VOPOS

Datalogger and Controller
For Professional Refrigeration

Manual
(User-Service-Installation)

VER 2.0 (04-12)
Allineata con versione FW 4.2.0.20

SMARTFREEZE®

INDEX

USER MANUAL

INTRODUCTION

This manual contains the information necessary for the correct installation of the product and also the instructions for its maintenance and use.

We therefore recommend to pay the maximum attention to the following instructions and to keep them on hand.

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

PRODUCT GENERAL DESCRIPTION

The Vopos is an electronic microprocessor controller for the control of the refrigeration temperature and humidity suitable for professional refrigeration applications. It is also equipped with a data logger, useful for HACCP data recording

The control of the refrigeration temperature is activated by ON/OFF control.

The Vopos can be configured to manage the defrost by stopping the compressor, electric heater (resistance) or hot gas/reverse cycle, according to three modes: programmed, i.e., at time intervals or at specific times (real time clock); automatic, i.e., through an "intelligent" defrost function (Smartdefrost) that activates the defrost when there is the frost on the evaporator or in case of low evaporation temperatures (emergency defrost); manual, i.e., through the keyboard, at the request of user.

The Controller is equipped with energy saving functions such as NIGHT / DAY (operating set-points for different time slots), evaporator and condenser fans thermoregulation.

The Controller has a sophisticated diagnostic system, achieved through continuous monitoring of current absorptions on the relays which are connected to the refrigerator components. In case of abnormal absorption, the controller alerts the possible component failure, preventing emergency situations.

The Controller has 4 relays, 3 inputs for NTC temperature probes (one configurable as digital input), 1 humidity sensor input, alternately used as a digital signal and an internal buzzer for the beeps and alarms.

Each of the relays is configurable, through special parameters, to handle any of the 14 actions performed by the controller (cooling, defrost, ventilation, etc..).

Other distinctive features of Vopos Controller are the touch keyboard, the display with scrolling messages, the mini-USB port and the connection with the Smartfreeze Unit, the device for remote monitoring and control.

1 - SAFETY

Do not power on the controller during installation or mechanical/electrical intervention, since there are some connectors under high voltage inside.

In the controller case there aren't components that can be managed by the user.

VOPOS Controller doesn't have any protection of connected loads. Therefore all the loads should be protected for short circuits, for high/low currents and for right temperatures by appropriate devices as fuses, magneto-thermal switches, etc…

VOPOS Controller is free from electromagnetic emission according to EEC Directives. To reduce the causes of disorders such radiated or conducted, which can propagate through the probes, loads and controller power supply, you must do the wiring of the cables preventing their passage close to the absorption of high loads or sources of electromagnetic disturbances. WARNING: Follow this rules in order to avoid malfunctioning of USB device and/or touch pad due to EMI (Electro Magnetic Interferences).

It is necessary to put temperature probes in contact with food, verify that these comply with food and health requirements.

If the controller will be installed in devices whose malfunctioning may generate hazard for people, animals or things, it must be adopted extra safety systems that operate independently of the controllers.

Violation of safety rules during the installation and failure to comply with the instructions contained in this manual may affect the overall safety level of product.

2 - TECHNICAL SPECIFICATIONS

Mechanics: ABS case, size 32x74mm

Supply: Switching 110-230V 50/60Hz with an input for back up (5V cc)

Probes inputs

	Range	Resolution
S1: ntc thermoregulation	(-50.0,+50.0°C)	0,1°C
S2: ntc evaporator	(-50.0,+50.0°C)	0,1°C
S3: ntc condenser/alarm	(-20.0,+80.0°C)	0,1°C
S4: digital/4-20mA	(10-99 Rh%)	1%
Internal current probe	(0-20A)	0,1A

Relays outputs: 4 relays 20A-8A-5A-5A (one is a switch N.C./N.A.). **WARNING Maximum total allowed simultaneous current absorbed on the whole outputs is 20 A.**

User interface:

Touch pad with 4 keys and a menu configuration;

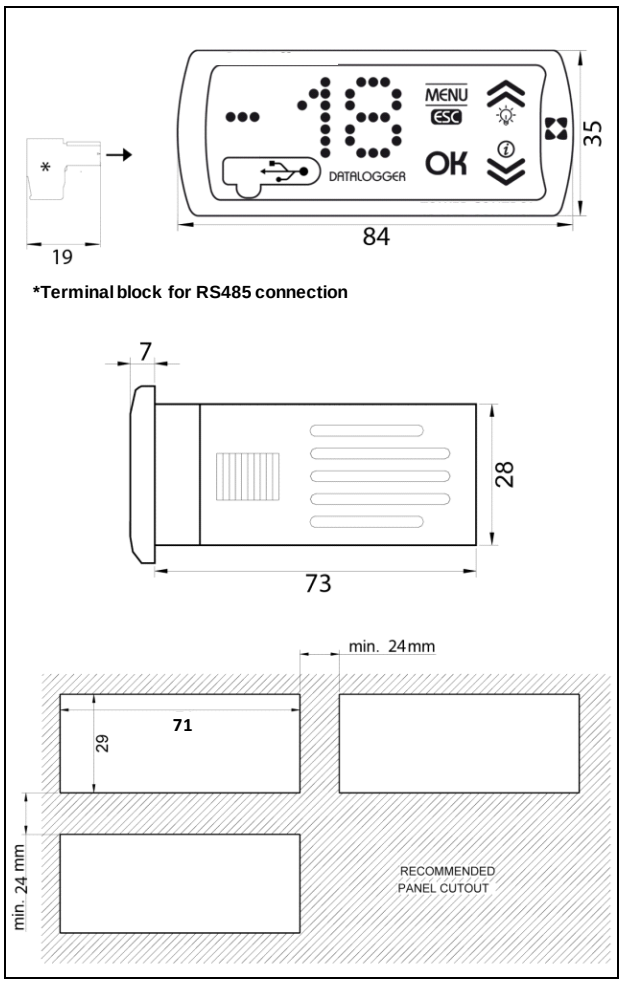
Led display with 3 alphanumeric digits 7x5 segments (for a total of 7x15 dots) and with sliding words

Communication

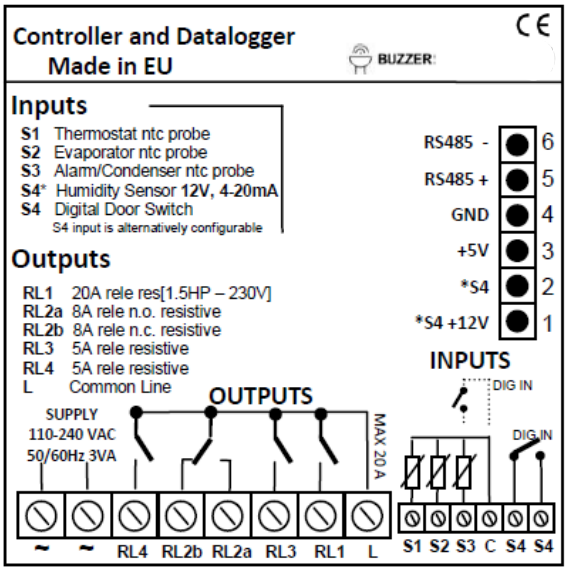
RS485 to connect to Smartfreeze Unit (SFU) for remote Monitoring and Control (option);

Mini USB to upgrade firmware, to setting parameters (in/out), to download temperature recording data, to upload refrigerator bill (materials) and to record start up data.

Mechanical dimensions [mm], Panel cut-out and mounting



3 - CONNECTIONS



WARNING!

THE CONTROLLER IS SET BY SMARTFREEZE WITH THE FOLLOWING PASSWORDS:

- **User Password (Parameter PSU) = 0 (means NO password needed to access the functions);**
- **Service Password (Parameter PSU) = 5 (password will be required by the controller to access the service menu).**

4 - KEYBOARD DESCRIPTION

The keyboard is a touch pad with 4 keys.

5 - KEYS DESCRIPTION

- **MENU/ESC**  by this key, from the operation mode, the controller accesses Menu; from other levels or when the controller displays a message or an information string, it has the function of **ESC.**

- **OK KEY**  it confirms the required action. During the controller operation mode, without pressing **MENU** key, it allows to display the current date and time.

- **UP/LIGHT KEY**  in normal operation mode, it enables the **UP** function, after the selection of **MENU** for scrolling menu and submenu items. It increases the **SET POINT** and/or parameters values. If it has been scheduled **OSP** super parameter *(for super parameters details, see paragraph 13)*, the key, pressed for 2 seconds, enables the function **LIGHT** and allows to turn on (**LIGHT ON** message) and off the light (**LIGHT OFF** message).

- **DOWN/INFO KEY**  in normal operation mode, it enables the **DOWN** function, after the selection of **MENU** for scrolling by menu and submenus items. It decreases the **SET POINT** and/or parameters values. It enables **INFO** function, when it is pressed for 2 seconds, and enables the information string with the % of operating compressor in the last hour, of the evaporator and condenser temperatures (if enabled), of the instantaneous consumption and, ultimately, of the last temperature alarm data, if it happened (alarm type, maximum temperature for high temperature alarm and minimum temperature for low temperature alarm, with date/ time of start event**).**

EX. WITH RECORDED ALARM

- ***K45%; TE -24°C TC 56°C; WATT 230; HIGH TEMPERATURE; MINUTES 12; MAX +23°C; 12/08/09 23:56***

EX. WITH NOT RECORDED ALARM (if % non calculated = --%)

- ***K45%; Te-24°C; Tc+56°C; WATT 230***

5.1 - CONTROLLER TURNING ON

To turn on the controller, in stand-by mode (the display shows the following symbol **---**), press any key, unless **OK,** for longer than 2 seconds.
The controller displays the message **TO TURN ON OK; TO ESCAPE ESC.**
Choosing **OK**, the controller displays the message **DONE**, **WELCOME** and starts to adjust, displaying the cold room temperature.
Choosing **ESC**, the controller leaves the turning on and returns to stand-by mode.
If **PSU** parameter is **>0** (for parameters details, see paragraph 14), before the turning on, the controller displays the message **PASSWORD** and stops on the three digits ***000***. The **Password** is setting by **UP/DOWN** keys and confirmed by **OK** key.
If the password is correct, the controller turns on.
If the password is not correct, the controller displays the message **WRONG PASSWORD** and returns to stand-by mode.

5.2 - NORMAL DISPLAYING MODE

In normal displaying mode, the controller displays the cold room temperature (Probe S1) or the probe alarm temperature, depending on the configuration chosen by the manufacturer.
The temperature scale will be shown in tenths of degree Celsius with a minus sign (only for negative values) for a range between -29.9° C and +69.9°C. Below the lower limit, the temperature appears with °C sign and scale.
If the compressor is activated, temperature displaying is alternating by the message **COOLING** or, in defrost case, by the message **DEFROST**.

5.3 - DISPLAYING MODE IN CASE OF EVENT

If fault, warning or alarm occur, the controller displays the event alternated by the cold room temperature until the event is corrected, with an option to append more events.

- **MESSAGES OF FAILURE (variables are shown in bold italics).**
  The occurrence of one of the following messages requires a technician intervention:
  - **PROBE FAIL S*x***
  - **LOAD ERROR –RL*x*-**
  - **DEFROST TIME OUT**
  - **HIGH CONDENSATION *65°C***
  - **LOW EVAPORATION *-29°C***
  - **LOW GAS**
  - **PCB TEMPERATURE (CIRCUIT TEMPERATURE) *76°C***
  - **TEST TIME-OUT**

- **WARNING MESSAGES**
  The occurrence of one of the following messages requires attention by the user.
  - **DIRTY CONDESER**
  - **COMPRESSOR USAGE**
  - **NO PEN DRIVE**
  - **PEN-DRIVE LOCKED**
  - **FILE ERROR**
  - **NO FILE**
  - **FULL MEMORY**
  - **REMOVE PEN AND PRESS OK**

- **ALARM MESSAGES (see paragraph 6)**
  - **HIGH TEMPERATURE**
  - **LOW TEMPERATURE**

6 - HACCP FUNCTIONS

With reference to the HACCP standards (Reg CE 852/2004), that require the continuous monitoring of product conservation temperatures, a procedure has been developed to record temperature alarms, divided into two types:

- *high temperature inside the cold room,*
- *low temperature inside the cold room.*

Monitoring probe can be S3 set as alarm probe or the same probe set as regulation probe S1. The controller shows only the last two events on the display. For each alarm event, the following data are recorded:

- *duration of event,*
- *peak temperature,*
- *start date/time of event.*

6.1 - TEMPERATURE PRE-ALARM

If there is an **High Temperature** pre-alarm (*temperature>SPU+ALH. For parameters details, see paragraph 14),* the controller displays the cold room temperature alternated by the message **HIGH TEMPERATURE**, only if it has been scheduled **VSP** super parameter *(for super parameters details, see paragraph 13).*
If there is a **Low Temperature** pre-alarm *(temperature<SPU+ALL. For parameters details, see paragraph 14),* the controller displays the message **LOW TEMPERATURE**, without the event is recorded.

6.2 - TEMPERATURE ALARM

If there is an **High Temperature** alarm *(temperature>SPU+ALH for longer than ALD min. For parameters details, see paragraph 14),* the controller displays the message **HIGH TEMPERATURE**, with the buzzer that will sound until the temperature returns within the set limits.

If there is a **Low Temperature** alarm (*temperature<SPU+ALL for a time longer than ALD min. For parameters details, see paragraph 14),* the controller

displays the message **LOW TEMPERATURE**, with the buzzer that will sound until the temperature returns within the set limits.

6.3 - ALARM END

If it has been scheduled **VSP** super parameter *(for super parameters details, see paragraph 13),* when alarm ends, the controller displays the message **PUSH INFO KEY** alternated by the cold room temperature until **INFO** is read.
This message informs the user that some alarms have been occurred, if he did not read the message or he did not hear the buzzer.

6.4 - BUZZER TURNING OFF

The buzzer will be stopped by pressing any key.
For temperature alarms, the buzzer turning off inhibits even the message **PUSH INFO KEY**. The buzzer can be enabled and disabled by the schedule of **VSP** super parameter (*for super parameters details, see paragraph 13).*

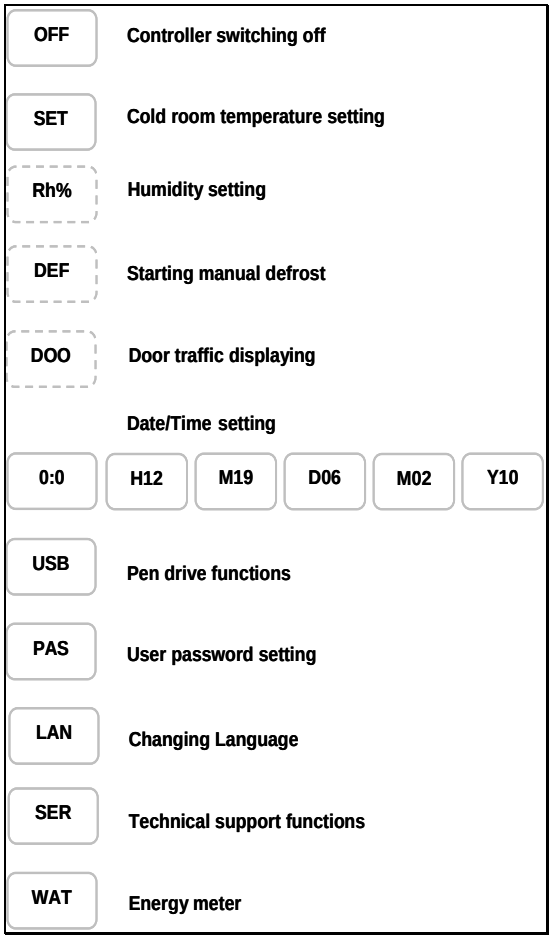
6.4.1 Buzzer reiteration and persistence

Parameter **BUR** *(for parameters details, see paragraph 14)* represents the time, in minutes, of buzzer reiteration. The reiteration implies the buzzer reactivation, after the buzzer has been stopped by the key board, with the alarm still persisting.
With the parameter **BUR=0**, the buzzer reiteration is disabled.
Parameter **BUF** (*for parameters details, see paragraph 14)* sets the time the buzzer will sound, without the turning off. After **BUR** time, the buzzer starts again and gets repeated after **BUR** minutes.
If **BUF=0** buzzer stays on until the alarm end.

7 - USER MENU DESCRIPTION

User Menu is accessible by pressing the **MENU** key; for scrolling each item use **UP** and **DOWN** keys.
Below is a list of features visible using the **DOWN** key.

Warning!
The items listed by the dotted frame are viewable only if their function is previously enabled.



7.1 - CONTROLLER TURNING OFF

OFF - In the operation mode, pressing **MENU** key, the controller displays the message **OFF**.
Pressing **OK**, it displays the message **TO TURN OFF OK; TO ESCAPE ESC.**
Choosing **OK**, the controller displays the message **DONE, BYE.** Then it turns off and returns to stand-by mode, displaying the symbol **---**.
Choosing **ESC**, the controller leaves the turning off and returns to operation mode.
If **PSU** parameter is >0 (*for parameters details, see paragraph 14),* before the turning off, the controller displays the message **PASSWORD** and stops on the three digits ***000***. The PASSWORD is setting by **UP/DOWN** keys and confirmed by **OK** key.
If the password is correct, the controller turns off.
If the password is not correct, the controller displays the message **WRONG PASSWORD** and returns to the Menu item **OFF**.

7.2 - COLD ROOM TEMPERATURE SETTING

SET - From the Menu item **SET**, pressing **OK** key, the controller displays the message **SET TEMPERATURE** and stops on the operating temperature set point that can be changed by **UP/DOWN** keys.
Pressing **OK** key, the controller displays the message **TO CONFIRM OK; TO ESCAPE ESC.**
Choosing **OK**, the controller displays the message **DONE**. The value of the new set is confirmed by flashing the digits

and a short beep of the buzzer. Since then, the controller adjusts the temperature with reference to the new set point.
Choosing **ESC**, the controller leaves the temperature setting and adjusts the temperature with reference to the old set point.
If **PSU** parameter is **>0** *(for parameters details, see paragraph 14),* before the temperature setting, the controller displays the message **PASSWORD** and stops on the three digit ***000***. The password is setting by **UP/DOWN** keys and confirmed by **OK** key.
If the password is correct, the controller allows the cold room temperature setting.
If the password is not correct, the controller displays the message **WRONG PASSWORD** and returns to the Menu item **SET**.

7.3 - HUMIDITY SETTING

RH% - If it hasn't been scheduled **DOP** super parameter *(for super parameters details, see paragraph 13),* the humidity control is not enabled and, in the Menu, there isn't the item **RH%.**
From the Menu item **RH%,** pressing **OK** key, the controller displays the message **SET HUMIDITY** and stops on operating humidity set point that can be changed by **UP/DOWN** keys.
Pressing **OK** key, the controller displays the message **TO CONFIRM OK; TO ESCAPE ESC.**
Choosing **OK**, the controller displays the message **DONE**. The value of the new set is confirmed by flashing the digits and a short beep of the buzzer. Since then, the controller adjusts the humidity with reference to the new set point.
Choosing **ESC**, the controller leaves the setting of the humidity and adjusts the temperature with reference to the old set point.

7.4 - STARTING MANUAL DEFROST

DEF - If it hasn't been scheduled **VSP** super parameter *(for super parameters details, see paragraph 13),* the manual defrost is not enabled and, in the Menu, there isn't the item **DEF**.
From the Menu item **DEF**, pressing **OK** key, the controller displays the message **TO DEFROST OK; TO ESCAPE ESC.**
Choosing **OK**, the controller displays the message **DONE** and, if there are the right conditions, it starts defrost and displays the message **DEFROST**.
If there aren't the right conditions for defrost, the controller displays the message **ACCESS DENIED** and the temperature. If defrost is pending, the controller displays the message **WAITING DEFROST** alternated by the temperature until the defrost starting.
Choosing **ESC**, the controller leaves the defrost and displays the cold room temperature.

7.5 - DOOR TRAFFIC DISPLAYING

DOO - If it hasn't been scheduled **DOO** super parameter *(for super parameters details, see paragraph 13)*, the monitoring of door openings is not enabled and, in the Menu, there isn't the item **DOO**.
From the Menu item **DOO**, pressing **OK** key, the controller displays the door traffic list of the 2 last days:

ES.

- ***OPENING FOR MINUTES TODAY 034 021 CRITICAL 001; OPENINGS 11/08/09 012 FOR MINUTES 000.***

If there aren't door traffic events, the controller displays the message **NO EVENTS**.

7.6 - DATE/TIMESETTING

0:0 - From the Menu item **0:0**, pressing **OK** key, the controller displays time digits that can be changed by **UP/DOWN** keys.
Pressing **OK** key, the controller displays progressively minute digits, day, month and year. The confirmation of the selected data is set by pressing **OK** key.
Pressing **ESC** key, the controller leaves the data/time setting in every phase*: hour H, minutes M, day D, month M, year Y.*
Warning!
Confirming the value of the year Y, date-time setting causes the automatic memory cancellation and the controller displays the message MEMORY RESET.
If PSU parameter is >0 (for parameters details, see paragraph 14), before the Data/Time setting, the controller displays the message PASSWORD and stops on the three digits 000. The PASSWORD is setting by UP/DOWN keys and confirmed by OK key.
If the password is correct, the controller allows the Date/Time setting.
If the password is not correct, the controller displays the message WRONG PASSWORD and returns to the Menu item 0:0.

7.7 - USB FUNCTIONS

USB - Warning!
Before entering this Menu item, put the pen drive, with its adapter, in controller USB port.
From the Menu item **USB**, pressing **OK** key, the controller displays the submenu item **SAVE PARAMETERS**. By **UP/DOWN** keys, it is possible to scroll other submenu items: **LOAD PARAMETERS, UPGRADE FIRMWARE, DOWNLOAD DATA, MATERIALS, STARTUP**.
If the pen drive isn't on, the controller displays the message **NO PEN DRIVE.**
If the pen drive is on, but it is write protected, the controller displays the message **PEN DRIVE LOCKED.**

Warning!
If there are EMI (Electro Magnetic Interferences) due to the refrigerator components, USB may malfunction. So, it is necessary to turn off the controller and to put in stand-by mode (---) as described in paragraph 7.1.
From stand-by mode (---), USB menu item is accessible pressing OK key for more than 3 seconds.

7.7.1 Save parameters
From the Menu item **USB/SAVE PARAMETERS**, pressing **OK** key, the controller saves parameters in the pen drive, creating the file "param00.par".
If in the pen drive there is another file with the same name, the controller creates a file "param01.par" and so on.

7.7.2 Load parameters
From the Menu item **USB/LOAD PARAMETERS**, pressing **OK** key, the controller updates the parameters, read from

the file "param.par" that is in the pen drive root.
Warning!
If this file is not present in pen drive root or if it has another name, the controller displays the message NO FILE and it doesn't load the parameters.
The controller is associated with a parameters and super parameters setting utility, available in the DOWNLOAD section of Smartfreeze SERVICE area: http://service.smartfreeze.com.

7.7.3 Upgrade firmware
From the Menu item **USB/UPGRADE FIRMWARE**, pressing **OK** key, the controller starts the upgrade procedure, if there is the file "Vopos.bin" in the pen drive root.
Smartfreeze periodically releases firmware updates that can be downloaded from its website.
Warning!
For firmware upgrade, use only the files released by Smartfreeze.
Smartfreeze is not responsible for any malfunction of the controller caused by files derived from other sources.

7.7.4 Download data
From the Menu item **USB/DOWNLOAD DATA**, pressing **OK** key, the controller displays submenu item **LATEST 24 HOURS.**
By **UP/DOWN** keys, it is possible to scroll the other submenu items: **LATEST 168 HOURS** and **ALL MEMORY**.

7.7.4.1 Latest 24 hours

From the Menu item **USB/DOWNLOAD DATA/LATEST 24 HOURS,** pressing **OK** key, the controller starts the transfer of temperature recorded data of the latest 24 hours of refrigerator working on the pen drive, creating the file "thermo00.csv"
If in the pen drive there is another file with the same name, the controller creates a file "thermo01.csv" and so on.

7.7.4.2 Latest 168 hours

From the Menu item **USB/DOWNLOAD DATA/LATEST 168 HOURS,** pressing **OK** key, the controller starts the transfer of temperature recorded data of the latest 168 hours of refrigerator working on the pen drive, creating the file "thermo00.csv"
If in the pen drive there is another file with the same name, the controller creates a file "thermo01.csv" and so on.

7.7.4.3 All Memory

From the Menu item **USB/DOWNLOAD DATA/ALL MEMORY,** pressing **OK** key, the controller starts the transfer of temperature recorded data of the whole memory on the pen drive, creating the file "thermo00.csv"
If in the pen drive there is another file with the same name, the controller creates a file "thermo01.csv" and so on.

The controller is associated with an utility for the displaying of temperature data recorded, Smartviewer, available in the DOWNLOAD section of Smartfreeze SERVICE AREA of Smartfreeze web site: http://service.smartfreeze.com.

7.7.5 Memory Dump
From the Menu item **USB/MEMORY DUMP,** pressing **OK** key, the controller copies all its memory on a special file useful for service reasons.

7.7.6 Materials
From the Menu item **USB/MATERIALS**, with a setting file which the refrigerator manufacturer would have, it is possible to add the list of refrigerator materials (refrigerator bil), with their PART NUMBER and descriptions.

7.7.7 Start up
This menu item is disabled to the user and is restricted to Smartfreeze for the controller startup procedure.

7.7 - USER PASSWORD SETTING

PAS - From the Menu item **PAS**, pressing **OK** key, the controller displays the message **SETUP PASSWORD** and stops on the three digits ***000*** that can be changed by **UP/DOWN** keys.
Pressing **OK** key, the controller displays the message **TO CONFIRM OK; TO ESCAPE ESC.**
Choosing **OK**, the controller displays the message **DONE**. The value of the new PASSWORD is confirmed by flashing the digits and a short beep of the buzzer. Since then, the controller allows the access to protected functions just by setting the new password.
Choosing **ESC**, the controller leaves the password setting and displays the cold room temperature.
If **PSU** parameter is **>0** (for parameters details, see paragraph 14), before the password setting, the controller displays the message **PASSWORD** and stops on the three digits ***000***. The PASSWORD is setting by **UP/DOWN** keys and confirmed by **OK** key.
If the password is correct, the controller allows the password setting.
If the password is not correct, the controller displays the message **WRONG PASSWORD** and returns to the Menu item **PAS**.

7.8 - CHANGING LANGUAGE

LAN - From the Menu item **LAN**, pressing **OK**, the controller displays the language item **ITALIAN**. By **UP/DOWN** keys it is possible to scroll other languages items: **FRENCH, GERMAN, SPANISH, AND ENGLIS**H.
Pressing **OK** key, the controller displays the message **TO CONFIRM OK; TO ESCAPE ESC.**
Choosing **OK**, the controller displays the message **DONE** and the cold room temperature.
Choosing **ESC**, the controller leaves the changing language displays the cold room temperature.

7.9 - TECHNICAL SUPPORT FUNCTIONS

SER - Access to Menu item **SER** is under password and is reserved for technical support.

7.10 - ENERGY METER

WAT - From the Menu item **WAT**, pressing **OK** key, the controller displays submenu item **KWh CURRENT**.

By **UP/DOWN** keys, it is possible to scroll the other submenu items: **Wh HOURLY** and **KWh DAILY**.

7.10.1 KWh current
From the Menu item **WAT/KWh CURRENT**, pressing **OK** key, the controller displays the value of energy totalized from 00:01 on the current day.

7.10.1 Wh hourly

From the Menu item **WAT/Wh HOURLY**, pressing **OK** key, the controller displays the value of energy totalized in the previous hour.

7.10.1 KWh daily
From the Menu item **WAT/KWh DAILY**, pressing **OK** key, the controller displays the value of energy totalized in the previous day.

SERVICE MANUAL

8 - MENU SERVICE

INF	**Information – it shows the daily % and the previous 24h % of compressor usage; the calibration values and the PCB temperature**
DEF	**Defrost List – it shows the last 2 defrost events**
!	**Failure List – it shows the last 2 failure events**
PAR	**Parameters setting – it allows the parameters setting**
TST	**D-Test – it starts routine test**
DAT	**D-Test Data – it shows the data test**
CLR	**Erasing Events – It erase memory events**
I/O	**Input/Output – it shows probe temperature and relays RL1, RL2, RL3, RL4 condition**
FW	**Firmware Version – it shows firmware version**
SN	**Controller Serial Number – it shows the controller serial number**

8.1 - INFORMATION

INF - From submenu item **SER/INF**, pressing **OK** key, the controller displays information for the technical support.

EX

- ***1h=45% 24h=67% - % Compressor usage in the last hour and in the last 24 hours; % not calculated;***
- ***E MIN-23°C /MAX-34°C/CYCLES 06 - Calibration values: min and max evaporation and number cycles for calibration ;***
- ***DELTA 18°C RANGE 65°C/34°C - Average adjusted value of condenser thermal exchange and min-max adjusted values in detection criteria of dirty condenser;***
- ***BOARD 76°C - Vopos board temperature.***

8.2 - DEFROST LIST

DEF - From submenu item **SER/DEF**, pressing **OK** key, the controller displays the 2 last defrost events data, starting with the most recent.
If there aren't data, the controller displays the message **NO EVENTS** and returns to submenu **SER/INF.**

EX.
- ***Most recent event: MINUTES 012 23:45 03/08/09 M101;***
- ***Older event: MINUTES 008 10:49 03/08/09 M09***

For the details of defrost causes (MXX) see paragraph 9.9.

8.3 - FAILURE LIST

! - From submenu item **SER/!,** pressing **OK** key, the controller displays the 2 last failure events data, starting with the most recent.
If there aren't data, the controller displays the message **NO EVENTS** and returns to submenu **SER/INF**.

EX.
- ***Most recent event: PROBE S2 11-08-09 10:07;***
- ***Older event: DEFROST M 03-08-09 23:57***

8.4 - PARAMETERS SETTING

PAR - From submenu item **SER/PAR**, pressing **OK** key, the controller displays the first parameter. The parameters can be selected by **UP/DOWN** keys. For choosing the parameter to modify, press **OK** key.
Then the controller displays the current parameter value. By **UP/DOWN** keys, it is possible to select the new parameter value and confirm it pressing **OK** key. The new parameter value is confirmed by flashing the digits, a short beep of the buzzer and then the controller displays the next parameter. Since then, the controller adopts the new parameter value.
Choosing **ESC**, the controller leaves the parameters setting and displays the last parameter selected.
The exit from the submenu for parameters setting is **for 4 minutes time-out or by pressing MENU key for 5 seconds**.

8.5 - D-TEST

TST - From submenu item **SER/TST**, pressing **OK** key, the controller displays the message **TO START TEST OK; TO ESCAPE ESC.**
Choosing **OK**, the controller starts the routine test and displays the message **DONE**.
During the test the controller displays the cold room

temperature alternated by the message that indicates the current phase with its label *(for test steps details, see paragraph 10)*. In each test phase, by **UP/DOWN** keys, it is possible to get the following information: by **UP** key, the phase duration in hours and minutes; by **DOWN** key, S2 and S3 probes temperatures and consumption in Watts.
At the end of the test, the controller displays the message **TEST END** and adjusts with reference to the setting parameters. To delete the message **TEST END** it is necessary to turn off and on the controller or to interrupt the power supply.
Warning!
During the test, high and low temperature alarms are disabled. During the test, any fault, parameter or set point change stops the test.
The controller displays the message TEST DISCONTINUED. The restart is made by Menu, but the message can be deleted by manual restart or by turning off and on again the controller.
Stops (black-out) and starts of energy do not erase the message TEST DISCONTINUED. In the case of black-out during the test, it remains pending and begins again to restore supply.
It is possible to stop the test, by pressing UP key for 5 seconds and the controller displays the message TEST DISCONTINUED, which can be deleted according to the procedure described above.

8.6 - D-TEST DATA

DAT - From submenu item **SER/DAT**, pressing **OK** key, the controller displays the D-Test report.
If there aren't data, the controller displays the message **NO DATA** and returns to Menu **SER**.

EX.
- ***START TEST M12 S22 KW 3,1 - Duration and consumption;***
- ***DEFROST M5 S3 KW 0,7 - Defrost duration in Ph2 and consumption;***
- ***PULL-UP 230s/°C; PULL-DOWN 668s/°C - Test pending in phases 4 and 5 in seconds/degrees.***

8.7 - EVENTS ERASING

CLR - From submenu item **SER/CLR**, pressing **OK** key, the controller displays the message **TO ERASE OK; TO ESCAPE ESC.** Pressing again **OK** key, the controller displays the message **DONE** and returns to submenu **SER/INF**.

8.8 - INPUT/OUTPUT

I/O - From submenu item **SER/I/O**, pressing **OK** key, the controller displays information for technical support.

EX.
- ***S1=-19,7°C; S2=-34.3°C; S3=53, 5°C; S4=49 RH% - Temperatures read by installed probes; missing or faulty probes are ignored***
- ***RL1 ON, RL2 OFF, RL3 OFF, RL4 ON - State of relays RL 1 2 3 4.***
  - ✓ If S3 is configured as digital probe or it is not installed, the related information are not displayed;
  - ✓ If S4 is configured as digital probe or it is not installed, the related information are not displayed.

8.9 - FIRMWARE VERSION

FW - From submenu item **SER/FW**, pressing **OK** key, the controller displays the firmware version and returns to submenu **SER/INF.**

8.10 - CONTROLLER SERIAL NUMBER

SN - From submenu item SER/SN, pressing **OK** key, the controller displays its serial number and returns to submenu **SER/INF.**

9 - CONTROLLER ACTIONS

In order to join each relay to the desired functions, it's necessary to attribute to the parameters:

RL1, RL2, RL3 and RL4 up to four of the function described below.
Warning !
If none of the four relays is joined to at least one function, the display will show the message PROGRAMMING

9.1 - COOLING

Related parameters
SET- (-40.0, 40.0;0.1) °C set-point settable from user menu
HYH - (0.0, 10.0;0.1) °C - adjustment top hysteresis point
HYL - (0.0, 10.0;0.1) °C - adjustment lower hysteresis point
ASS - (0, 255;1) sec - compressor start delay
ADL - (0, 255;1) sec-cycling prevention (minimum time between two compressor starts)
DAC - (0, 10;1) sec - delay time for compressor turns off.

Cooling transfer
Cooling is transferred to any of the relays by setting value 01 on relay parameter **RLx** (*for parameters details, see paragraph 14).*

9.1.2 Logic
Cooling is done with higher and lower bandwidth with reference to the set point and the **HYH** and **HYL** differentials *(for parameters details, see paragraph 14).*
Compressor stops when the value measured by probe S1 reaches **[SET-HYL]°C** value, after time **DAC** (for parameters details, see paragraph 14).
Compressor restarts when the value measured by probe S1 reaches **[SET+HYH]°C** value.
The **ADL** anticycling parameter *(for parameters details, see paragraph 14)* prevents compressor short cycles during thermoregulation cycles.
ASS parameter represents the compressor delay at controller power on by the keyboard or after the restoration of power supply *(for parameters details, see paragraph 14).*

WARNING !
Setting HYH=0, the controller stops temperature alarms regulation and recording and the display will show the message PROGRAMMING.

9.2 - DEFROST

Related parameters
DOP (0, 255;1) - num defrost limits exceeded
FOP (0, 255;1) - num fan parameters exceeded
DTE (0, 20;1) °C - temperature at defrost end referred to S2
DTO (0, 60;1) - min defrost maximum time
DRP (0.255;1)sec - drip time
ITD (2,24;1) hours - interval between defrost
SD1 (0,24;1) min - time start 1st programmed defrost
SD2 (0,24;1) min - time start 2nd programmed defrost
SD3 (0,24;1) min - time start 3rd programmed defrost
SD4 (0,24;1) min - time start 4th programmed defrost

Defrost transfer
Defrost is transferred to any of the relays by setting value 02 on relay parameter **RLx** (*for parameters details, see paragraph 14).*

9.2.1 Defrost types
The controller handles several types of defrost, programmable by **DOP** super parameter (*for super parameters details, see paragraph 13).*
- Defrost by compressor off,
- Electric defrost,
- Hot gas and inverted cycle defrost.

9.2.1.1 Defrost by compressor off
Defrost by compressor off stops the compressor by the action of the evaporator fans up to the conditions of defrost end (S2> **DTE** or **DTO** expired) (*for parameters details, see paragraph 14).*

9.2.1.2 Electric defrost
Electric defrost turns off the compressor by the operation of defrost heater up to the conditions of defrost end (S2> **DTE** or **DTO** expired) (*for details of the parameters, see paragraph 14).*

9.2.1.3 Hot gas and inverted cycle defrost
Hot gas and inverted cycle defrost turns on the compressor and opens the defrosting valve up to the conditions of defrost end (S2> **DTE** or **DTO** expired) *(for parameters details, see paragraph 14).*

9.2.2 Types of defrost starting
The controller handles several types of defrost starting, programmable by **DOP** super parameter *(for super parameters details, see paragraph 13).*
The interval between defrosts is expressed by **ITD** parameter *(for parameters details, see paragraph 14).*
Defrost starts in different ways, whose index m is shown in the defrost list, viewable by the submenu item **SER/DEF** (see paragraph 8). Defrosts, which can occur with or without evaporator S2 probe installed, are as follows:
- m1 manual defrost by keyboard
- m2 defrost by serial command
- m3 automatic defrost at every IDT hours
- m5 automatic defrost at RTC time
- m6 automatic defrost by D-Test
- m7 automatic defrost in absence of calibration data
- m8 automatic defrost by insufficient evaporation
- m9 automatic defrost by excessive evaporation
- m10 automatic defrost by calibrated protection
- m11 automatic defrost by time protection
- m12 automatic protection defrost by low temperature evaporation

9.2.2.1 M1 -Manual defrost by keyboard
Manual defrost is enabled by the right value of **DOP** super parameter (weight 1) *(for super parameters details, see paragraph 13)* and it starts by menu item **DEF** *(see paragraph 7).*

Electric Defrost
It starts immediately if the S2 evaporator temperature is less than **DTE** *(for parameters details, see paragraph 14).*

Hot gas defrost
It starts when set point is reached, if the S2 evaporator temperature is less than **DTE** with **DOP** parameter weight 64 *(for super parameters details, see paragraph 13).*
Where set point value is not reached within a maximum time of 20 minutes after manual defrost, it however starts. During the waiting period, the controller displays the message **WAITING DEFROST.**

9.2.2.2 M2 - Defrost by serial command
Defrost can be started by a serial command of REALOAD software or by SFU (Smartfreeze Unit for Remote Monitoring and Control), if is connected to Vopos.
Defrost starts at once or at the end of compressor cycle with **DOP** weight 64 *(for super parameters details, see paragraph 13)* and if S2 temperature is lower that **DTE°C** (*for super parameters details, see paragraph 13).*

9.2.2.3 M3 - Automatic defrost at every IDT *hours*
Defrost can be started at time intervals set by **ITD** parameter in hour (*for parameters details, see paragraph 14)*, enabled by **DOP** weight 3 (*for super parameters details, see paragraph 13).*
Defrost starts at once or at the end of compressor cycle with **DOP** weight 64 *(for super parameters details, see paragraph 13)* and if S2 temperature is lower that **DTE°C** *(for super parameters details, see paragraph 13).*

9.2.2.4 M5 - Automatic defrost at RTC time
Defrost can be started at a determinate time setting **DOP** parameter weight 16 *(for super parameters details, see paragraph 13).*
Defrosts day-time may be up to 4 hours beginning at SD1, SD2, SD3, SD4. Defrost starts at once or at the end of compressor cycle with **DOP** weight 64 (for super parameters details, see paragraph 13) and if S2 temperature is lower that **DTE°C** *(for super parameters details, see paragraph 13).*

9.2.2.5 From M6 to M12 - Automatic defrosts, started independently by the controller
These defrosts start independently by controller with reference to an algorithmic that estimates the ice formation on the evaporator by the end defrost S2 probe.
The defrosts are enabled according to **PDO** super parameters weight 128 *(for super parameters details, see paragraph 13).*
Sensitivity to ice presence is determined by **SDT** parameter (*for super parameters details, see paragraph 13).* Reducing **SDT** value, controller sensitivity to detect the frost presence on the evaporator increases.
In this category there are also defrosts started by controller when there are specific procedures, such as the D-Test.

9.2.3 Evaporator fans action during defrost
- **forced on: (FOP weight 2)** it is the typical case of defrost by compressor off,
- **forced off: (FOP weight <>2)** for all other types of defrost,

- **controlled by FSD: (FOP weight = 64)** for all other types of defrost, except defrost by compressor off, that during defrost requires a temporary ventilation to dispose of the product cold, limiting the increase of temperature in the cold room. In this case, during defrost, the evaporator fans follow this rule:
  - ✓ Fan ev. OFF: S2>= SET-FSD
  - ✓ Fan ev. ON: S2< SET-FSD-5°C

9.2.4 Condenser fans action during defrost

- **forced on: (FOP weight 32)**
- **forced off: (FOP weight <>32)**
- **controlled by FCD: (FOP weight = 64).** In this case, during defrost, the condenser fans follow this rule:
  - ✓ Fan ev. OFF: S2>= SET-FSD
  - ✓ Fan ev. ON: S2< SET-FSD-5°C

9.2.5 Dripping: defrost end

When temperature reaches **DTE** *(for parameters details, see paragraph 14)* output enabled by action 02 is disabled. From this moment, the controller may or not start the dripping (defrosted water drainage) depending on **DRP** parameter set (for super parameters details, see paragraph 13): **DRP=0** avoids the dripping, while **DRP >0** starts the dripping with loads off, for **DRP** seconds.

9.3 - EVAPORATOR FANS ACTION

Related parameters

FOP (0, 255;1) flag- configuration super parameter
FAS (-20, 20;1) °C - fan activation consensus regulated
FSD (-40, 10;1) °C - fan off set during defrost
FAD (0, 255;1) sec - fan time delay from start o defrost S2
HYF (1, 20.0;1) °C - isteresi ventole in regolazione
LBT (- 0;1) °C - evaporator low temperature limit
DOO (0,255;1) sec - t max turn off time with open doors

Evaporator fans action transfer

Evaporator fans action is transferred to any of the relays by setting value **03** on relay parameter **RLx** *(for parameters details, see paragraph 14).*

9.3.1 Fan in parallel with compressor

With this configuration the evaporator fans will have main consensus only with compressor on during the cooling. Otherwise they will remain off.
In addition to the main consensus, the evaporator fans are subject to the following conditions:

- **on for S2<= FAS; off for S2>= [FAS+HYF].**

If S2 is not installed or faulty, fans are on or off in thermoregulation with reference to the compressor and to its turning on **FAD** parameter expired, where **FAD** *(for parameters details, see paragraph 14)* is the consensus temperature at the turning on and after defrost.

9.3.2 Independent fans

With this configuration, evaporator fans will have consensus only with reference to this condition:

- **on for S2<= FAS; off for S2>= [FAS+HYF].**

If S2 is not installed or faulty, on **FAD** parameter expired ay controller turning on, where **FAS** *(for parameters details, see paragraph 14)* is the consensus temperature at the turning on and after defrost.
During defrost are following the conditions defined by **FOP** super parameter *(for super parameters details, see paragraph 13).*

9.4 - CONDENSERS FAN OPERATION

Related parameters:

FOP (0, 255;1) flag - configuration super parameter
FCE (0, 60;1) °C - fan action consensus
HYC (0, 20.0;1) °C - condensers fan hysteresis

Condenser fans action transfer

Condenser fans action is transferred to any of the relays by setting value **04** on relay parameter **RLx** (*for parameters details, see paragraph 14).*

9.4.1 Thermoregulation fans

Condenser fans are thermo-regulated during cooling with reference to the following conditions:

- **off: S3<=FCE; on: S3>[FCE+HYC]°C *(for parameters details, see paragraph 14)*** with turning off in compressor pause when temperature **FCE°C** is reached.

During defrost, condenser fans can be set on, off or thermo-regulated according to **FOP** super parameter *(for super parameters details, see paragraph 13).*

9.5 - MICRO DOOR ACTION ON LOADS

Related parameters

ISP (0, 255;1) num - configuration super parameter on inputs
DOO (0, 255;1) sec - door open maximum time allowed

9.5.1 Logic

By ISP super parameter (for super parameters details, see paragraph 13), **it is possible to enable S3 or S4 inputs as micro door digital input normally open or closed.**
When a door opening is detected, the controller displays the message **OPEN DOOR**.
The related actions to this event are the followings:

a) the evaporator fan is turned off while the compressor output is unaffected;
b) light on mode is enabled and transferred to the relay with action 05;
c) spent **DOO**, the fan is enabled, the light is turning off and set the alarm **CLOSE DOOR.**

At door closing, evaporator fans start again with a **10 seconds** delay.

9.6 - COLD ROOM LIGHT ACTION

Related parameter

OSP (0, 255;1) num - configuration of super parameter on outputs

Cold room light action transfer

Cold room light action is transferred to any of the relays by setting value **05** on relay parameter **RLx** *(for parameters details, see paragraph 14)* and by setting, with **OSP** super parameters (*for super parameters details, see paragraph 13),* **UP** key as light.

9.7 - ANTI-ICE RESISTANCE ACTION

Related parameter

SPX (-10 10;1) °C - temperature for ice resistor

Anti-Ice Resistance Action

Anti-Ice resistance action is transferred to any of the relays

by setting value **07** on relay parameter **RLx** *(for parameters details, see paragraph 14).*

9.7.1 Logic

Anti-Ice resistance action enables relay set with value **07** if S1 probe detects a temperature S1<=SPX°C and disables it when temperature condition is S1>=(SPX+2)°C.
In other words, load is controlled in warm action with hysteresis of 2°C.

9.8 - CONDENSATION DISCHARGE RESISTANCE ACTION

Related parameters

DDR (0, 240;1) min - turn off delay after a defrost

Condensation discharge resistance transfer

Condensation discharge resistance action is transferred to any of the relays by setting value **08** on relay parameter **RLx** *(for parameters details, see paragraph 14).*

9.8.1 Logic

The turning on of condensation discharge resistance starts with defrost beginning and ends after DDR minutes *(for parameters details, see paragraph 14).* It has the aim to heat the defrost water drainage pipe that otherwise would remain frozen and would not allow the conveyance of water on the drip tray.

9.9 - AUTOMATIC ENERGY SAVING (AES)

Related parameters

AES (1, 12;1) ore - time to sample % compressor on
CPM (50, 99;1) % - threshold % compressor ON triggered by AES
SPI (1, 5;1) °C - temp increase of operating set-point
Automatic Energy Saving function, enabled by **OSP** super parameter weight 16 *(for super parameters details, see paragraph 13),* reduces energy consumption when compressor usage percentage reaches a set value. In this condition the operating set point is increased by **SPI °C** (*for parameters details, see paragraph 14)* and then re-established to the set conditions.

9.9.1 AES on

After **AES** consecutive hours, during which the compressor usage percentage is > or = to the **CPM** percentage, the set-point changes to **[SET + SPI]** *(for parameters details, see paragraph 14).*

9.9.2 AES off

After **AES** consecutive hours, during which Automatic Energy Saving is on, with the compressor usage hourly percentage < to the **CPM** percentage, the controller restores the original set point.

9.10 - NIGHT&DAY (N&D)

Related parameters

NDS (0, 24;1) hours - activation time of function Night&Day
NDD (0, 23;1) hours - duration of function Night&Day
SPI (1, 5;1) °C - increase in degrees of operating set-point
LGH (0, 1;1) flag - light state unchanged or forced off in Night&Day
This function, enabled by **OSP** super parameter weight 32 *(for super parameters details, see paragraph 13),* starts every day and reduces cold room consumption, increasing the set point by **SPI °C**, starting from an hour set by **NDS** parameter for a duration of **NDD** hours *(for parameters details, see paragraph 14).*
During H&D mode, if **LGH=1, the** light mode is forced off; if **LGH=0**, light mode remains unchanged *(for parameters details, see paragraph 14).*

9.11 - DEHUMIDIFICATION

Related parameters

HRH (-10 10;1) Rh% - dehumidification hysteresis
HPO (-10 10;1) Rh% - humidity reading offset

Dehumidification transfer

Dehumidification is transferred to any of the relays by setting value **10** on relay parameter **RLx** *(for parameters details, see paragraph 14).*
Dehumidification enables the set relay when **Rh%** value, detected by the humidity probe, exceeds threshold **SetRh%+ HRH** and it is disabled when the set humidity value is reached.

9.12 - HUMIDIFICATION

Related parameters

HRL (-10 10;1) Rh% - humidity hysteresis
HPO (-10 10;1) Rh% - humidity operation offset

Humidification transfer

Humidification is transferred to any of the relays by setting value **09** on relay parameter **RLx** *(for parameters details, see paragraph 14).*
Humidification enables the set relay when **Rh%** value, detected by the humidity probe, exceeds threshold **SetRh%+ HRH** and it is disabled when the set humidity value is reached.

9.13 - SMART CLIMATE

Related parameters

HRL (-10 10;1) Rh% - humidification hysteresis
HRH (-10 10;1) Rh% - dehumidification hysteresis
HPO (-10 10;1) Rh% - humidity reading offset
OSP (0, 255;1) num - output configuration super parameter.
The Smart Climate is based on a new algorithm of control that includes humidity regulation in the cold room in a neutral area, with dehumidification in refrigerator static condition and humidification with forced external air in cold room. This function needs the installation of humidity probe.
In this function, temperature control is most important than the humidity one.

9.14 - HUMIDITY CONTROL WITHOUT PROBE

RH (10 99;1) Rh% - humidity set-point

In refrigerators with positive temperature, humidity control is possible without a probe. It is enabled by adding weight 8 to the **FOP** super parameter *(for super parameters details, see paragraph 13).*
By correlation tables between compressor time and evaporator fans time, it is set the relative percentage of the cold room. Minimum Rh% set is **60%;** maximum is **90%.**
For relative humidity values set between 60 and 75%, fans evaporator output is off during the compressor pause. When compressor is on, evaporator fans have a trend of turning on/turning off for 60 seconds.
For relative humidity percentages set between 75% and 90%, fans evaporator output is always on during the compressor turning on; during the compressor pause, fans evaporator output is on for a time proportional to the average pause time of the compressor.

9.15 - RELAY ALARM ACTION

Relay alarm action transfer
Relay alarm action, in its various configurations, is transferred to any of the relays by setting the following values on relay parameter **RLx** (for parameters details, see paragraph 14):

- relay set with value **11** remains **normally closed** and opens when there is an alarm, **and IT IS NOT POSSIBLE** buzzer turning off;
- relay set with value **12** remains **normally closed** and opens when there is an alarm, **and IT IS POSSIBLE** buzzer turning off;
- relay set with value **13** remains **normally opened** and closes when there is an alarm, **and IT IS NOT POSSIBLE** buzzer turning off;
- relay set with value **14** remains **normally off** and closes when there is an alarm, **and IT IS POSSIBLE** buzzer turning off.

9.16 - WARM ACTION

Related parameters
SET (-40.0, 40.0;0.1) °C - set-point entered from user menu
HYC (0.0, 10.0;0.1) °C - regulation lower hysteresis warm action

Warm action transfer
Warm action is transferred to any of the relays by setting value **06** on relay parameter **RLx** *(for parameters details, see paragraph 14).*
The regulation is done with higher and lower bandwidth with reference to the set point and **HYC** differential *(for parameters details, see paragraph 14).*
The consensus is when the value measured by the S1 probe reaches the **[SET-HYC] ° C**; the block occurs when the value measured by the S1 probe reaches the **[SET] ° C** *(for parameters details, see paragraph 14).*
If in the controller installation are provided both actions, **HYL** parameter will be ignored *(for parameters details, see paragraph 14).*

10 - D-TEST

Related parameters
SET (-40.0, 40.0;0.1) °C - regulation set-point
STB (1-10) num - quantity of stability cycles in phase 0
CYC (1-10) num - quantity of stand-by cycles in phase 1
ETT (-40.0, 40.0;0.1) °C - climbing set-point
HYH (0.0, 9.9;0,1) - upper regulation hysteresis
HYL (0.0, 9.9;0,1) - lower regulation hysteresis
DTE (0.0, 40.0) - defrost end temperature detected by S2
DTO (1-250;1) min - defrost maximum time
SUM (1-250;1) min - maximum pull-down time admitted in Summer
WIN(1-250;1) min -maximum pull-down time admitted in Winter
CURRENT LIMITS PRx - *see paragraph 11*
The D-Test performs refrigerators functional and electrical, useful during the assembly and technical support phases, as it provides important elements for diagnosis.
The test is divided into six phases (Ph):

1. Stabilization (STA),

2. Thermoregulation (CYC),

3. Defrosting (DEF),

4. Recovery (REC),

5. Slope (UP),

6. Descent (DWN).

10.1- TEST STARTING

D-Test starts from submenu item **SER/TST**. Pressing **OK** key, the controller displays the message **TO START TEST OK; TO ESCAPE ESC**.
Choosing **OK**, the controller starts the routine test and displays the message **DONE**.

10.2 - DISPLAYING DURING THE TEST

During the test the controller displays the cold room temperature alternated by the message that indicates the current phase with its label (for test steps details, see paragraph 10). In each test phase, by **UP/DOWN** keys, it is possible to get the following information: by **UP** key, the phase duration in hours and minutes; by **DOWN** key, S2 and S3 probes temperatures and consumption in Watts.
At the end of the test, the controller displays the message **TEST END** and adjusts with reference to the setting parameters. To delete the message **TEST END** it is necessary to turn off and on the controller or to interrupt the power supply.

Warning!
During the test, high and low temperature alarms are disabled. During the test, any fault, parameter or set point change stops the test.
The controller displays the message TEST DISCONTINUED. The restart is made by Menu, but the message can be deleted by manual restart or by turning off and on again the controller.
Stops (black-out) and starts of energy do not erase the message TEST DISCONTINUED. In the case of black-out during the test, it remains pending and begins again to restore supply.
It is possible to stop the test, by pressing MENU key for 5 seconds and the controller displays the message TEST DISCONTINUED, which can be deleted according to the procedure described above.

10.3 - TEST ENDING

10.3.1 Test ending for not reaching set
The controller stops the D-Test if, during the turning on or the thermoregulation, doesn't reach the set point in **WIN** minutes in winter or in **SUM** minutes in summer *(for parameters details, see paragraph 14).* In this case, the controller displays the message **SET NOT REACHED.**
The selection of **WIN /SUM** parameter is made with reference to this condition: if, at test starting, S1 probe detects a temperature >20° C, the controller selects the parameter **SUM;** if S1 probe detects a temperature <20° C, the controller selects the parameter **WIN**.

10.3.2 Test ending for not reaching of end defrost temperature
If, during test phase Ph3, S2 probe doesn't reach **DTE °C** value in **DTO** minutes, the controller stops the D-Test and displays the message **DEFROST TIME OUT**.

10.3.3 Test ending for failure
During the test, any fault stops the test. Also the door opening (if the door switch has been connected to S4 in order to detect the door status) provokes the test ending. During the test, the management of the alarms and the evaporator temperature alarm are disabled.
If the test ends for failure, the controller displays the message **TEST DISCONTINUED.** To delete the message, it is necessary to turn off and on the controller or to interrupt the power supply.

10.3.4 Test ending for parameter change
During the test, any parameter change, including the set-point, stops the test.
If the test ends for parameter change, the controller displays the message **TEST DISCONTINUED.**
To delete the message, it is necessary to turn off and on the controller or to interrupt the power supply.

10.3.5 Test ending from the keyboard
D-Test can be stopped by pressing for 5 seconds the **MENU** key. The controller returns to the operation mode and displays the message **TEST DISCONTINUED.**

10.3.6 Regular test ending
At the end of the test, the controller displays the message **TEST END** and starts the regulation according to the setting parameters.
To delete the message, it is necessary to turn off and on the controller or to interrupt the power supply.

10.4 - SPECIAL CONDITIONS

10.4.1 Drip and recovery
Drip (wait for compressor restarting after defrost) is counted in the recovery phase. Data displayed is net of this time.

10.4.2 Test restarting after power supply
After an interruption of the power supply occurred during the test, it restarts from the beginning.

10.4.3 Memory reset
The controller memory reset does not cancel the D-Test data.

10.5 - D-TEST DATA DISPLAYING

From submenu item **SER/DAT**, pressing **OK** key, the controller displays the D-Test report. The controller leaves the report pressing **MENU** key or after 2 minutes of time out. The controller displays the report again pressing **DOWN** key.
If there aren't data, the controller displays the message **NO DATA** and returns to Menu **SER**.

EX.
- ***START TEST M12 S22 KW 3,1 - Duration and consumption;***
- ***DEFROST M5 S3 KW 0,7 - Defrost duration in Ph2 and consumption;***
- ***PULL-UP 230s/°C - PULL-DOWN 668s/°C - Test pending in phases 4 and 5 in seconds/degrees***

10.6 D-TEST DATA CANCELLATION

D-Test data cancellation is possible only by overwriting the most recent data, after starting a new test.

11 - ELECTRICAL LOADS CONTROL

Associated parameters
PR1 power used by load on a RL1 - [0-1500] W - default 0W - step 10W
PR2 power used by load RL2 - [0-1000] W - default 0W - step 10W
PR3 power used by load on RL3 - [0-500] W - default 0W - step 10W
PR4 power used by load on a RL4 - [0-500] W - default 0W - step 10W
Maximum measured load is 2500 Watts.
If Pri=0 this control is disabled.

11.1 Real-time control of total power consumption

During the operation mode, the controller monitors total power consumption which should not exceed the sum of all allowed loads compared to a pre-set tolerance.

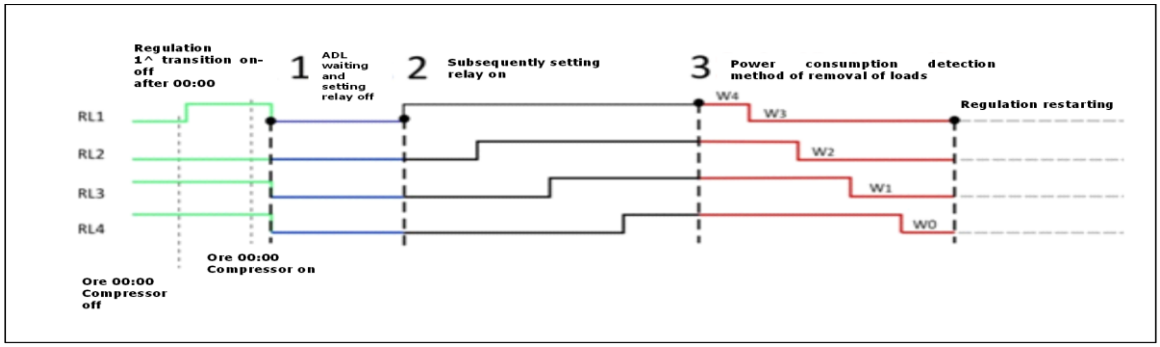
11.2 Daily control on each load

The policy provides that, at the first transition on-> off of the cooling relay after 00:00 hours, the setting is locked for **LDA** seconds (Scheme 1, step 1) and then the relay are enabled in sequence (Scheme 1, step 2) (for parameters details, see paragraph 14).
Subsequently (Scheme 1, step 3), the verification of power consumption on each relay is enabled with the method of removal of loads, measuring the decrease of power.
If it is a value outside the range of tolerance for expected consumption or it is detected non zero consumption, the failure is stored and displayed the message **LOAD ERROR- RLX**, without setting changes.

11.3 On demand control of total power consumption by each load
If there is a temperature alarm or a failure (except dirty condenser) or if the consumption verification exceeds the

expected one, the controller repeats the daily routine total power consumption.

Scheme 1



12 - FUNCTION FAILURES VS. WORKING MODES

MESSAGE	FAILURE	CAUSE	FUNCTION
PROBE S1	Thermoregulation probe faulty or missing	Detected Values out of range	Average time cycles on thermoregulation or transfer of adjustments to probe if calibration data Te_{min}/Te_{max} are present
PROBE S2	Evaporator probe faulty or missing	Detected values out of range	Timed DEFROST every ITD hours for the duration of DTO minutes
PROBE S3	Condenser probe faulty or missing	Detected values out of range	Cuts out reading as if probe were not fitted and sets fans in parallel wit compressor
PROBE S4	Humidity probe faulty or missing	Detected values out of range	Cuts out reading as if probe were not fitted
LOW EVAPORATION	Evaporator LOW TEMPERATURE	S2<LBT°C	Carrie out a protective DEFROST if enabled by parameter DOP weight 64; later if see S2<LBT°C records event and turns compressor OFF with cycle time otherwise returns to normal regulation
HIGH CONDENSATION	Condenser HIGH TEMPERATURE	S3>MCT°C	Stops regulation activating fans only to reach temperature MCT-10°C measured by PROBE S3
DIRTY CONDENSER	Dirty condensed	ΔS3 > DCN during compressor ON	No action (warning only on display)
COMPRESSOR USAGE	High usage of compressor	Active for CPH% in the 24 hours	No action (warning only on display)
DEFROST M	Excessive defrost time	Temperature DTE not reached in time DTO minutes	Warns that during DEFROST temperature DTE was not reached within DTO time
LOW GAS	Low pressure detected inside gas circuit		No action
LOAD –RLx-	High consumption on a relay Ux	Controller has detected a higher than normal consumption value	When consumption is too high the relevant load is excluded.

13 - SUPER PARAMETERS

The controller is associated with a parameters and super parameters setting utility, Easy Setting, available in the DOWNLOAD section of Smartfreeze SERVICE AREA of Smartfreeze web site: http://service.smartfreeze.com.

VSP
(give to the Superparameter the value of the sum of the weights corresponding to the various option you wish to enable)

Operation with zero weight	Weight	Operation with weight X	Weight
Celsius	0	Fahrenheit	1
Buzzer disabled	0	Buzzer enabled	2
Pre alarm warning disabled	0	Pre alarm warning enabled	4
Notice of occurred alarm disabled	0	Notice of occurred alarm enabled	8
Displaying without decimals and with large font	0	Displaying with decimals and small font	16
During defrost, displaying temperature	0	During defrost, no displaying temperature	32
free	0	free	64
free	0	free	128

ISP
(give to the Superparameter the value of the sum of the weights corresponding to the various option you wish to enable)

Operation with zero weight	Weight	Operation with weight X	Weight
Input S2 disabled	0	Input S2 enabled	1
Input S3 disabled	0	Input S3 enabled	2
Input S3 analogical	0	Input S3 digital	4
Input S3 digital n.a.	0	Input S3 digital n.c.	8
Input S3 micro port	0	Input S3 pressostat	16
Input S3 probe condenser	0	Input S3 probe alarms	32
Input S4 digital	0	Input S4 humidity sensor 4-20mA	64
Input S4 digital micro port n.c.	0	Input S4 digital micro port n.a.	128

OSP
(give to the Superparameter the value of the sum of the weights corresponding to the various option you wish to enable)

Operation with zero weight	Weight	Operation with weight X	Weight
UP Key not operative	0	UP Key turns LIGHT on	1
free	0	free	2
Current control disabled	0	Current control enabled	4
Relays for temperature failures and alarms	0	Relay for temperature alarms	8
Automatic Energy Saving disabled	0	Automatic Energy Saving enabled	16
Night&Day disabled	0	Night&Day enabled	32
free	0	free	64
Independent humidity control	0	Humidity control in neutral area	128

FOP
(give to the Superparameter the value of the sum of the weights corresponding to the various option you wish to enable)

Operation with zero weight	Weight	Operation with weight X	Weight
Fan evaporator disabled	0	Fan evaporator enabled	1
Fan evaporator in parallel to compressor	0	Fan evaporator independent	2
Fan evaporator off during defrost	0	Fan evaporator on during defrost	4
Fan evaporator not controller during defrost	0	Fan evaporator controller during defrost	8
Fan condenser off during defrost	0	Fan condenser on during defrost	16
Fan condenser controlled during defrost	0	Fan condenser not controlled during defrost	32
Control Rh% on fan times disabled	0	Control Rh% on fan times enabled	64
free	0	free	128

DOP
(give to the Superparameter the value of the sum of the weights corresponding to the various option you wish to enable)

Operation with zero weight	Weight	Operation with weight X	Weight
Manual defrost disabled	0	Manual defrost enabled	1
Compressor off in defrost	0	Compressor on for defrost	2
Defrost every ITD hours disabled	0	Defrost every ITD hours enabled	4
free	0	free	8
Defrost at RTC time disabled	0	Defrost at RTC times enabled	16
Protection defrost disabled	0	Protection defrost enabled	32
Immediate defrost start	0	Defrost start at set	64
Automatic defrost disabled	0	Automatic defrost enabled	128

14 - PARAMETERS

COD	PARAMETER	POSITION	LOWER LIMIT	UPPER LIMIT	UNIT	SCALE	STEP	DEFAULT
ADR	SERIAL ADRESS	0	0	255	num	1	1	2
VSP	USER INTERFACE SUPER PARAMETER	1	0	255	num	1	1	0
ISP	INPUT SETUP SUPER PARAMETER	2	0	255	num	1	1	0
OSP	OUTPUT SETUP SUPER PARAMETER	3	0	255	num	1	1	0
FOP	FANS SETUP SUPER PARAMETER	4	0	255	num	1	1	0
DOP	DEFROST SETUP SUPER PARAMETER	5	0	255	num	1	1	0
ALH	HIGH TEMPERATURE DIFFERENTIAL	6	0	500	°C	10	0.1	60
ALL	LOW TEMPERATURE DIFFERENTIAL	7	-500	0	°C	10	0.1	-30
ALD	ALARM DELAY IN REGULATION	8	1	240	min	1	1	20
ADS	ALARM DELAY AT POWER ON	9	1	240	min	1	1	90
ADF	ALARM DELAY AFTER DEFROST	10	1	240	min	1	1	30
BUR	TIME BUZZER REITERATION	11	0	255	min	1	1	30
BUF	TIME BUZZER PERSISTANCE IN ALARM	12	0	255	min	1	1	5
HYH	LOWER HYSTERESIS IN COOLING	13	0	99	°C	10	0.1	0
HYL	UPPER HYSTERESIS IN COOLING	14	0	0	°C	10	0.1	0
HYC	HYSTERESIS CONDENSER FAN	15	10	0	°C	10	0.1	0
DAC	COMPRESSOR OFF DELAY	16	1	30	sec	1	1	5
ADL	ANTICYCLING DELAY	17	0	255	sec	1	1	60
ASS	COMPRESSOR DELAY AT POWER ON	18	0	255	sec	1	1	60
CON	TIME COMPRESSOR ON IN PROBE FAIL	19	0	255	min	1	1	3
COF	TIME COMPRESSOR OFF IN PROBE FAIL	20	0	255	min	1	1	2
CPH	MAX % COMPRESSOR ON IN 24 HOURS	21	0	99	%	1	1	90
FAS	SET EVAPORATOR FAN IN COOLING	22	-400	400	°C	10	0.1	100
FAD	FAN EVAPORATOR DELAY IN PROBE FAIL OR DISABLED	23	0	255	sec	1	1	60
FSD	SET EVAPORATOR FAN OFF IN DEFROST	24	-99	0	°C	10	0.1	-40
LBT	MIN EVAPORATOR TEMPERATURE	25	-500	0	°C	10	0.1	-400
DOO	DOOR OPENING TIME LIMIT; DOO=0 disable	26	0	255	sec	1	1	40
FCE	SET CONDENSER FAN	27	0	600	°C	10	0.1	250
HYF	DIFFERENTIAL FAN CONDNESER ACTION	28	10	200	°C	10	0.1	50
MCT	MAX CONDENSATION TEMPERATURE	29	0	700	°C	10	0.1	500
DCN	DIRTY CONDENSER THRESHOLD	30	0	300	°C	10	0.1	100
GAS	LOW GAS THRESHOLD	31	0	200	°C	10	0.1	20
DCR	DIFFERENTIAL RECOVERY TEMPERATURE IN HIGH TEMPERATURE CONDENSER	32	0	200	°C	10	0.1	100
RMT	RECOVERY TIME IN HIGH TEMPERATURE CONDENSER	33	1	255	sec	1	1	60
PMT	NUMBER OF PROTECTION EVENTS DURING TPB PERIOD	34	1	255	num	1	1	3
TPB	TIME WINDOW FOR HIGH TEMPERATURE CONDENSER EVENTS COUNTS	35	1	255	min	1	1	30
DTE	TEMPERATURE DEFROSTING END	36	0	500	°C	10	0.1	40
DRP	DRIPPING TIME	37	0	240	sec	1	1	0
DTO	DEFROST TIME -OUT	38	1	60	min	1	1	20
ITD	INTERVAL DEFROST	39	1	24	hours	1	1	8

.... follows

PARAMETERS (FOLLOWS)

COD	PARAMETER	POSITION	LOWER LIMIT	UPPER LIMIT	UNIT	SCALE	STEP	DEFAULT
SDT	ICE SENSIBILITY	40	0	50	°C	10	0.1	15
SD1	1ST DAILY DEFROST	41	0	23	hours	1	1	0
SD2	2ND DAILY DEFROST	42	0	23	hours	1	1	0
SD3	3RD DAILY DEFROST	43	0	23	hours	1	1	0
SD4	4TH DAILY DEFROST	44	0	23	hours	1	1	0
HOF	HUMIDITY PROBE OFFSET	45	-10	10	Rh %	1	1	0
HRH	DEHUMIDIFICATION HYSTERISIS	46	0	10	Rh %	1	1	0
HRL	HUMIDIFICATION HYSTERISIS	47	0	10	Rh %	1	1	0
CPM	MAX % COMPRESSOR IN AES HOURS	48	0	99	%	1	1	70
AES	HOURS OF COMPRESSORT SAMPLING FOR AUTOMATIC ENERGY SAVING	49	1	12	hours	1	1	4
SPI	SETPOINT INCREASE IN NIGHT&DAY	50	0	50	°C	10	0.1	10
NDS	NIGHT&DAY START	51	0	23	hours	1	1	20
NDD	NIGHT&DAY DURATION	52	1	23	hours	1	1	10
LGH	LIGHT OFF IN NIGHT&DAY	53	0	1	num	1	1	0
SPX	DOOR RESISTOR SETPOINT	54	-100	100	°C	10	0.1	30
DDR	DRAIN RESISTOR ACTIVATION TIME	55	0	240	min	1	1	15
PR1	CHARGE POWER IN RELE 1	56	0	1500	Watt	1	10	0
PR2	CHARGE POWER IN RELE 2	57	0	1000	Watt	1	10	0
PR3	CHARGE POWER IN RELE 3	58	0	500	Watt	1	10	0
PR4	CHARGE POWER IN RELE 4	59	0	500	Watt	1	10	0
SPE	SLIDING WORDS SPEED	60	3	10	num	1	1	6
STB	NUMBER OF D-TEST THERMOSTATICAL CYCLES	61	1	10	num	1	1	1
CYC	NUMBER OF D-TEST STABILIZATION CYCLES	62	1	10	num	1	1	2
WIN	D-TEST PULL-DOWN TIME IN WINTER	63	10	255	min	1	1	90
SUM	D-TEST PULL-DOWN TIME IN SUMMER	64	10	255	min	1	1	120
ETT	PULL-UP SET IN D-TEST	65	-300	150	°C	10	0.1	100
SPU	USER SETPOINT	66	-400	400	°C	10	0.1	20
OF1	PROBE S1 OFFSET	67	-99	99	°C	10	0.1	0
OF2	PROBE S2 OFFSET	68	-99	99	°C	10	0.1	0
OF3	PROBE S3 OFFSET	69	-99	99	°C	10	0.1	0
SLL	LOWER SETPOINT LIMIT	70	-400	20	°C	10	0.1	-200
SLH	UPPER SETPOINT LIMIT	71	-20	400	°C	10	0.1	100
RHU	HUMIDITY SETPOINT SETTING BY KEYBOARD	72	10	99	Rh%	1	1	75
MNS	MAINS VOLTAGE	73	100	240	Volt	1	1	230
HRZ	MAINS FREQUENCY	74	50	60	Hertz	1	10	50
HTB	MAXIMUM PCB TEMPERATURE	75	0	900	°C	1	1	700
RL1	RELE 1 OUTPUT SETTING	76	0	20	num	1	1	0
RL2	RELE 2 OUTPUT SETTING	77	0	20	num	1	1	0
RL3	RELE 3 OUTPUT SETTING	78	0	20	num	1	1	0
RL4	RELE 4 OUTPUT SETTING	79	0	20	num	1	1	0
PSS	SERVICE PASSWORD	80	0	255	num	1	1	5
PSU	USER PASSWORD	81	0	255	num	1	1	0

INSTALLATION MANUAL

15 - INSTALLATION

15.1 Probes installation

Temperature and humidity probes should be connected by an insertion connector with micro screw stop.

S1 probe positioning

Install the thermoregulation probe S1 preferably in a position not subject to air flows, in order to measure the real temperature of the cold room.

S2 probe positioning

Be sure to place the evaporator probe S2 (see figure 1) in order to obtain sufficient sensitivity for detection of temperature.
For groups with reverse cycle or electric defrost, the probe must be positioned at the beginning of the circuit and locked in contact with the evaporator tube bundle, allowing the aluminium strip around the bulb of the probe itself. For groups with hot gas defrost, the probe must be positioned at the exit of the circuit.

Figure 1 - S2 positioning

S3 Probe positioning set as condenser probe

Install this probe with a clamp on the outlet side of the condenser. S3 probe manages, if enabled, the thermoregulation fan condenser, dirty condenser notice and the high temperature condenser alarm. S3 and S4 inputs are set as digital inputs.
S3 or S4 inputs can be set as micro port digital input and only accept clean contacts with direct or inverse logic (see figure 2).
Warning!
No voltage should be applied to the digital input points of the VOPOS Controller.

Figure 2 - S2 positioning

Humidity probe S4

After configuring the input S4 for reading humidity probe (4-20 mA type), place the probe in a position not subject to air flows, in order to measure the real humidity of the cold room.
Observe polarity when connecting cables to the controller (see paragraph 3).
Warning!
Accidental polarity inversion could damage the probe and the input circuit within the controller.

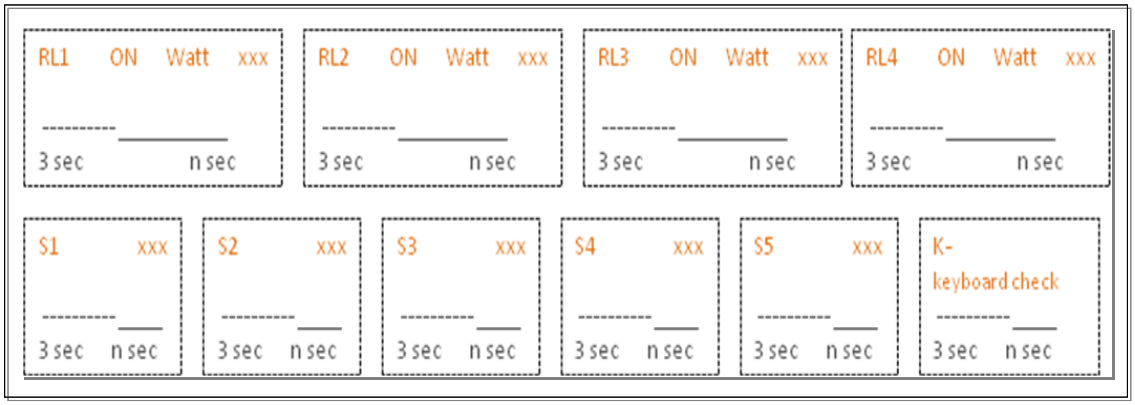
15.2 Loads installation

Enter the network (from 110 to 230 Vac) to terminals of the power controller, respecting the positions. The terminals RL1, RL2, RL3, RL4 showing the input phase (L) when relative relays are energized (see paragraph 3).
Take care to respect load capacity of each relay to avoid damaging the controller.

15.3 Self test Function

If in stand-by mode (the display shows the following symbols **---**) are simultaneously pressed the **MENU + DOWN/INFO** keys for 2 seconds (for details of the keyboard, see section 4), the controller enables an input/output scan procedure that turns on sequentially loads for 3 seconds each and reads the connected probes. After scanning, the controller returns to stand-by mode.
During the sequentially turning on of the loads, the controller estimates (with reference to the current consumption) the power consumption on each relay and displays it. After 500ms of delay, a higher or lower power Prx (for details of the parameters, see section 14) requires the immediate exit from the function with loads locked until the controller turning off and its turning on.
When running Self Test, the display shows consumption in Watts.

ON/OFF READINGS AND DISPLAYING



Via delle Conce, 20
00154 Roma
Italy
Tel. +39.06571763301
Fax +39.06571763400
www.smartfreeze.com
info@smartfreeze.com