe Pr2 measure; **P3** Do not use; **Ec** Measure **Pr1** in Normal mode + ECO label when in ECO mode; **SP** Set Point; **oF** Display not lit.	P1	
16	rd	Differential (Hysteresis)	0.0 ÷ 30.0°C/°F	2.0	
17	rEd	Differential (Hysteresis) in ECO mode	0.0 ÷ 30.0°C/°F	2.0	
18	rt1	Output activation time for Pr1 probe error	**oF** Disabled; -1 ÷ -59 (s) ÷ 1 ÷ 99 (min).	oF	
19	rt2	Output deactivation time for Pr1 probe error	**oF** Disabled; -1 ÷ -59 (s) ÷ 1 ÷ 99 (min).	oF	
20	rHC	Output operating mode	**H** Heating; **C** Cooling; **nr** Do not use; **HC** Do not use; **C3** Do not use.	C	
21	ddL	Display Lock during defrost	**oF** Not active; **on** Active at last measure; **Lb** Active with label dEF during defrost and PdF at defrost.	oF	
22	dcd	Defrost activation time for continuous compressor operating	**oF** Disabled; -1 ÷ -59 (min) ÷ 1 ÷ 99 (h).	oF	
23	ddE	Defrost duration	**oF** Disabled; -1 ÷ -59 (s) ÷ 1 ÷ 99 (min).	oF	
24	dd1	Defrosting interval	**oF** Disabled; -1 ÷ -59 (min) ÷ 1 ÷ 99 (h).	oF	
25	dSd	Delay first defrost after power-on	**oF** Defrost at power-on; -1 ÷ -59 (min) ÷ 1 ÷ 99 (h).	oF	
26	PP1	Out delay at switching-on	**oF** Disabled; -1 ÷ -59 (s) ÷ 1 ÷ 99 (min).	oF	
27	PP2	Out delay after switching OFF	**oF** Disabled; -1 ÷ -59 (s) ÷ 1 ÷ 99 (min).	oF	
28	PP3	Delay between two output switching-ON	**oF** Disabled; -1 ÷ -59 (s) ÷ 1 ÷ 99 (min).	oF	
29	Pod	Output delay at power ON	**oF** Disabled; -1 ÷ -59 (s) ÷ 1 ÷ 99 (min).	oF	
30	AAy	Temperature Alarm 1 type	**1** Absolute for **Pr1** with label H1-Lo; **2** Relative to Pr1 with label H1-Lo; **3** Absolute for **Au** with label H1-Lo; **4** Relative to **Au** with label H1-Lo; **5** Absolute for **Pr1** with no label; **6** Relative to **Pr1** with no label; **7** Absolute for **Au** with no label; **8** Relative to **Au** with no label.	1	
31	AHA	High temperature Alarm threshold	**oF** Disabled; -99.9 ÷ +999°C/°F.	oF	
32	ALA	Low temperature Alarm threshold	**oF** Disabled; -99.9 ÷ +999°C/°F	oF	
33	AAd	Temperature Alarms Differential	0.0 ÷ 30.0°C/°F	1.0	
34	Aat	Temperature Alarms Delay	**oF** Disabled; -1 ÷ -59 (s) ÷ 1 ÷ 99 (min).	oF	
35	APA	Temperature Alarms delay at power ON	**oF** Disabled; -1 ÷ -59 (min) ÷ 1 ÷ 99 (h).	2.00	
36	AdA	Temperature Alarms delay and unlock display delay after defrost	**oF** Disabled; -1 ÷ -59 (min) ÷ 1 ÷ 99 (h).	1.00	
37	AoA	Open Door Alarm Delay	**oF** Disabled; -1 ÷ -59 (s) ÷ 1 ÷ 99 (min).	3.00	
38	obu	Buzzer function mode	**oF** Function disabled; **1** Active for alarms only; **2** Active for key pressed only; **3** Active for alarms and key pressed.	3.00	
39	tUF	U/⏻ Key Function	**oF** No function; **1** Do not use; **2** ECO Mode selection; **3** Switch ON/Switch OFF (Stand-by); **4** Do not use.	oF	
40	tFb	▼/Aux Key Function		oF	
41	tLo	Keyboard lock function delay	**oF** Disabled; -1 ÷ -59 (s) ÷ 1 ÷ 30 (min).	oF	
42	tEd	Set Point visibility with P key fast procedure	**0** None; **1** SP; **2** SPE; **3** SP and SPE; **4** Active SP; **5, 6** Do not use.	1	
43	tPP	Password to Access Parameter functions	**oF** Disabled; 001 ÷ 999.	oF	

8. PROBLEMS AND MAINTENANCE

8.1 Notifications

8.1.1 Error messages

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

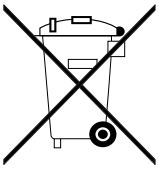
8.1.2 Other messages

Message	Reason
od	Delay at power-on in progress
Ln	Keyboard locked
H1	Maximum temperature alarm in progress
Lo	Minimum temperature alarm in progress
AL	Digital Input alarm in progress
oP	Door Open
dEF	Defrost in progress with ddL = Lb
PdF	Post-defrosting in progress with ddL = Lb
Eco	Eco Mode in progress

8.2 Cleaning

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

8.3 Disposal



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

9. WARRANTY AND REPAIRS

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

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

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

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

10. TECHNICAL DATA

10.1 Electrical characteristics

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

AC frequency: 50/60 Hz;

Power consumption: about 3 VA;

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

Output: 1 relay output SPST-NO:

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

12 A max. for those with removable terminal model;

Relay output Electrical life: 100000 operations;

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

Overvoltage category: II;

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

Protection class: Class II;

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

10.2 Mechanical characteristics

Housing: Self-extinguishing plastic, UL 94 V0;

Heat and fire resistance category: D;

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

Dimensions: 78 x 35 mm, depth 64 mm;

Weight: about 150 g;

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

Connections:

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

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

Protection degree: IP65 mounted with gasket and screw type bracket;

Pollution degree: 2;

Operating temperature: 0 ÷ 50°C;

Operating humidity: < 95 RH% with no condensation;

Storage temperature: -25 ÷ +60°C.

10.3 Functional features

Temperature Control: ON/OFF mode;
Defrost control: Interval cycles by stopping compressor;
Measurement range: NTC: -50 ÷ +109°C/-58 ÷ +228°F;
Display resolution: 1° or 0.1° (range -99.9 ÷ +99.9°);
Overall accuracy: ±(0.5% fs + 1 digit);
Sampling rate: 130 ms;
Display: 3 Digit Red or Blue (optional), height 17.7 mm;
Software class and structure: Class A;
Compliance: Directive 2004/108/CE (EN55022: class B; EN61000-4-2: 8kV air, 4kV cont.; EN61000-4-3: 10V/m; EN61000-4-4: 2kV supply and relay outputs, 1kV inputs; EN61000-4-5: supply 2kV com. mode, 1 kV\diff. mode; EN61000-4-6: 3V),
Directive 2006/95/CE (EN 60730-1, EN 60730-2-9),
Regulation 37/2005/CE (EN13485 air, S, A, 2, -50°C +90°C with probe NTC 103AT11).

11. HOW TO ORDER

MODEL
e31 - = Instrument with mechanical keyboard
e31N - = Instrument with NFC technology and mechanical keyboard

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

b: OUTPUT 1 (OUT 1)
H = Relay output SPST-NO 30A-AC1 (resistive load)
R = Relay output SPST-NO 16A-AC1 (resistive load)
S = Relay output SPDT 16A-AC1 (resistive load)

c: BUZZER
B = Buzzer
- = No

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

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

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

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

	-	a	b	c	d	e	f	g	h	i	jj	kk

g, i: RESERVED CODES; **jj, kk**: SPECIAL CODES