E51

ELECTRONIC FREEZER CONTROLLER

OPERATING INSTRUCTIONS

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PREFACE

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

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

Ascon Tecnologic S.rl. 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.

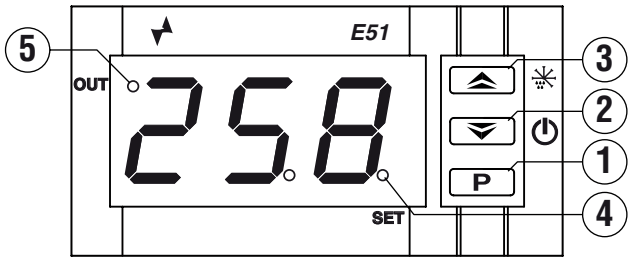
1. INSTRUMENT DESCRIPTION

1.1 General description

The model **E51** is a **digital electronic controller** that is typically used in cooling applications that have **temperature control with ON/OFF** mode and **defrosting control** with intervals time **by stopping compressor**.

The instrument has **1 relay output** and **1 input** for **PTC** or **NTC temperature probes**.

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 (▼)/(✳)**:** In programming mode is used for decreasing the values to be set and for selecting the parameters. In normal mode and if parameter *Fb* = **1** it can be used to turning on and off (stand-by) the device (hold pressed for 1 s).

3 (▲)/(⏻)**:** In programming mode is used for increasing the values to be set and for selecting the parameters. In normal mode can be used to start/stop manual defrost (hold pressed for 5 s). In programming mode can be used to return in normal mode (hold for 2 s) and to change parameters level (with key (P)). Pressed together with the key (P) for 5 s allows the keyboard unlock.

4 **LED SET:** In programming mode indicates the programming level of the parameters. In normal mode it indicates the Stand-by status and blinks when a key is pressed.

5 **LED OUT**: Indicates the output status (compressor or temperature control device): **ON** (lit up), **OFF** (turned OFF) or **inhibited** (flashing).

2. PROGRAMMING

2.1 Fast Set point programming

Press the key (P) then release it, the display starts showing *SP* alternated to the Set Point value.

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

(▲)/(▼) keys increase or decrease the value one digit at a time, but if the button is pressed for more than 1 s the value increases or decreases rapidly, and if pressed for more than 2 s, the increasing/decreasing speed raises even more to quickly reach the desired value.

When the desired value is set press the key (P) to exit from Set Point programming mode.

To manually exit the Set Point programming mode press the (P) key or automatically if no key is pressed for 15 s. After that time the display returns to the normal function mode.

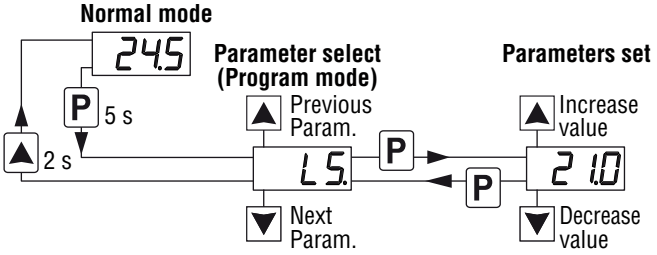
2.2 Standard mode parameters programming

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 (▲) key pressed for 2 s until the instrument returns in normal mode.



2.3 Parameter protection using the password

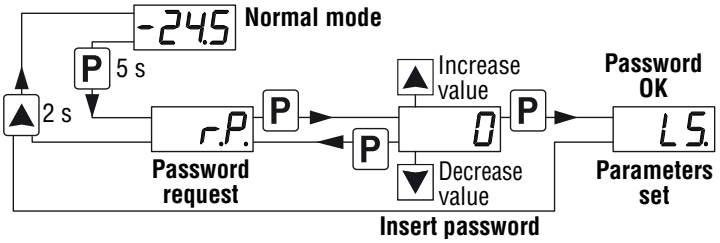
The instrument has a parameter protection function using a password that can be personalised through the *PP* parameter.

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

When the protection is active, to access the parameters press the (P) key and keep it pressed for about 5 s, after which the display shows *rP*. At this point, 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 *tPP* = **oF**.



Note: If the Password gets lost, just just cut OFF the supply, then push (P) key and keep it pressed for 5 s while powering again ON the instrument. In this way it is possible to access all the parameters, verify and modify the parameter *PP*.

2.4 Customized mode parameter programming (parameters programming level)

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

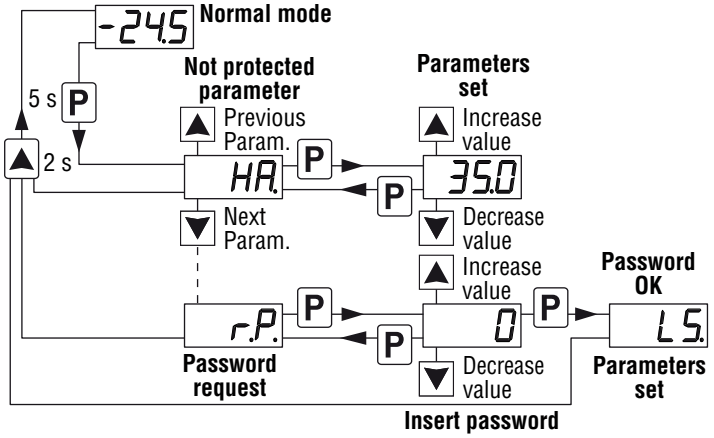
Enter the program mode using the PP Password and select the parameter that must be accessible (no password protection).

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

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

The **SET LED** will change its state to indicate the new access level of the parameter (**ON** = not protected; **flashing** = password protected).

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



2.5 Reset parameters to default value/Level

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

To restore the default parameters value set value **-48** at r.P password request (PP pasword must be active).

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

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 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 65 x 33 mm, is designed for flush-in panel mounting. Make a 58 x 25 mm hole and insert the instrument, fixing it with the provided special brackets.

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

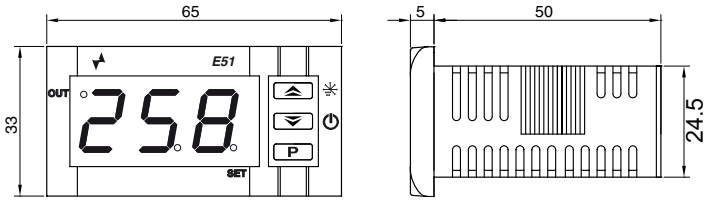
Avoid placing the instrument in environments with very high humidity levels or dirt that may create condensation or where conductive substances may enter the instrument's case.

Ensure the adequate ventilation to the instrument and avoid to place it 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.

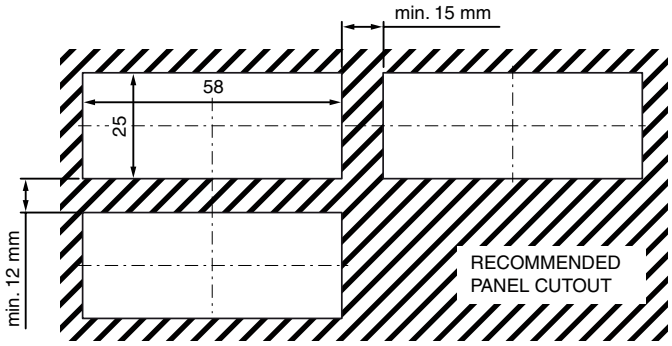
Connect the instrument as far away as possible from sources of electromagnetic disturbances such as motors, power relays, relays, solenoid valves, etc..

4.2 Dimensions [mm]

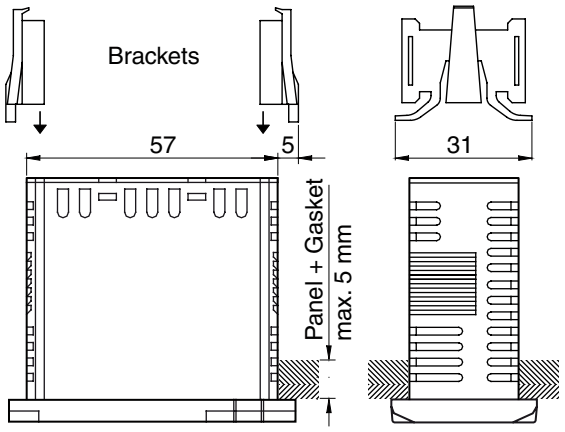
4.2.1 Mechanical dimensions



4.2.2 Panel cut-out



4.3 Mounting



4.4 Electrical connections

Carry out the electrical wiring by connecting only one wire to each terminal, according to the diagram that follows, 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 equipped neither with switches nor internal devices to protect against current overloads: the installation must include an overload protection and a two-phase circuit-breaker, placed as near as possible to the instrument, 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.

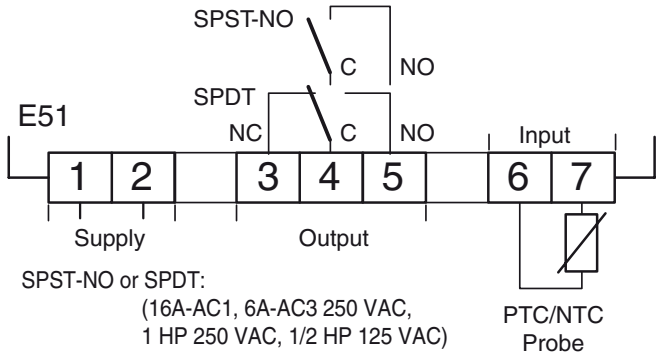
It is strongly recommended that cables with proper insulation, according to the working voltages and temperatures, be used.

Furthermore, the input cable of the probe has to be kept separate from line voltage wiring. When a probe shielded cable is used, the protection shield should be connected to ground at only one side.

Whether the instrument is 12 V version it is recommended to use an external transformer TCTR, or with equivalent features, 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.

4.4.1 Electrical wiring diagram



5. FUNCTIONS

5.1 Measuring and Display Configuration

Through parameter r u, it is possible to select the temperature engineering unit (°C or °F) and, through parameter dP, is possible to set the desired measure resolution(oF = 1°; on = 0.1°).

The instrument allows the measure calibration, which can be used to re-calibrate the instrument according to application needs, through the parameters CA.

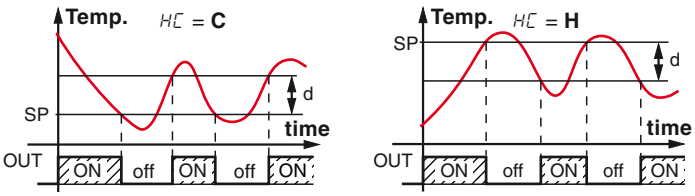
Using FL parameter can be set a software filter for measuring the input values in order to reduce the sensitivity to measurement disturbances (increasing the sampling time).

Please remember that what shown on the display can be changed also by the dL parameter - Display lock function during defrost (see the *Defrost* function).

5.2 Temperature control

The instrument control is **ON/OFF** and acts on the **OUT** output depending on the Probe measuring, the **SP** Set Point, the intervention differential (Histeresys) **d** and the **HC** control mode.

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



In the event of a probe error, it is possible to set the instrument so that the **OUT** output continues working in cycles according to the times programmed at parameters t 1 (activation time) and t2 (deactivation time).

If a probe error occurs, the instrument activates the **OUT** output for the time t 1, then deactivates it for the time t2 and so on whilst the error remains.

Programming t 1 = **oF** the OUT output in probe error condition remains switched OFF.

Programming instead t 1 = **any value** and t2 = **oF** the **OUT** output in probe error condition remains switched ON.

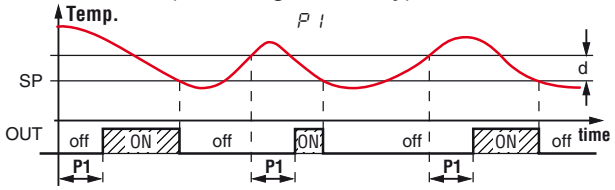
Remember that the temperature control function can be conditioned by the *Compressor Protections*, *Delay at power ON* and *Defrost functions*.

5.3 Compressor protection function and power-on delay

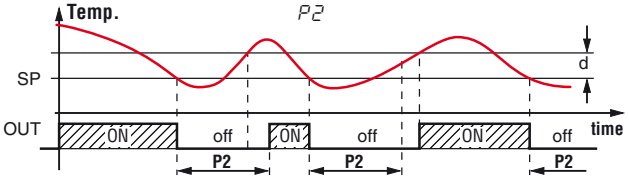
The "**Compressor Protection**" function aims to avoid continuous and close start-ups of the compressor controlled by the instrument in cooling applications.

This function foresees 3 time controls to the switching ON of the output associated to the temperature control request. The protection consists of preventing the output being switched ON during the times set at parameters P 1, P2 and P3 and therefore that any activation occurs only after all times have elapsed.

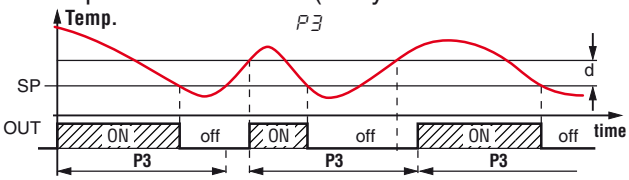
1 First control (parameter P1) foresees a delay to output activation (switching-ON delay).



2 Second control (parameter P2) foresees an inhibition to the activation of the output by a time delay that starts when the output is turning OFF (delay after switching-OFF).



3 Third control (parameter P3) foresees an inhibition to output activation by a time delay that starts last time the output was turned ON (delay between two switching-ON).



During the output inhibition the LED **OUT** blinks.
It is also possible to prevent the output activation at instrument power ON for the time set at parameter od.
During the power ON delay phase, the display shows the label od, alternated to the normal visualization.
All these functions are disabled if the relative parameters are set to **OFF** (oF).

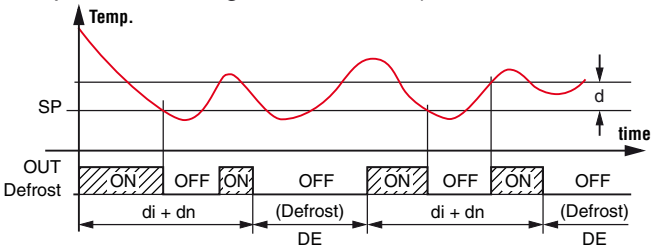
5.4 Defrost control

The automatic defrost control is made by the *stopping compressor* method and occurs according to the following parameters:

dC Defrost interval computation
- rt - based on real time (instrument ON);
- ct - based only on compressor running time (output ON).

d1 Interval between defrost cycles (h);
dn Interval between defrost cycles (min);
dE Lenght of defrost cycles.

The instrument switches OFF the output for the time dE each [d1 + dn] time (of real time functioning if dC = **rt** or of compressor running time if dC = ct).



Example with dC = **rt**
During the defrost phase, the display shows the label dF, alternated with the normal visualisation.
Automatic defrost cycles are disabled setting d1 and dn = **0**.
Manual and Automatic defrost cycles are disabled by dE = **0**.
During the defrost the temperature alarms are disabled during the entire cycle and also later for the time set at parameter dA (see *Temperature alarm functions*).

5.4.1 Manual defrost

To start a manual defrost cycle, press the key ▲/❄ when the it is not in programming mode and keep it pressed for about 5 s after which, if the conditions are correct, the display shows the label dF and the instrument performs out a defrost cycle.
To stop a defrost cycle, press the key ▲/❄ during the defrost and keep it pressed for about 5 s.

5.4.2 Display lock during Defrosting

Through parameters dL, Et and dA it is possible to define the display behaviour during defrost (in all the cases it also shows the label dF):

dL = **on**
The dL parameter locks the display at the last temperature reading during all the defrost cycle until, at the end of defrost, the temperature has returned below the value of the last measurement or value [SP + d] or has elapsed the time set at parameter dA.

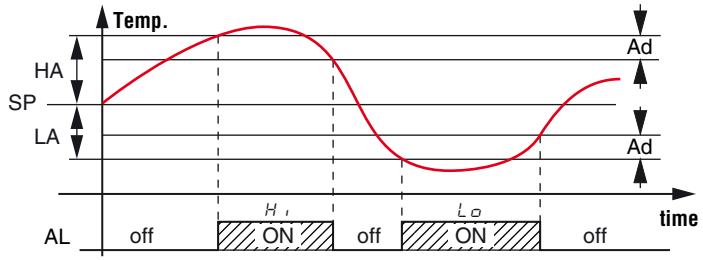
dL = **Lb**
During the defrost cycle the display shows the label dF and Pd after defrost until, at the end of defrost, the temperature has reached the value [SP + d] or has elapsed the time set at parameter dA.

dL = **oF**
During the defrost cycle the display continues showing the temperature measured by the probe alternated to the label dF.

5.5 Temperature Alarms

The relative type temperature alarms work according to the probe measurement, the alarm thresholds set at parameters HA (relative maximum alarm) and LA (relative minimum alarm) and the relative differential Ad (alarm histeresys). Using some parameters it is also possible to delay the enabling and the intervention of these alarms. These parameters are:

PA Temperature alarm exclusion time at instrument power ON if the instrument is in alarm status when it is switched ON. If the instrument is not in alarm status at power ON the time PA it is not considered.
dA Temperature alarm exclusion time at the end of defrost.
At Temperature alarms delay activation time. Temperature alarms are enabled at the end of the exclusion times and are activated after the At time when the temperature measured by the probe exceeds the value [SP + HA] or goes below the value [SP - HA].



In alarm condition the instrument shows on the display:
H1 alternated to the measured temperature(max. alarm);
Lo alternated to the measured temperature (min. alarm).
The maximum and minimum temperature alarms can be disabled by setting the related parameters HA and LA = **oF**.

5.6 ON/Standby Function

Once powered ON the instrument can assume 2 different conditions:

- **ON**: The controller uses the control functions.
- **STANDBY**: The controller uses no use control functions and the display is turned OFF except for the **SET** LED.

If a power failure occurs, when the power returns, the system sets itself in the condition it was in before the black-out.

The ON/Stand-by function can be selected using the ⏬ key if the parameter Fb = **1**.

Pressing the key ⏬ for at least 1 s, it is possible to switch the instrument from ON to Stand-by status and vice versa.

5.7 Keyboard lock function

The instrument allows to completely lock the keyboard. This function is useful when the controller is installed in an accessible area and changes must be avoided.

To activate the keyboard lock, simply set the parameter Lo to a value different than **oF**. The value set for Lo parameter is the keys inactivity time elapsed which the keyboard will be locked.

Therefore, pressing no buttons for the time set at Lo, the normal functions of the keys are automatically disabled.

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

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

6. PROGRAMMABLE PARAMETERS TABLE

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

Parameter		Description	Range	Default
1	LS	Minimum Set Point	-58 ÷ HS °C/°F	-50
2	HS	Maximum Set Point	LS ÷ 302 °C/°F	100
3	SP	Set Point	LS ÷ HS	0.0
4	CA	Probe Calibration	-30 ÷ 30.0 °C/°F	0.0
5	cu	Unit of measurement	°C Celsius degrees °F Fahrenheit	°C
6	dP	Decimal point	on - oF	on
7	Ft	Measurement filter	oF ÷ 20.0 s	2.0
8	d	Differential (Hysteresis)	0.1 ÷ 30.0 °C/°F	2.0
9	t1	Activation time output Out for probe broken	oF ÷ 999 min	oF
10	t2	Deactivation time output Out for probe broken	oF ÷ 999 min	oF
11	HC	Function mode output Out	H Heat C Cool	C
12	di	Defrosting interval (h)	0 ÷ 24 h	6
13	dn	Defrosting interval (min)	0÷ 59 min	0
14	dE	Lenght of defrost cycle	oF ÷ 999 min	30
15	dC	Defrosting intervals Counting mode	rt Real time; ct On Out time	rt
16	dL	Defrost display Lock	oF Display free on Lock on temperature before defrost Lb Lock on label dF (in defrost) and Pd (post-defrost)	oF
17	P1	Out delay at switch on	oF ÷ 999 min	oF
18	P2	Out delay after switch off	oF ÷ 999 min	oF
19	P3	Out delay between switching-on	oF ÷ 999 min	oF
20	od	Delay at power on	oF ÷ 999 min	oF
21	HA	Relative High temperature Alarm threshold	oF ÷ 99.9 °C/°F	oF
22	LA	Relative Low temperature Alarm threshold	oF ÷ 99.9 °C/°F	oF
23	Ad	Temperature Alarms Differential	0.1 ÷ 30.0 °C/°F	1.0
24	At	Temperature Alarms delay	oF ÷ 999 min	oF
25	PA	Temperature Alarms delay at power on	oF ÷ 999 min	120
26	dA	Temperature Alarms delay and unlock display delay after defrost	oF ÷ 999 min	60
27	Fb	Function mode key ⏬	oF No Function 1 ON/STAND-BY	oF
28	Lo	Keyboard lock function delay	oF ÷ 25 min	oF
29	PP	Access Password to parameter functions	oF ÷ 999	oF

7. PROBLEMS AND MAINTENANCE

7.1 Notifications

7.1.1 Error messages

Error	Reason	Action
E1 -E1	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
EE	Internal memory error	Check and if necessary re-program the parameters function

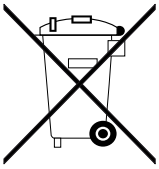
7.1.2 Other messages

Message	Reason
od	Delay at power-on in progress
dF	Defrost in progress with dLo = Lb
Pd	Post-defrosting in progress with dLo = Lb
Ln	Keyboard locked
H1	Maximum temperature alarm in progress
Lo	Minimum temperature alarm in progress

7.2 Cleaning

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

7.3 Disposal



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

8. 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.

9. TECHNICAL DATA

9.1 Electrical characteristics

Power supply: 12 VAC/VDC, 115 VAC, 230 VAC ±10%;
AC frequency: 50/60 Hz;
Power consumption: about 3 VA;
Input: **1 inputs** for **temperature probes**:
PTC (KTY 81-121, 990Ω @ 25°C) or
NTC (103AT-2, 10 kΩ @ 25°C);
Output: 1 relay output:

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

Relay output Electrical life:

- SPDT: 50000 operations;
- SPST-NO: 100000 operations;

Action type: Type 1.B (EN 60730-1);
Overvoltage category: II;
Protection class: Class II;
Isolation: Reinforced insulation between the low voltage part (supply 115/230 V and relay output) and front panel; Reinforced insulation between the low voltage section (supply 115/230 V and relay output) and the extra low voltage section (inputs); Reinforced between supply and relay output; No insulation between supply 12 V and inputs.

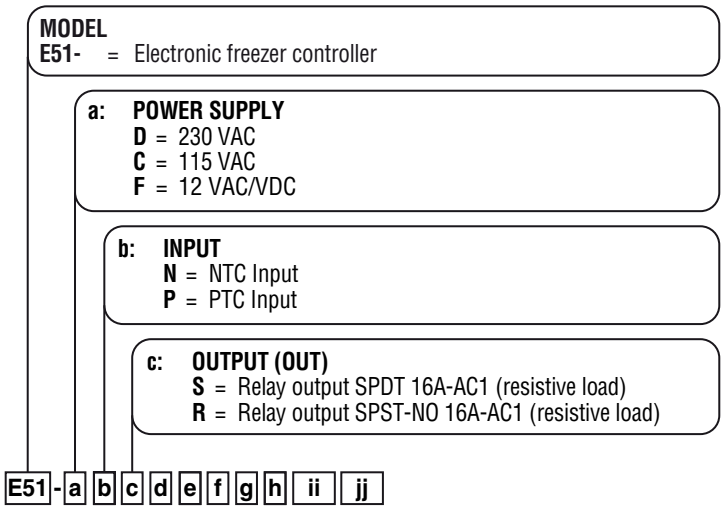
9.2 Mechanical characteristics

Housing: Self-extinguishing plastic, UL 94 V0;
Dimensions: 33 x 65 mm, depth 50 mm;
Weight: About 105 g;
Mounting: Incorporated flush in panel (gasket + panel max. 5 mm) in a 25 x 58 mm hole;
Connections: screw terminal block for 2.5 mm^2/ AWG 24 ÷ 14 cables;
Front panel protection: IP 65 (NEMA 3S) mounted in panel with gasket;
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: ON/OFF mode;
Defrost control: Interval cycles by stopping compressor;
Measurement range: **PTC** -50 ÷ 150°C/-58 ÷ 302°F or
NTC (-50 ÷ +109°C/-58 ÷ +228°F;
Display resolution: 1° or 0.1° (range -19.9 ÷ +99.9°);
Overall accuracy: ±(0.5% fs + 1 digit);
Sampling rate: 130 ms;
Display: 3 Digit Red, height 14 mm;
Software class and structure: Class A;
Compliance: ECC directive 2004/108/CE (EN55022: class B; EN61000-4-2: 8 kV air, 4 V cont.; EN61000-4-3: 10V/m; EN61000-4-4: 2 kV supply, inputs, outputs; EN61000-4-5: supply 2 kV com. mode, 1 kV\ diff. mode; EN61000-4-6: 3V), 2006/95/CE (EN 60730-1, EN 60730-2-7, EN 60730-2-9).

10. HOW TO ORDER



E51- **a** **b** **c** **d** **e** **f** **g** **h** **ii** **jj**

d, e, f, g, h: INTERNAL CODES; **ii, jj**: SPECIAL CODES