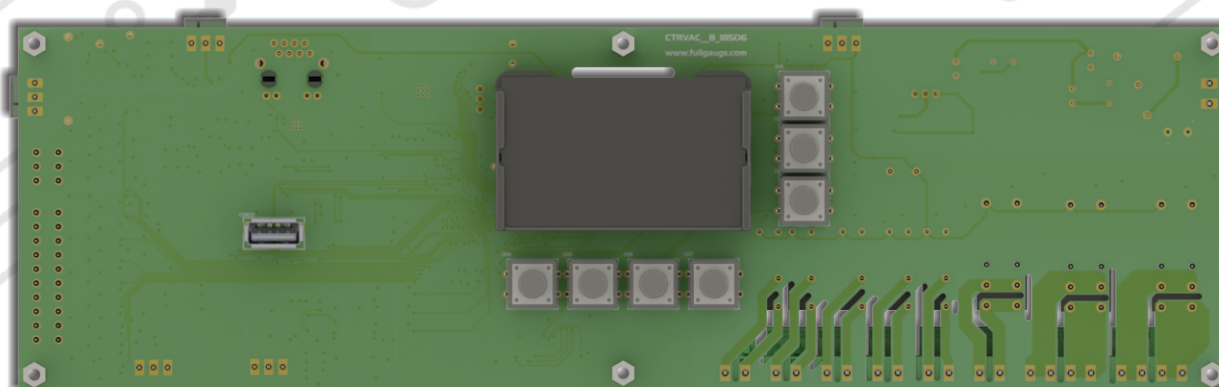




VC-108 Log



USB



Graphic
Display



Supervisory
System



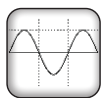
Alarms



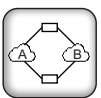
Recipes
System



Datalogger



Power Supply
Monitor



Control
Redundancy
Support



Dialer
Support



Emergency
System
Support



Overload
Protection



Polarity
Protection



Under/Over
Voltage
Protection

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2. DESCRIPTION

The **VC-IOB Log** Controller for vaccine refrigerators is a temperature controller specially designed to ensure adequate refrigeration of very sensitive products. For this, it has an emergency system for power outages, redundant ambient temperature sensors, datalogger for more than five years of data and support for the SitradPRO supervisory system, in addition to Control Redundancy support. It is available in a PCB (Printed Circuit Board), so it can be directly integrated to the mechanical structure of the refrigerator.

3. CHARACTERISTICS

- 10 temperature sensors;

- 2 ambient sensors;

- 1 evaporator sensor;

- 1 condenser sensor;

- 6 drawer sensors.

- 8 relays to switch on loads:

- 1 compressor;

- 1 defrost (natural, resistance or hot gas);

- 1 fan;

- 1 lighting;

- 1 frequency inverter;

- 1 emergency system switch;

- 1 alarm;

- 1 redundancy system switch;

- Power supply monitoring;

- Support for an emergency system for power outages;

- Emergency system battery charge monitoring;

- Auto dialing support in case of emergency;

- Datalogger:

- Adjustable log interval;

- Event logging capability;

- High data storage capacity: over 10 years (depending on settings);

- Integration with the Sitrad supervisory;

- USB port for datalogger export, preset import and export and equipment update;

- Temperature alarms simulation;

- Four levels of access to settings;

- Maintenance time control;

- Interface with graphic display and 7 keys;

4. APPLICATIONS

- Vaccine refrigerators.

5. TECHNICAL SPECIFICATIONS

Power supply*	12Vdc± 10%
Maximum consumption	5.84W
Operating humidity	10 a 90% UR (without condensation)
Maximum supported voltage	20Vdc
Control temperature	-50 a 105°C / -58 a 221°F
Temperature resolution	0,1°C (0,1 °F) across the range
Temperature sensors	S1 and S4: ambient sensors S2: evaporator sensor S3: condenser sensor S5 to S10: drawer sensors (all SB70 type sensors)
Power supply monitor	15 a 265 Vac
Digital input	I1: door sensor (N/A logic)
Output to relay	O1: compressor - 16 A / 250 Vac O2: defrost - 16 A / 250 Vac O3: fan - 16 A / 250 Vac O4: lamp - 5A / 250 Vac O5: inverter - 5A / 250 Vac O6: power switch - 5A / 250 Vac O7: alarm - 5A / 250 Vac O8: redundancy - 5A / 250 Vac
USB Interface	Compatible with the USB 2.0 Full-Speed Module (USBFS) standard; Flash drive data format (FAT32 file system, 32GB maximum capacity)
RS-485 communication	RS485 Sitrad: non isolated
Product size (WxLxD)	300 x 90 x 39,8mm

Power protection*	Condition	Minimum	Typical	Maximum	Unit
Under Voltage	Vin Decreasing	9.01	9.36	9.72	V
Under Voltage Hysteresis		150	260	390	mV
Over Voltage	Vin Increasing	17.32	18.02	18.74	V
Over Voltage Hysteresis		220	440	660	mV
Over Current	Vin=12V		0.8		A

6. ELECTRICAL PRECAUTIONS

 **BEFORE INSTALLING THE CONTROLLER, WE RECOMMEND THAT YOU READ THE ENTIRE INSTRUCTION MANUAL, IN ORDER TO AVOID DAMAGING THE PRODUCT.**

 PRODUCT INSTALLATION PRECAUTION:

- Before doing anything with this device, disconnect it from the electricity first;
- Ensure that the device has sufficient ventilation; avoid installing it in panels with devices that could cause it to operate outside of the specified temperature limits;
- Install the product away from sources of electromagnetic disturbance, such as motors, contactors, relays, solenoids, etc.

 AUTHORIZED SERVICING:

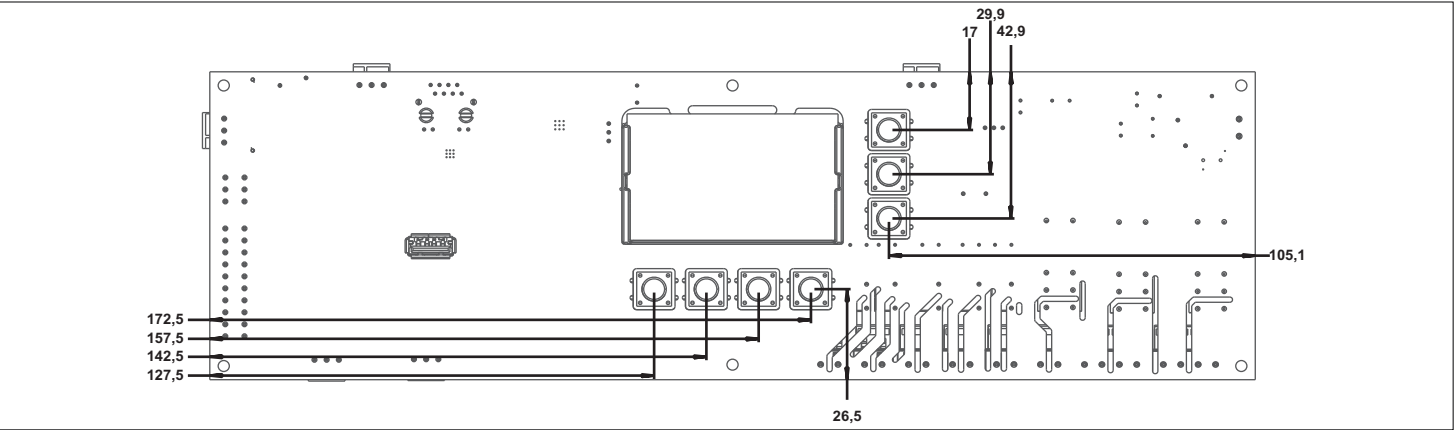
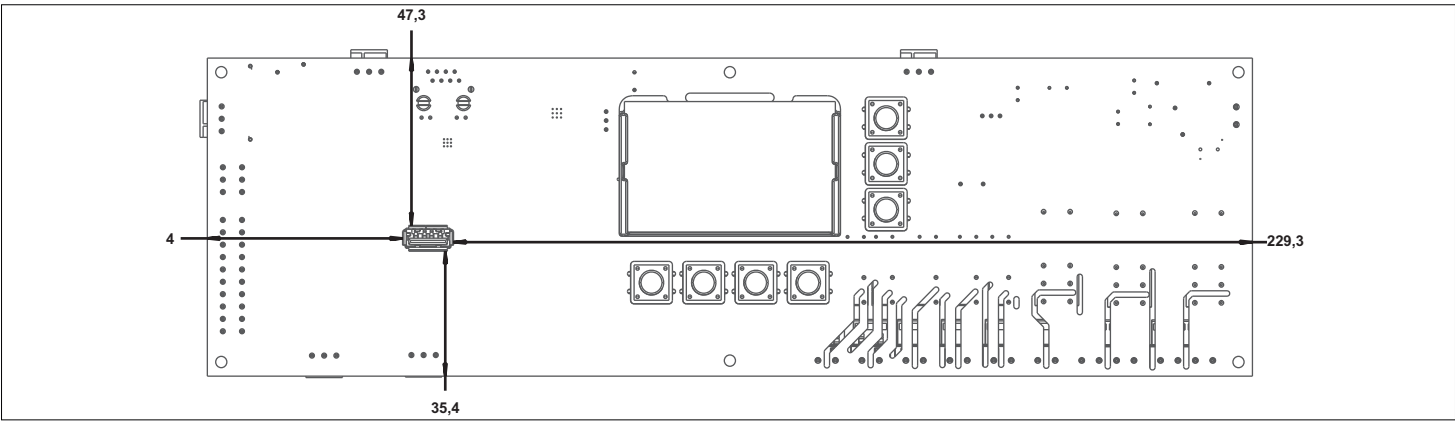
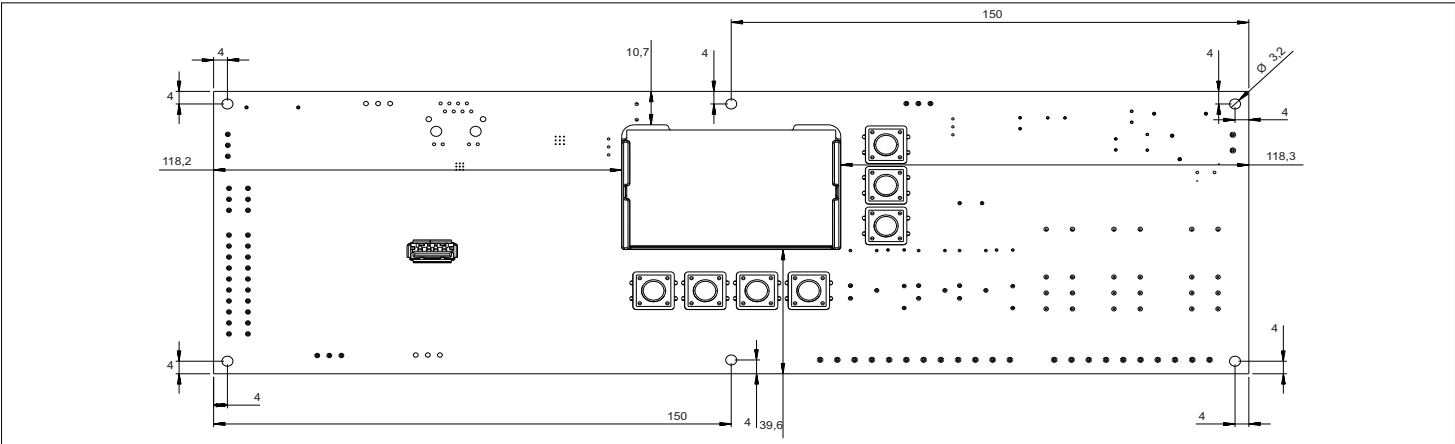
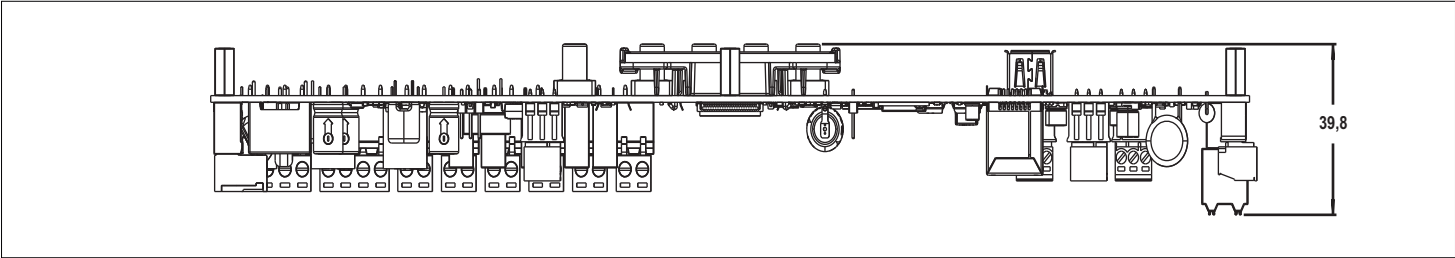
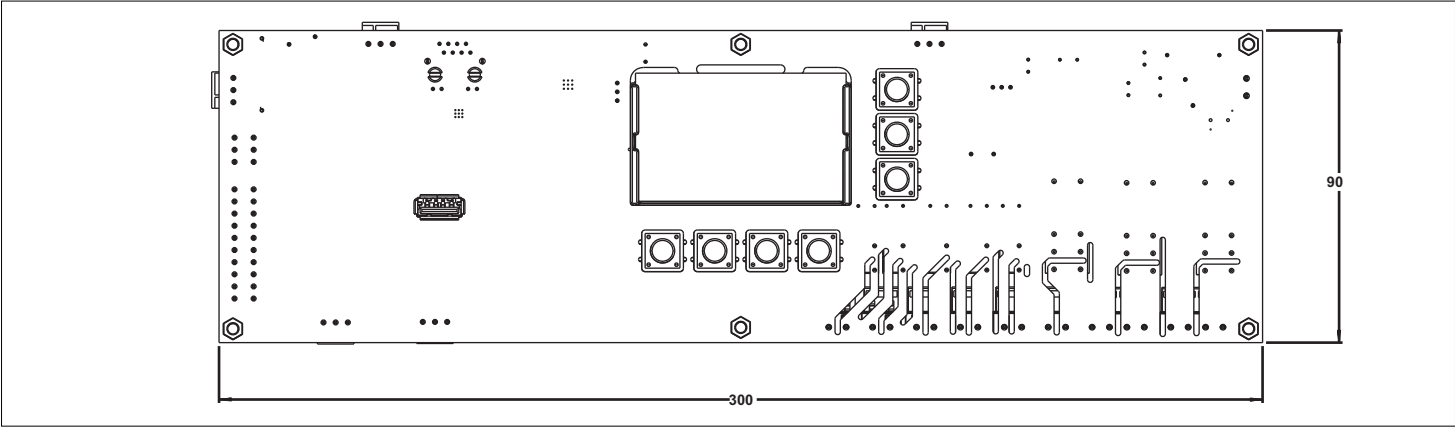
- This product must only be installed or repaired by qualified technicians.

 ACCESSORIES:

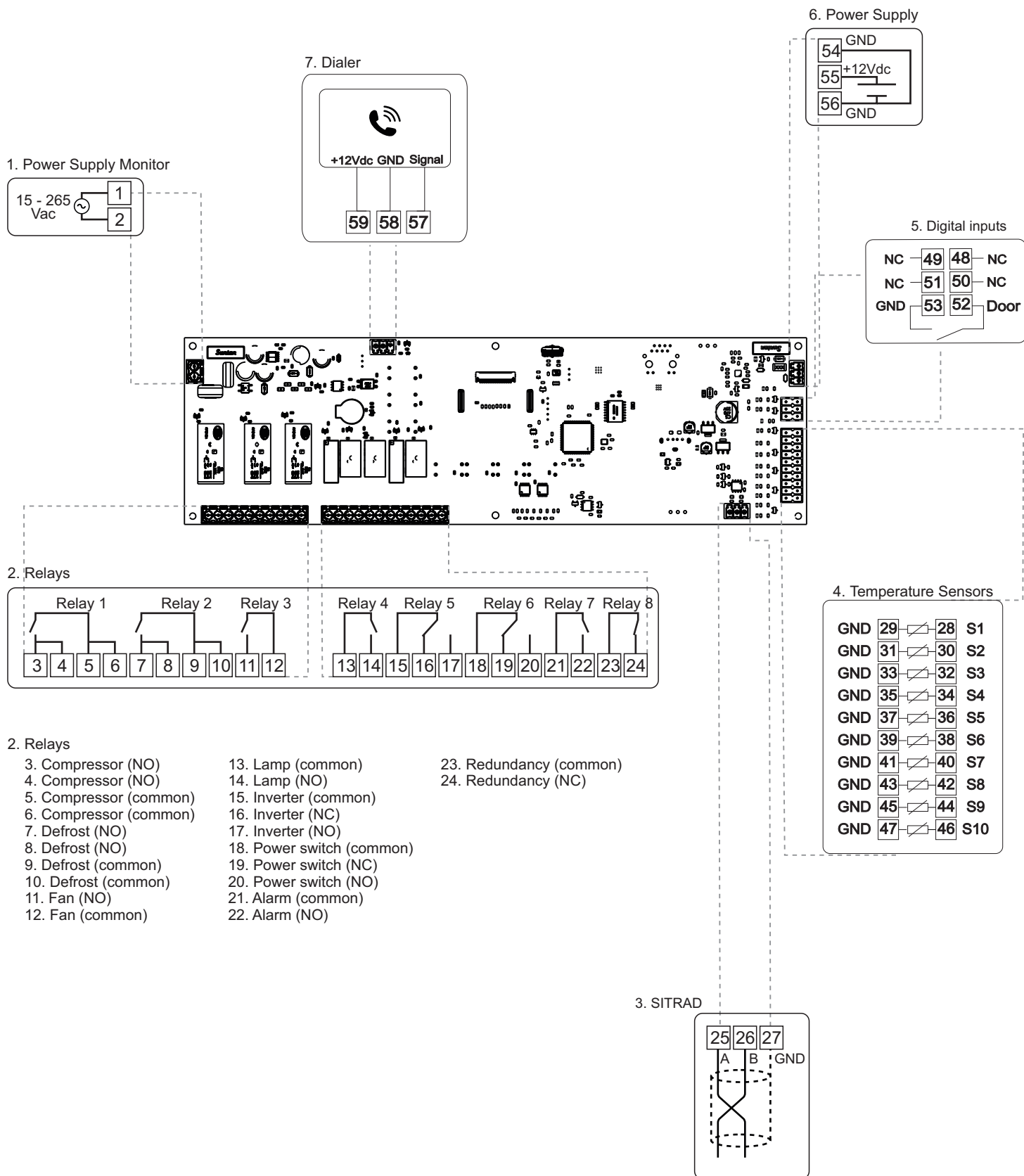
- Only use original Full Gauge Controls accessories;
- If you have any questions, please contact technical support.

IN ORDER TO BE ABLE TO PROVIDE CONTINUOUS DEVELOPMENT, FULL GAUGE CONTROLS RESERVES THE RIGHT TO AMEND THE INFORMATION IN THIS MANUAL AT ANY TIME, WITHOUT NOTICE.

7. DIMENSIONS



8. WIRING DIAGRAM



9. INTERFACE AND COMMAND KEYS

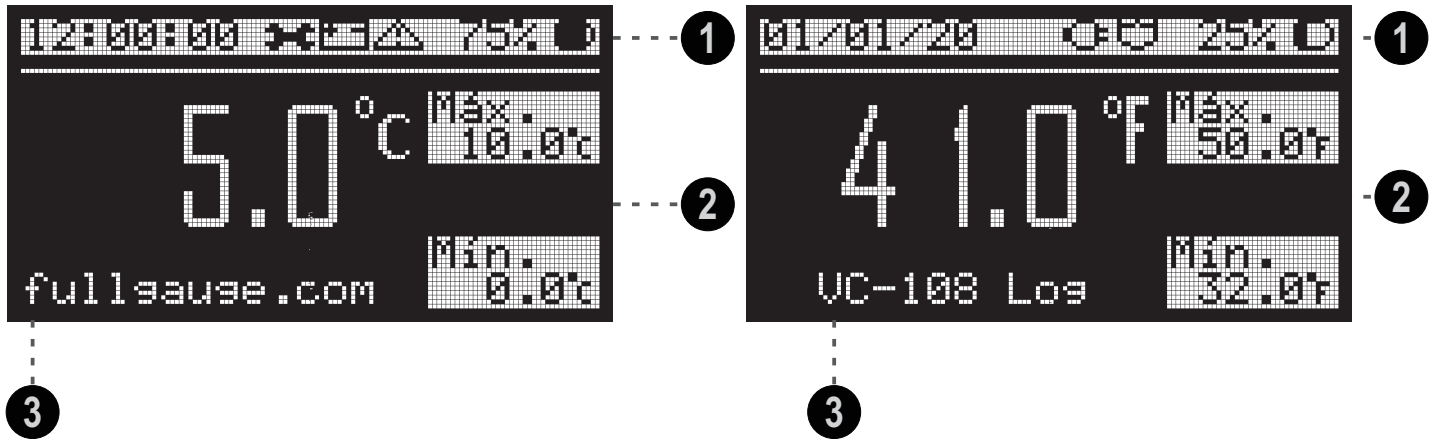
The interface consists of a 128 x 64 pixel graphic display and seven keys. Four keys are used for navigation: **SET**, **UP**, **DOWN** and **BACK**. The other three keys are used to turn on the lamp (**LAMP**), silence the buzzer and alarm relay (**MUTE**) and display active alarms and alarm history (**ALARMS**).



SET Key	Confirm and edit settings and values.
UP Key	Increase values and navigate “up” the menu.
DOWN Key	Decrease values and navigate “down” the menu.
BACK Key	Go back to the previous screen without confirming any change to the setting.
MUTE Key	Silences the buzzer.
LAMP Key	Turns the lamp on and off.
ALARMS Key	Access the view of: active alarms and alarm history. Press the alarm key to toggle between Active Alarms and Alarm History screens.

10. SUMMARY SCREENS

10.1. Main screen:



The Main Screen has a Status Bar at the top, ambient temperature information at the center and warning messages at the bottom.

1. The Status Bar reports time, battery charge, power supply or emergency system status, alarm status, and maintenance functionality.
2. The temperature information area reports the current temperature of the container on the left and the maximum and minimum on the right.
3. The message area usually displays the name of the equipment and instrument manufacturer. If any alarms are active, it displays the alarm description for the user.

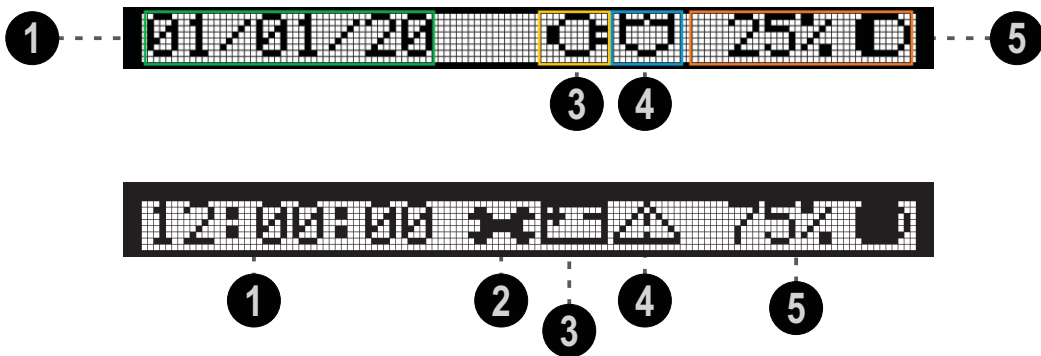


Note: For a list of all alarms that are displayed on the main screen, see Chapter 14 .Alarms.

10.1.1 Status Bar

The Status Bar has the following information:

1. **Time:** Alternates between date and time every 5 seconds;
2. **Maintenance:** Displays a key when the maintenance period has expired;
3. **Power / Emergency:** Displays a power plug when the equipment is powered by the mains, and a stationary battery when the equipment is powered by the emergency system;
4. **Alarm:** Displays a triangle with an exclamation point when an alarm is active, and a shield when the alarm / dialer relay is enabled;
5. **Battery level:** Displays the battery charge percentage, along with a battery symbol indicating the charge level. When the battery is charging, a battery charging animation is displayed.



Battery fully discharged



Battery charge low



Battery charge medium



Battery charge high



Battery fully charged



Maintenance period expired



Equipment powered by mains



Equipment powered by the emergency system



Alarm on



Alarm on Alarm / dialer relay on

10.2. Menus and Navigation

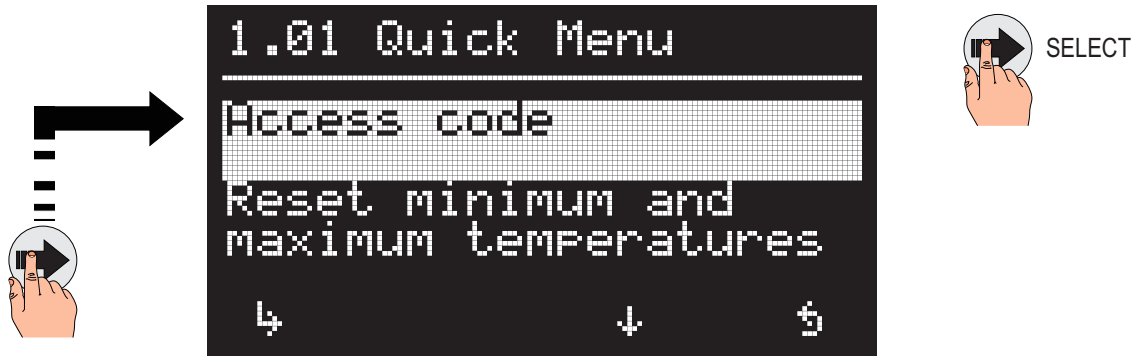
The main screen displays the most relevant information about the controller operation. To view other information, execute actions, and set controller parameters, use the menu system. Menu navigation is done using the **SET**, **UP**, **DOWN**, and **BACK** keys. In all menus, the navigation bar is displayed, along with the function of each key in the menu. Below is a list of the navigation bar icons and their meaning.

	Confirm item selection		Go back to the previous menu
	Select previous item		Select next item
	Confirm action/setting		Cancel action/setting
	Select previous screen		Select next screen/character
	Other information		Clear highs and lows

10.3 Quick Menu

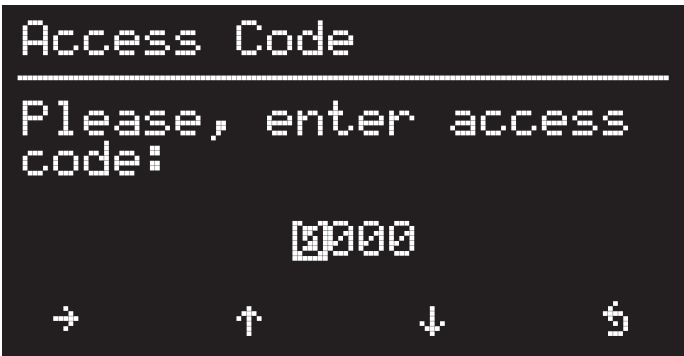
The quick menu is used to access other configuration menus or to perform simple actions.

To access it from the Main Screen, press the **SET** key.



The selected item is highlighted. To navigate between items, use the **UP** and **DOWN** keys. Select the desired item by pressing the **SET** key again. To return to the Main Screen, press the **BACK** key.

10.3.1. Access Code



From the Quick Menu, the other menus can be accessed by an access code, through item 1 . 01 Access code.

The selected digit is highlighted. Select the desired value using the **UP** and **DOWN** keys. Press the **SET** key to advance to the next digit or to confirm the selected code when the last digit is highlighted.

Below is a list of the available codes and the menus they grant access to:

	Basic Menu		Advanced Menu
	Equipment Name		Maintenance Menu

10.3.2. Reset of minimum and maximum temperatures

This function has the purpose of resetting the maximum and minimum temperatures of the environment (sensor S1 and S4) quickly. This procedure loads the minimum and maximum temperatures recorded with the current ambient temperature.

Go to quick menu 1.02 using the **UP** and **DOWN** keys.

Press **SET** to select it.

Press **SET** again to confirm the operation or **BACK** otherwise.

If confirmed, the message: "Action executed successfully" will appear.

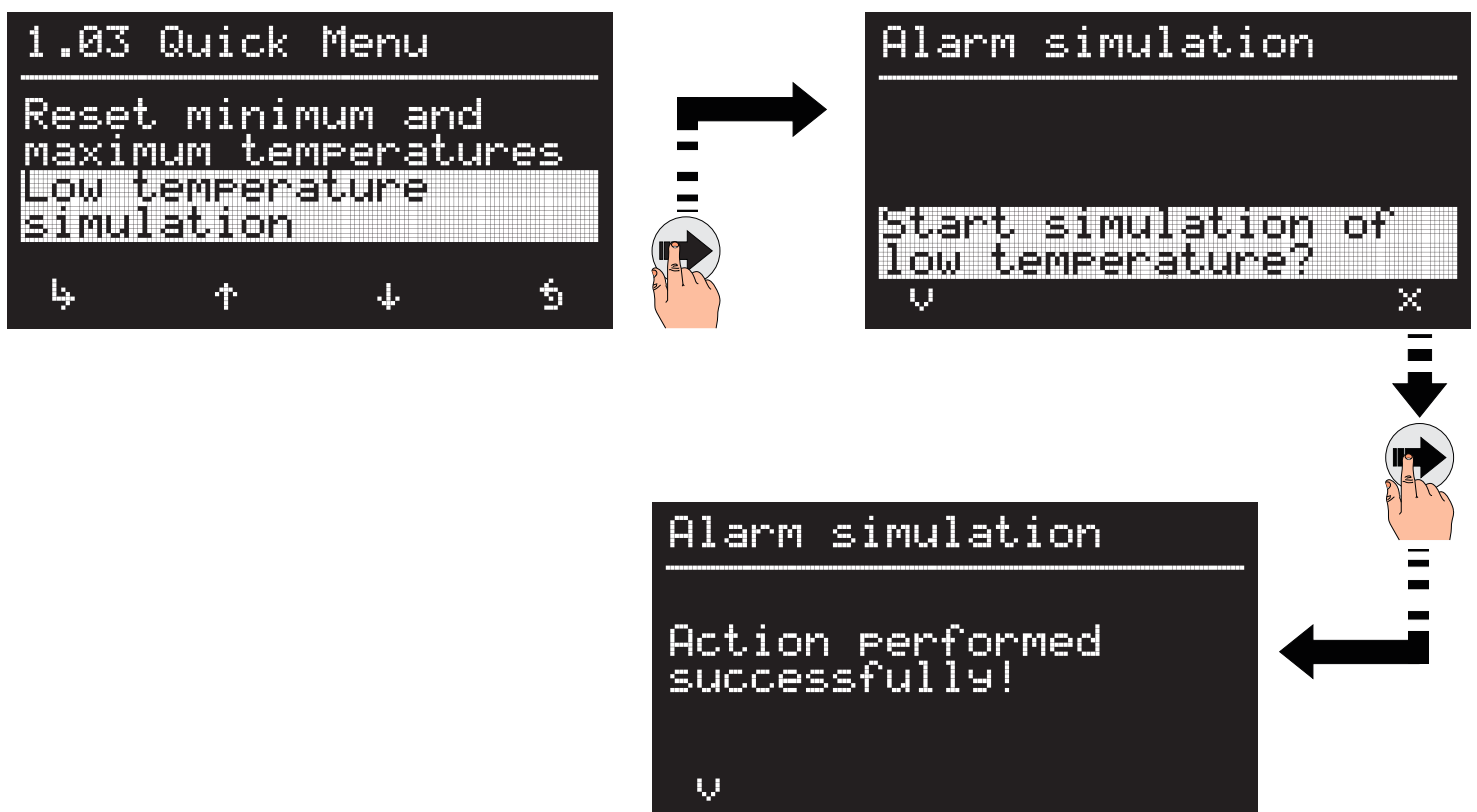
Press **SET** to return to the previous Quick Menu screen.



10.3.3 Simulation of Temperature Alarms:

To test the triggering of the alarm system, it is possible to start a high or low temperature alarm simulation, which will trigger an audible warning and the alarm / dialer relay, as configured in parameters F3.35 - Enable alarm output in the temperature simulation and F3.31 - Time to silence alarm automatically. More information about the simulation can be found in subchapter 13.5 Alarm Simulation.

To start or end a temperature alarm simulation, select in the Quick Menu options 1.03 - Low temperature simulation or 1.04 - High temperature simulation and press the **SET** key. Then a confirmation screen is displayed. If you want to proceed with the action, press the **SET** key again. If you wish to cancel the action, press the **BACK** key.

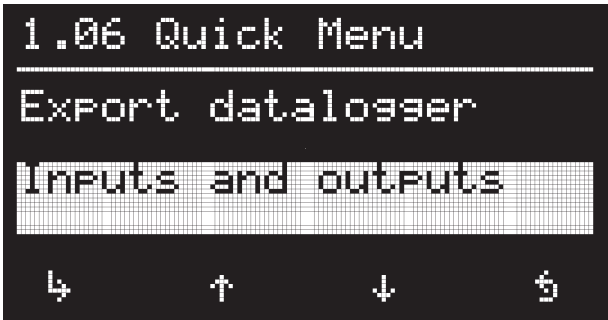


10.3.4 Export Datalogger:

The Export Datalogger function is explained in Chapter 14.3.

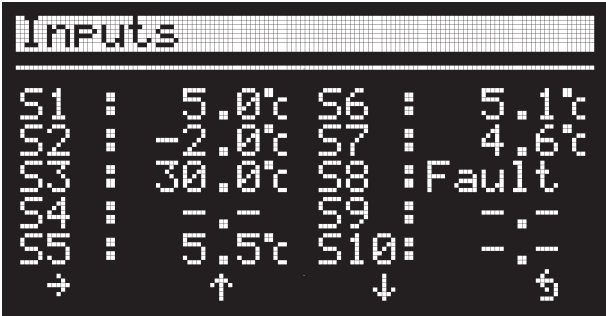
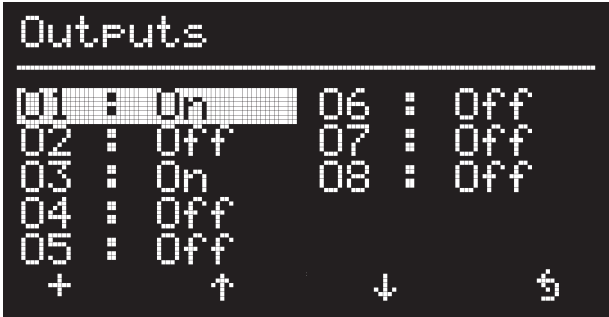
10.3.5 Inputs and Outputs Display:

All inputs and outputs can be displayed easily through the Quick Menu. For that, select option 1 . 06 - Inputs and outputs and press the **SET** key.



The inputs and outputs display has five screens. To navigate between the screens press the **UP** and **DOWN** keys.

The first screen displays the status of the digital outputs (relays), which are represented by the letter O followed by the output number, from 1 to 8. Their value can be On or Off.



The last three screens display the status of the analog (temperature and voltage) and digital inputs.

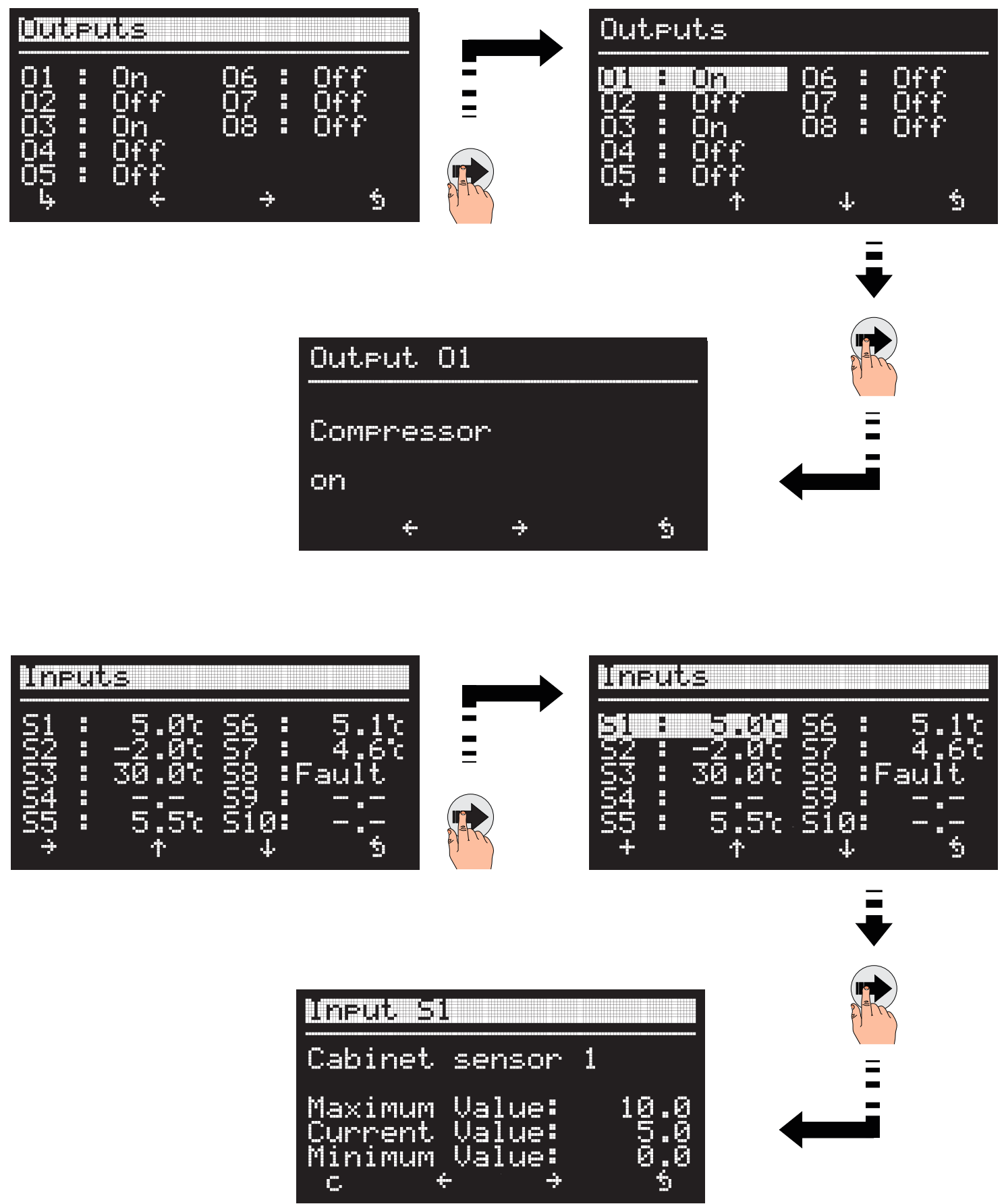
Temperature sensors are represented by the letter S followed by their number, from 1 to 10. Their current values are displayed in the selected unit (°C or °F). Disabled sensors are displayed as -.-.

Voltage monitors are represented by the letter V followed by their number, from 1 to 2. Their current values are displayed in volts (V).



Digital inputs are represented by the letter I followed by the input number, 1. Its value can be On, if the input is closed, or Off, if it is open.

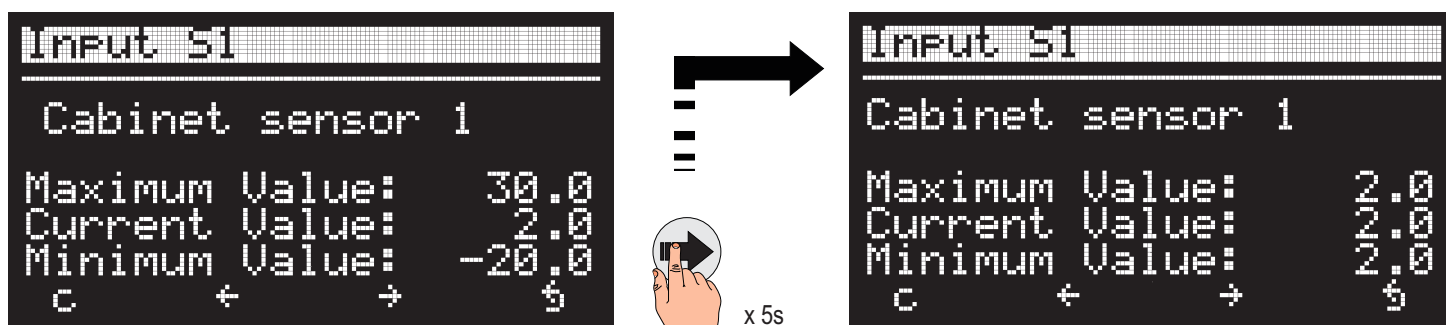
For more details about the status of an input or output, press the **SET** key on its respective screen. Navigate to it using the **UP** and **DOWN** keys and press **SET** to open the screen.



The equipment stores the minimum and maximum values of each analog input since power-up. It is possible to clear the maximum and minimum logs of each input individually.

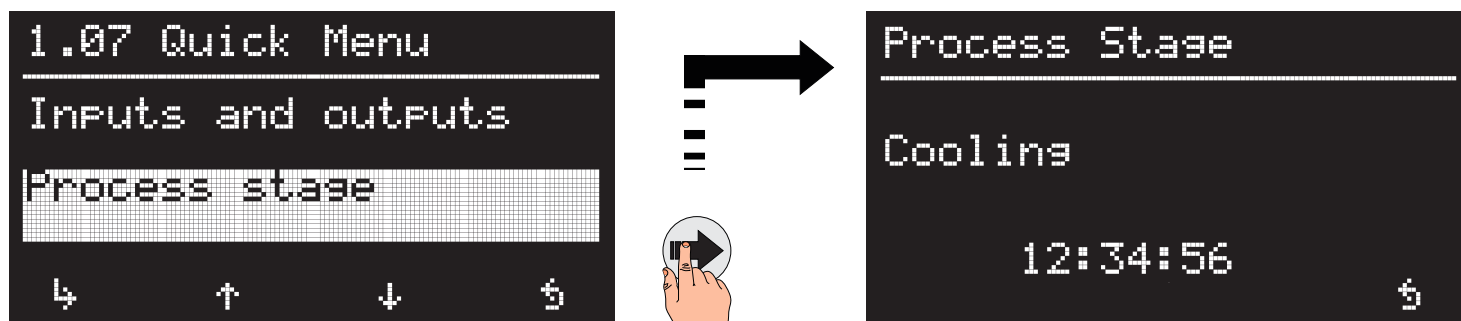
10.3.6 Clear Maximum and Minimum of Analog Inputs:

To clear the maximum and minimum records of an analog input, select the desired input through the Inputs and Outputs Display Screen and confirm by pressing the **SET** key. Then press the **SET** key for 5 seconds.



10.3.7 Process Stage:

To check the current stage of the refrigeration process in the controller and the time elapsed in this stage, access item 1.07 Process stage, in the Quick Menu, and press the **SET** key.

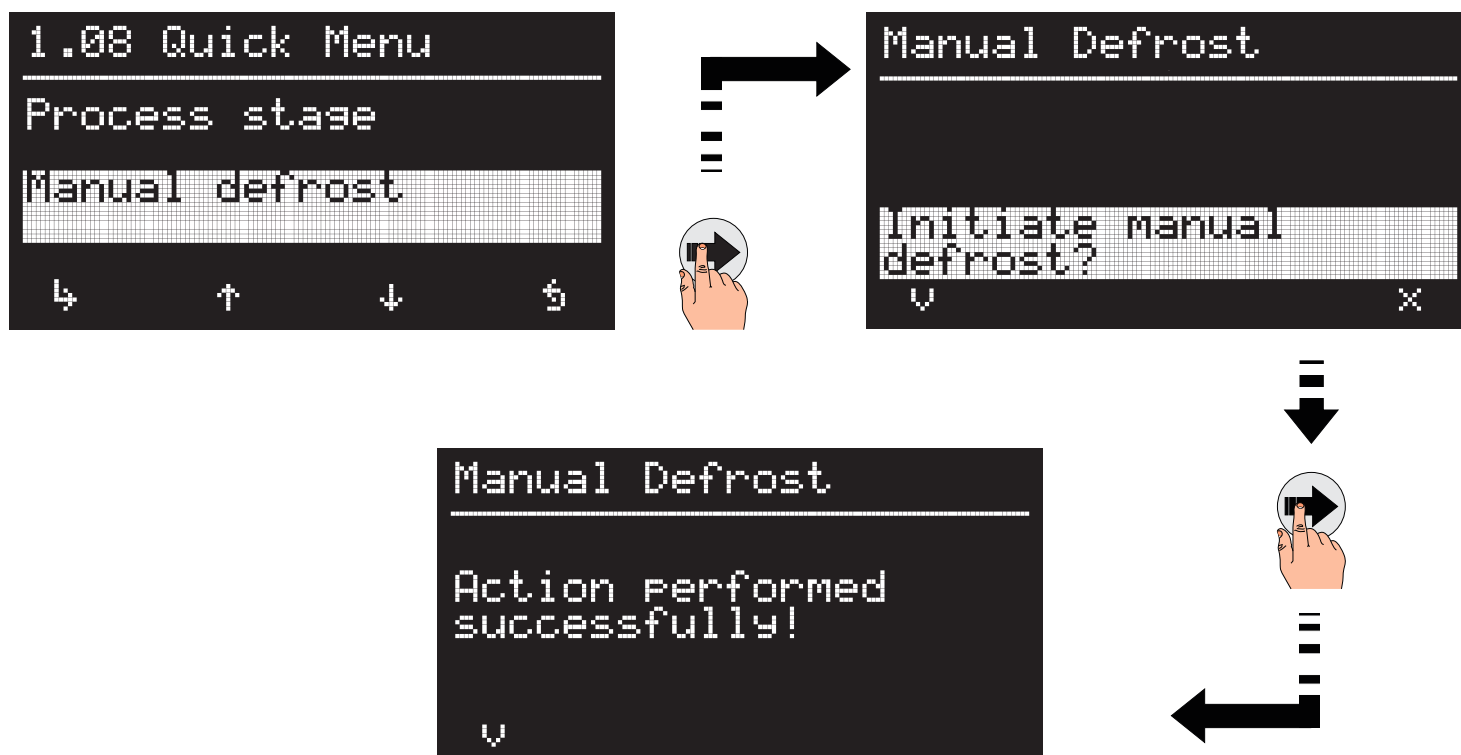


The process stages are:

- Startup Delay; - Refrigeration; - Pre-defrost; - Defrost; - Drainage; - Fan Delay

10.3.8 Manual Defrost:

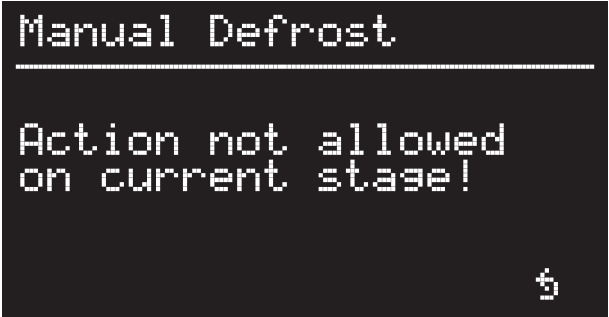
It is possible to manually start or end a defrost cycle, if necessary. To execute this action, select item 1.08 – Manual defrost, in the Quick Menu, and press the **SET** key. Then press **SET** again to confirm the action.



The defrost start and end actions have some restrictions. Namely:
Equipment defrost must be enabled: F3. 09 – Defrost type must be different from 0 (Disabled);
To start a manual defrost, the process must be in one of the following stages:

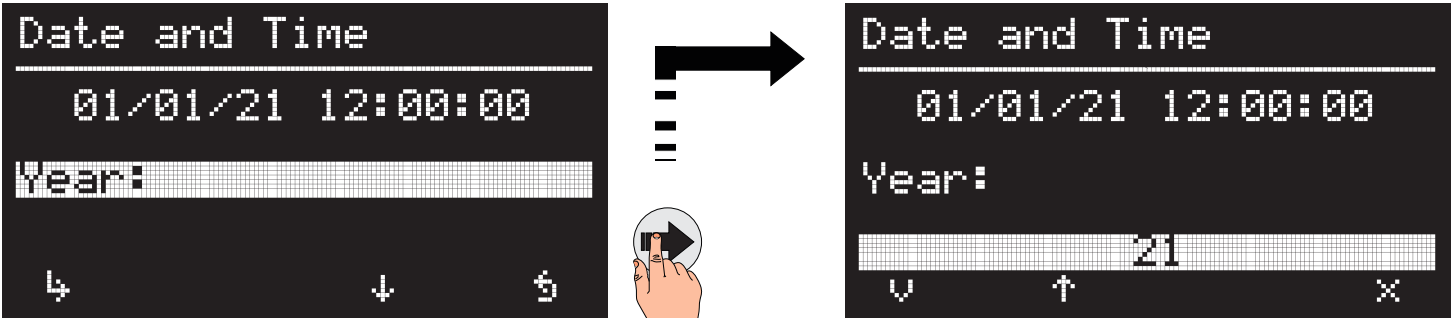
- 1. Refrigeration;
- 2. Fan Delay;
- 3. To start a manual defrost, the values read by the ambient (S1 or S4) and evaporator (S2) sensors must obey the following restrictions:
- 4. Ambient sensor: (S1 or S4) < F3. 15 – Ambient temperature to end defrost;
- 5. Evaporator sensor: (S2) < F3. 14 – Evaporator temperature to end defrost;
- 6. Evaporator sensor: (S2) < F3. 12 – Minimum temperature of the evaporator to start manual defrost;
- 7. To start a manual defrost, the process must be in one of the following stages;
- 8. Pre-defrost;
- 9. Defrost.

When the current stage of the process is not one of those listed to start or end the defrost, the controller displays the message shown to the side.
In this case, you have to wait until the process advances to the next stage (timed) so that a new attempt can be made.



10.3.9 Date and Time

To change the equipment's date and time, select item 1. 09 Date and Time in the Quick Menu and press the **SET** key.
The Date & Time Screen displays the current date and time. To set, navigate the Year, Day, Month, Hour, Minute and Second fields using the **UP** and **DOWN** keys and select it by pressing the **SET** key.



Select the field value using the **UP** and **DOWN** keys. Confirm the setting by pressing **SET** or cancel by pressing **BACK**. The time change is applied after setting each field.

10.3.10 Language

The equipment can be operated in three languages:
- Portuguese;
- English;
- Spanish.

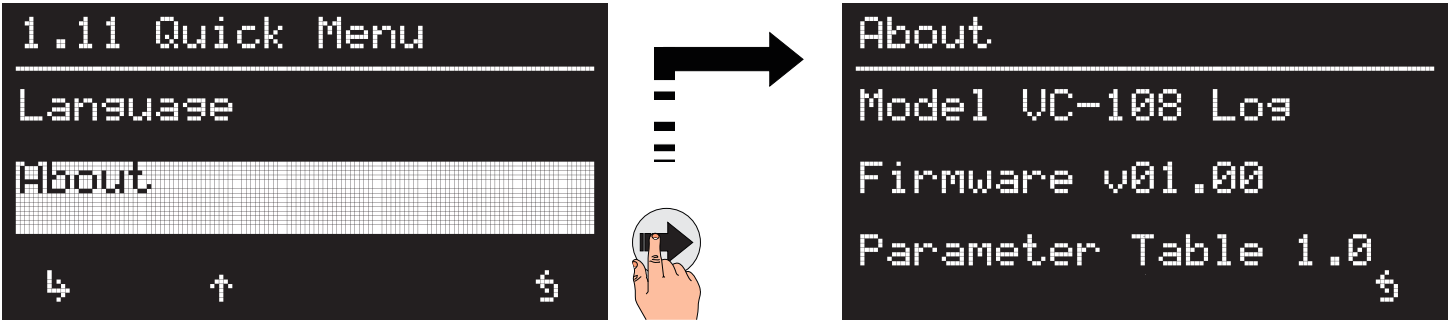
To change the language, select item 1. 10 Language in the Quick Menu and press the **SET** key.

Select the desired language using the **UP** and **DOWN** keys and confirm by pressing the **SET** key.



10.3.11 About the Equipment

To view basic information about the controller, access item 1 . 1 1 About, in the Quick Menu, and press the **SET** key. The equipment model, *firmware* version and Parameter Table version are displayed in sequence.



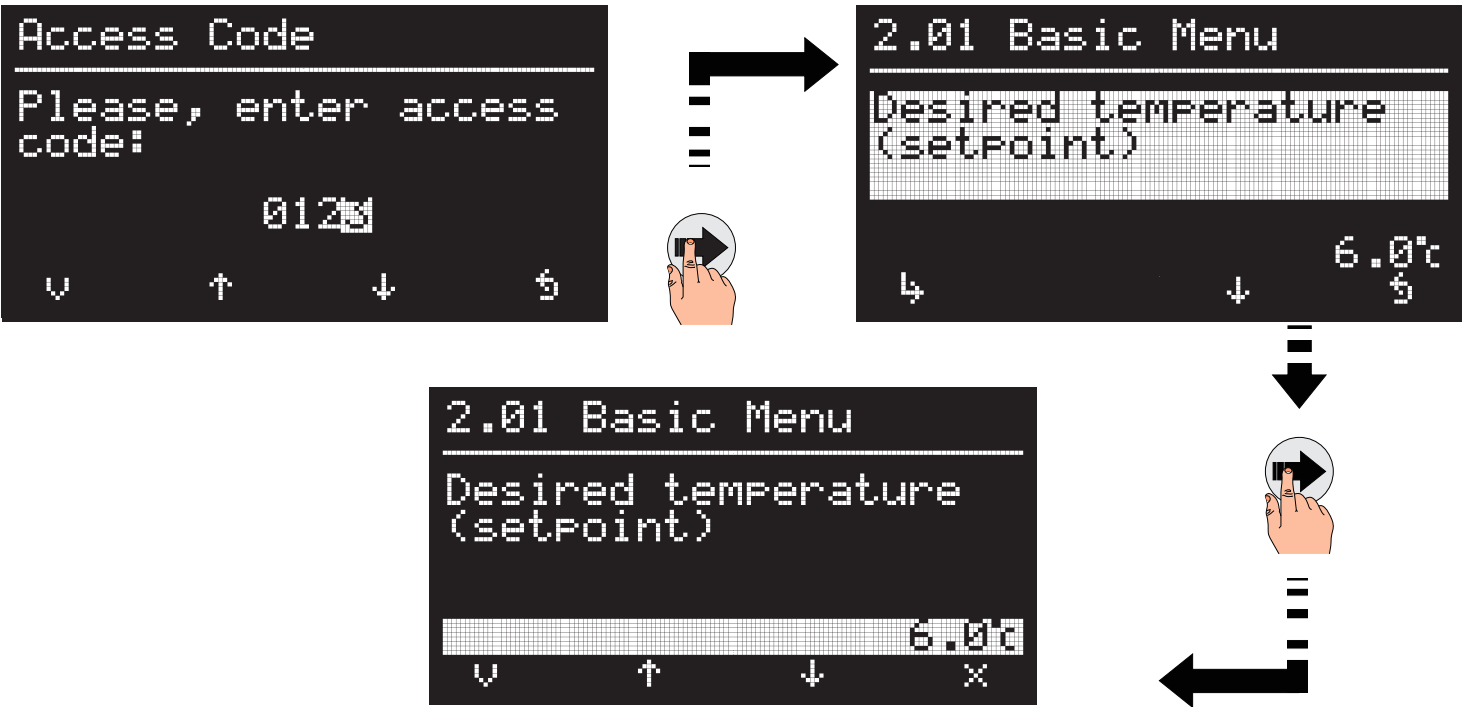
10.4 Basic and Advanced Menus

The Basic Menu contains user-level parameters. The Advanced Menu contains technical-level parameters. They can be accessed by selecting item 1 . 01 Access code from the Quick Menu and entering the code:

- 0123 for the Basic Menu;
- 0456 for the Advanced Menu.

The screen elements of the Basic and Advanced Menus are listed below:

- 1. Parameter number;
- 2. Parameter name;
- 3. Parameter value.



To select the parameters, use the **UP** and **DOWN** keys. Confirm the parameter you wish to set with the **SET** key. Use the **UP** and **DOWN** keys to change the parameter value and press **SET** to set. If you want to cancel editing, press the **BACK** key.

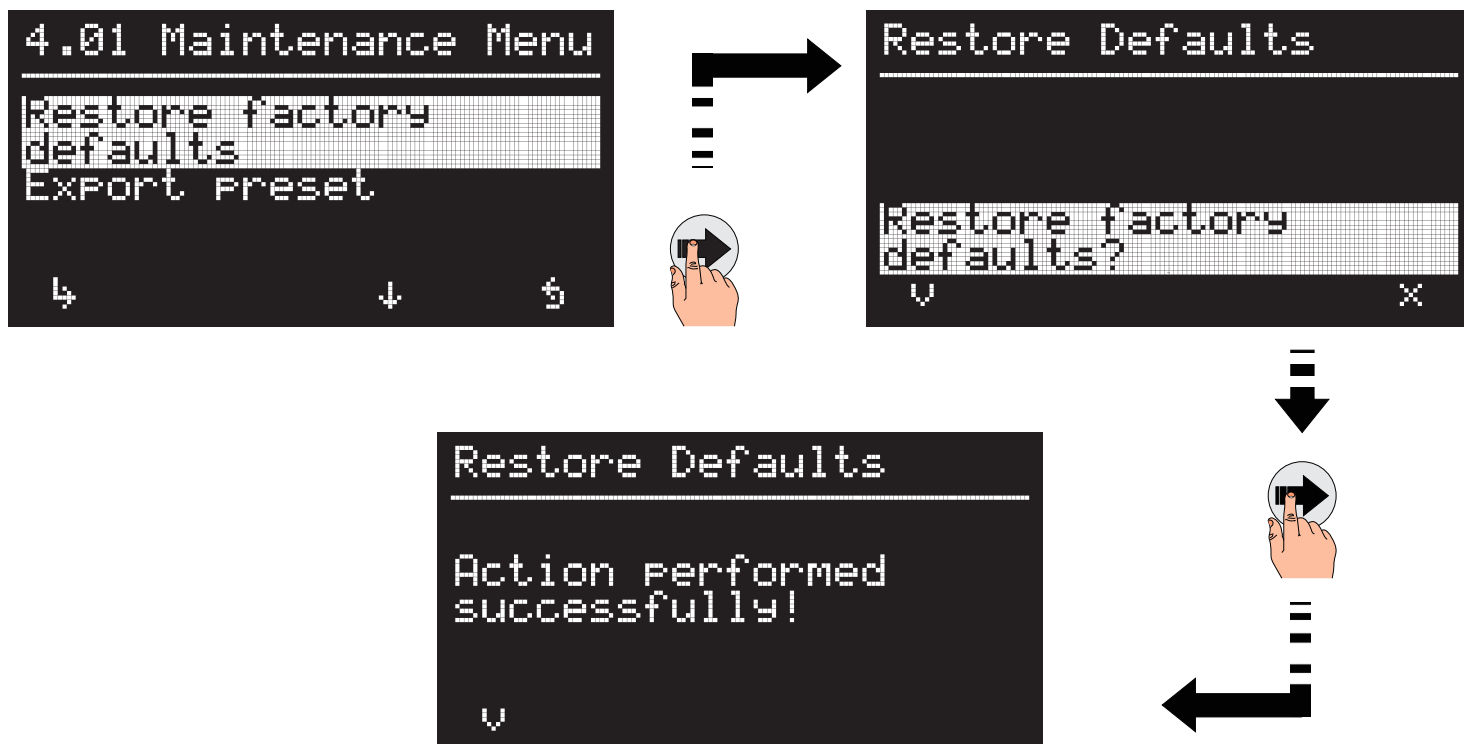
10.5 Maintenance Menu:

The Maintenance Menu offers functions intended to the vaccine refrigerator manufacturer. It can be accessed from the Quick Menu, selecting 1. 01 - Access code and entering code 0789.

10.5.1 Restore Factory Values:

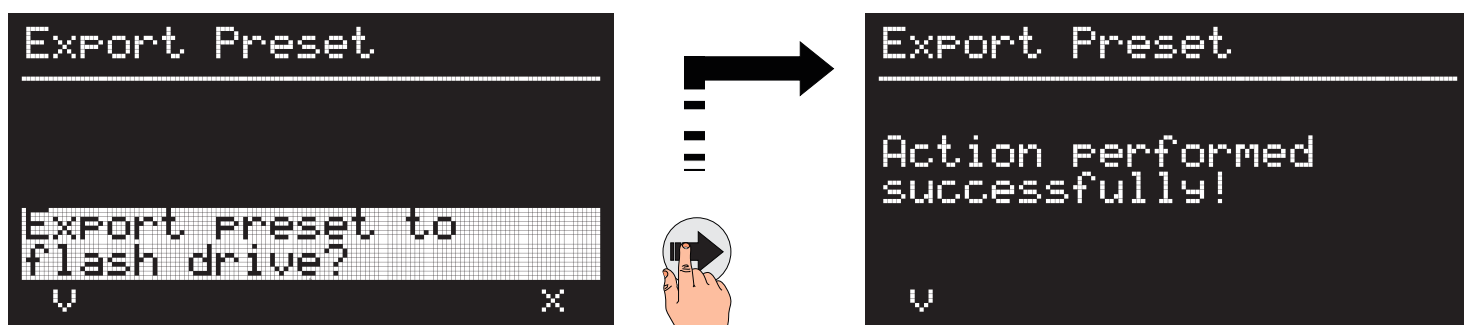
This action resets all parameters to the default values (see PARAMETER TABLE), including the Language and Equipment Name. This action cannot be undone, so proceed with great caution.

In the Maintenance Menu, select item 4. 01 Factory Reset and press the **SET** key.



10.5.2 Export preset:

The vaccine refrigerator controller allows the user to import and export recipes, which are files containing all the parameters of the controller. To export a preset with all the current parameters of the controller, insert a flash drive into the USB port, access item 4. 02 Export preset, from the Maintenance Menu, and press the **SET** key.



Warning: During the preset export process, **DO NOT REMOVE THE FLASH DRIVE** from the USB port and **DO NOT TURN OFF THE EQUIPMENT**.

The parameters are exported to a file named according to the following format:

VC-108_YYMMDD-hhmm.rec

Where:

- YYMMDD: Current date, in the year, month, day format;
- hhmm: Current time, in the hour, minute format.

The file is saved in the **VC-108** directory in the flash drive's root file system. If the directory does not exist, it will be created when exporting.



Notes: The flash drive used to export must have at least **1 MiB of free space**.



Notes: If the **VC-108** directory already has a file with the same name, a number is appended to the end of the file name, according to the format **VC-108_YYMMDDhhmm_1.rec**.

10.5.3 Import preset

```

▼ Pen Drive
  ▼ VC-108
    VC-108_2001010800.rec
    VC-108_2002011617.rec
    VC-108_2003250901.rec
  
```

Just as it is possible to export a preset containing the controller parameters, it is also possible to import a preset exported from another controller or created through **Sitrad^{PRO}** preset generator. A preset file with **.rec** extension must be placed inside a directory called **VC-108** located in the flash drive's root file system.



Notes: The device is capable of listing up to 32 update files. To ensure they are displayed properly, it is recommended that filenames, including extensions, do not exceed 42 characters.

To import a preset to the controller, insert a flash drive into the USB port, access item **4.03 - Import preset**, from the Maintenance Menu, and press the **SET** key.



Note: Recipes do not include the **Equipment name** parameter.

Then select the desired preset from the list displayed by the controller using the **UP** and **DOWN** keys, and press the **SET** key.



Important: The preset includes the parameter **F3.67 - Sitrad_Address**. Keep this in mind when copying the same preset to controllers in the same network.

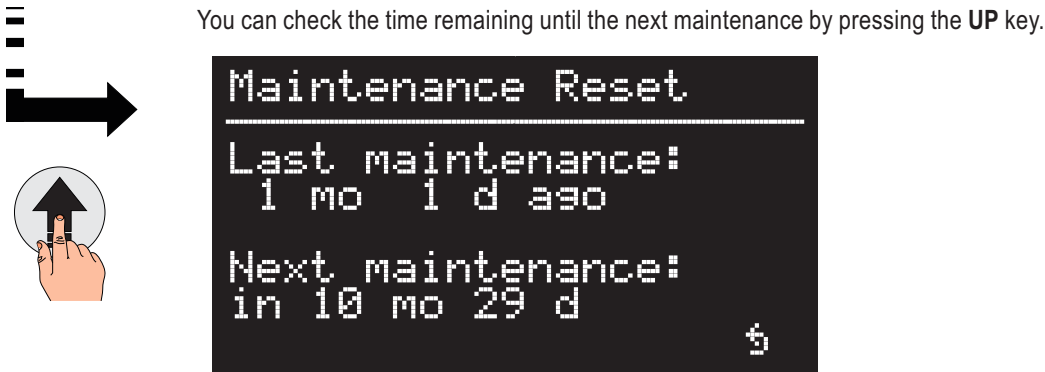
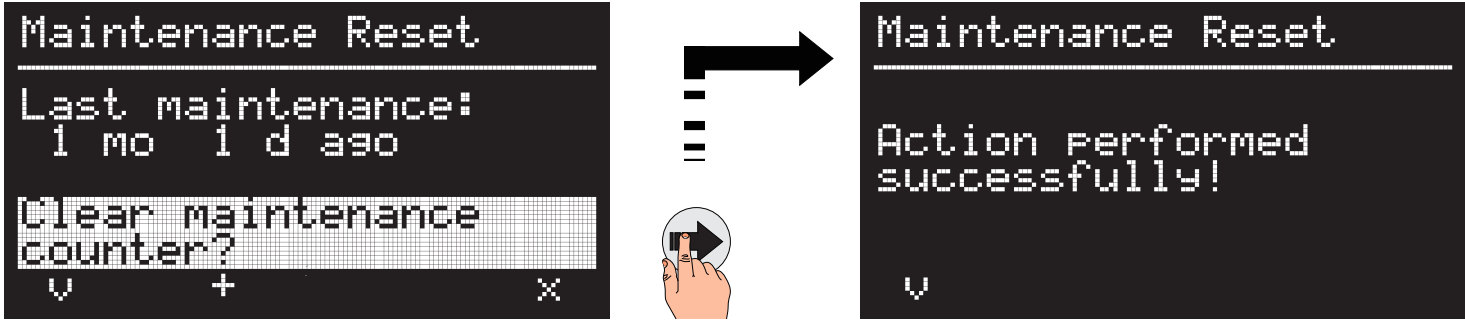
10.5.4 Update Firmware

To start a firmware update, enter the Maintenance Menu, select item 4 . 04 - Update Firmware and press the SET key. Learn more about firmware update in Chapter 14 - Firmware Update.

10.5.5 Maintenance Reset:

To display or reset the maintenance counter, select item 4 . 05 Maintenance reset from the Maintenance Menu.

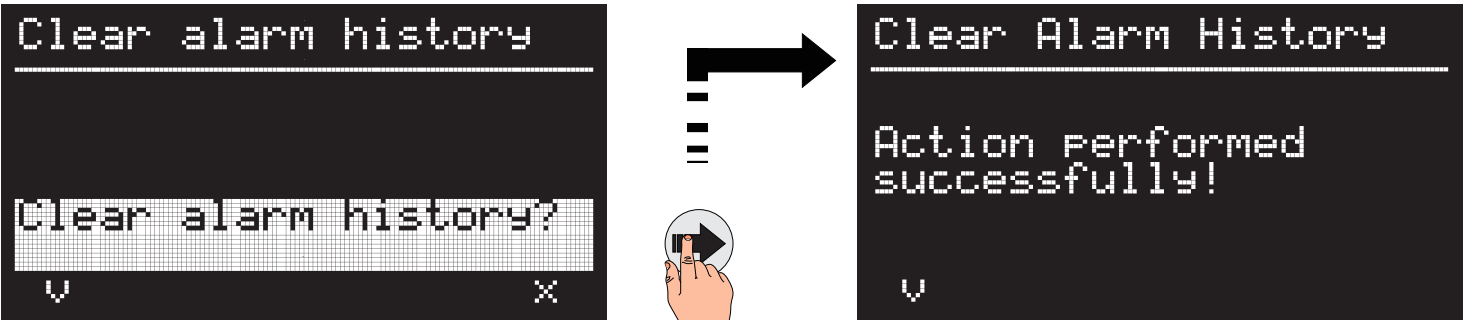
The Maintenance Reset Screen displays the time elapsed since the last recorded maintenance, in months and days. To reset the maintenance counter, confirm the action by pressing **SET**.



Note: If maintenance is disabled (F3 . 65), the following message will be displayed: Maintenance is disabled.

10.5.6 Clear Alarm History

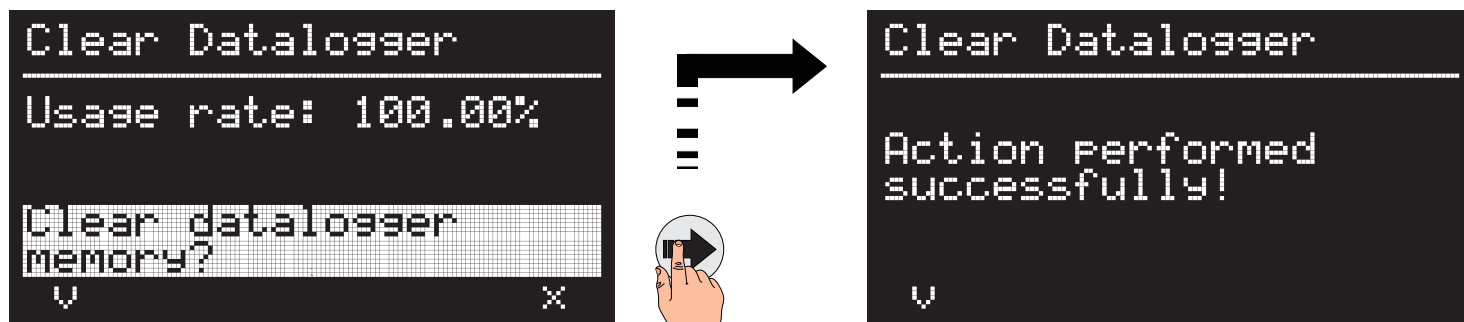
To clear the equipment's alarm history, select item 4 . 06 Clear alarm history from the Maintenance Menu and press the **SET** key. Confirm the action by pressing **SET** again.



Notes: When clearing the alarm history, active alarms are not affected. They remain active and when they are deactivated they will be displayed in the history as usual.

10.5.7 Clear Datalogger

To clear all the datalogger records, select item 4 - 07 Clear datalogger and press the **SET** key. Confirm the action by pressing **SET** again.



10.6 Equipment Name

The equipment name is displayed on the Main Screen and can be used to differentiate controllers according to the products they store. It also serves to differentiate the equipment when log files are exported.

To change the equipment name, select item 1 - 01 Access code in the Quick Menu and enter code 0234.



The name has up to 26 characters split into two lines of 13 characters each. This is the name display format on the Main Screen.

The Equipment Name Screen displays the name edit space blank, and highlights the character being set. Use the **UP** and **DOWN** keys and select one of the characters, which are: **A-Z, a-z, -, [and]**. Use the **BACK** key to advance to the next character. When the last character is selected, pressing the **BACK** key returns the selection to the first.

The name change cannot be canceled, only confirmed, so be very careful when setting. Use the **SET** key to store the name in the memory.

11. PARAMETERS TABLE

BASIC (PASSWORD 0123)

FUN	FUNCTION	DESCRIPTION	MIN	MAX	UNIT	
F2.01	Temperature setpoint	Control temperature. When the temperature of the ambient sensor (S1 or S4) is lower than the value set for this function, the compressor will be turned off.	F3.01	F3.02	°C (°F)	6,0 (42,8)
F2.02	Ambient sensor low temperature alarm (S1)	When the temperature of the ambient sensor (S1) is below this value, the alarm (buzzer) will be activated. If the alarm persists, the alarm relay will be activated after the time set in F3.32. Note: To validate this alarm, sensor S1 will always be used. If sensor S1 fails, sensor S4 will be used, but only if it is enabled in F3.47.	-50,0 (-58,0)	F2.03	°C (°F)	0,0 (32,0)
F2.03	Ambient sensor high temperature alarm (S1)	When the temperature of the ambient sensor (S1) is above this value, the alarm (buzzer) will be activated. If the alarm persists, the alarm relay will be activated after the time set in F3.32. Note: To validate this alarm, sensor S1 will always be used. If sensor S1 fails, sensor S4 will be used, but only if it is enabled in F3.47.	F2.02	105,0 (221,0)	°C (°F)	10,0 (50,0)
F2.04	Lamp on time	Length of time the lamp remains on after the equipment is turned on or after the lamp key is pressed.	0 [0 f f]	9999	seconds	120
F2.05	Open door alarm time	How long the door must remain open to activate the alarm (buzzer)	0 [0 f f]	9999	seconds	120

ADVANCED (PASSWORD 0456)

FUN	FUNCTION	DESCRIPTION	MIN	MAX	UNIT	DEFAULT
F3.01	Minimum temperature setpoint allowed to the end user	Limits set in order to avoid excessively high or low temperatures being accidentally set for the temperature setpoint, which could lead to high energy consumption by keeping the system on continuously.	-50,0 (-58,0)	F3.02	°C (°F)	2,0 (35,6)
F3.02	Maximum temperature setpoint allowed to the end user		F3.01	105,0 (221,0)	°C (°F)	8,0 (46,4)
F3.03	Control differential (hysteresis)	Temperature control differential in relation to the setpoint. When the temperature of the ambient sensor (S1 or S4) is greater than F2.01+F3.03, the compressor will be turned on.	0,1 (0,2)	20,0 (36,0)	°C (°F)	2,0 (3,6)
F3.04	Minimum time for compressor to be on	Minimum length of time the compressor will be on, i.e. the time between the last start and the next stop. This helps to avoid power surges in the mains.	0 [0 f f]	9999	seconds	0 [0 f f]
F3.05	Minimum time for the compressor to be off	Minimum length of time the compressor will be off, i.e. the time between the last stop and the next start. This helps to relieve the discharge pressure and increases the working life of the compressor.	0 [0 f f]	9999	seconds	120
F3.06	Length of time the compressor is on, if there is an error from the ambient sensor (S1 or S4)	If the ambient sensor (S1) is disconnected or out of the measurement range, the compressor will switch on or off according to the parameters set in these functions. Note: If sensor S4 is enabled in F3.47, control will operate based on the value of sensor S4.	0 [0 f f]	999	minutes	20
F3.07	Length of time the compressor is off, if there is an error from the ambient sensor (S1 or S4)		0 [0 f f]	999	minutes	10
F3.08	Delay when powering up the controller	When the instrument is turned on, it can remain disabled for a while, delaying the start of the process. During this time it only works as a temperature indicator. Helps to avoid power peaks, when power returns after outage, when several devices are connected to the same line. For that to work you should set different times for each device. This delay can be from the compressor or defrost (if defrost upon controller start is enabled in F3.11).	0 [0 f f]	999	minutes	0 [0 f f]
F3.09	Defrost type	0 - Disabled : There is no defrost cycle; 1 - Natural : Only the fan output is on; 2 - Resistance : Only the defrost output is on; 3 - Hot Gas : Compressor and defrost outputs are on.	0	3	-	2
F3.10	Interval between defrost cycles	Determines how often the defrost cycle will be carried out, counting time from the end of the previous defrost.	1	9999	minutes	240
F3.11	Defrost when the controller is powered on	This enables a defrost cycle to be conducted when the controller is powered on, for example, when the power returns after an outage.	0 (No)	1 (Yes)	-	0 (No)
F3.12	Minimum evaporator temperature (sensor S2) to start manual defrost	For a user-initiated manual defrost set through the quick menu, the evaporator temperature (sensor S2) must be below this value. Otherwise, the action will be dismissed.	-50,0 (-58,0)	105,0 (221,0)	°C (°F)	5,0 (41,0)
F3.13	Pre-defrost length (collecting in gas)	When the defrost cycle starts, the controller will turn only the fan on during this time, in order to take advantage of the residual energy of the gas.	0 [0 f f]	999	minutes	0 [0 f f]
F3.14	Evaporator temperature (S2 sensor) to end the defrost	If the temperature in the evaporator (sensor S2) reaches the set value, the defrost cycle will be halted, i.e. temperature controlled. This way, the defrost process is optimized.	-50,0 (-58,0)	105,0 (221,0)	°C (°F)	30,0
F3.15	Ambient temperature (S1 sensor) to end the defrost	If the ambient temperature (sensor S1 or S4) reaches the set value, the defrost cycle will be halted, i.e. temperature controlled.	-50,0 (-58,0)	105,0 (221,0)	°C (°F)	20,0 (68,0)

FUN	FUNCTION	DESCRIPTION	MIN	MAX	UNIT	DEFAULT
F3.16	Maximum time on defrost (for safety)	Maximum defrost duration. If, within this period, defrost is not ended by temperature (see parameters F3.14 or F3.15), the defrost will be ended by time.	1	999	minutes	30
F3.17	Drainage time (drip water from defrost)	Time required for dripping, that is, for the last drops of water to drain from the evaporator. During this period, all outputs remain off.	0 [0 ÷ 1]	999	minutes	0 [0 ÷ 1]
F3.18	Fan operation mode	0 - Dependent: The fan will be switched on with the compressor; 1 - Cyclical: The fan will stay on when the compressor is on. When the compressor is off, the fan will cycle according to the times set in F3.19 and F3.20. 2 - Continuous: The fan is always on.	0	2	-	0
F3.19	Fan on time	Length of time the fan will remain on in cyclic mode.	1	99	minutes	2
F3.20	Fan off time	Length of time the fan will remain off in cyclic mode.	1	99	minutes	8
F3.21	Turns off the fan when opening the door	Keeps the fan turned off while the door is open, to avoid heat exchange with the outside environment.	No	Yes	-	Yes
F3.22	High evaporator temperature (S2 sensor) to stop the fan	If the evaporator temperature (sensor S2) is above this value, the fan will be turned off. To turn the fan back on, a temperature differential of 2°C (3.6°F) will be observed. The purpose of this parameter is to turn off the fan until the ambient temperature approaches the design range of the refrigeration equipment, avoiding high temperatures and suction pressures that could damage the compressor. This is an ideal function when putting into operation an equipment that has been idle for a long time.	-50,0 (-58,0)	105,0 (221,0)	°C (°F)	50,0 (122,0)
F3.23	Evaporator temperature (sensor S2) to switch the fan back on after draining	After drainage is complete, a fan-delay cycle starts. The compressor will start up immediately, because the evaporator temperature is high, but the fan will only start after the evaporator temperature drops below the set value. This function is used to remove the heat still present in the evaporator due to defrosting, avoiding releasing it into the ambient.	-50,0 (-58,0)	105,0 (221,0)	°C (°F)	20,0 (68,0)
F3.24	Maximum time to turn the fan back on after draining	For safety, if the evaporator temperature does not reach the value set in function F3.23 or the S2 sensor is disconnected or fails, the fan will only come back on after the time set for this function has elapsed.	0 [0 ÷ 1]	999	minutes	1
F3.25	Temperature alarm hysteresis	When a high or low temperature alarm is active, to deactivate the alarm, the differential configured in this parameter will be respected.	0,1 (0,2)	20,0 (36,0)	°C (°F)	2,0 (3,6)
F3.26	Time to validate the temperature alarm	Minimum time spent in high or low temperature condition to activate the respective alarm. If set to 0 [0 ÷ 1], the alarm is activated as soon as its condition is satisfied.	0 [0 ÷ 1]	9999	seconds	30
F3.27	Alarm inhibit time upon power up	During this time the alarm remains off while waiting for the system to go back to operating mode.	0 [0 ÷ 1]	9999	minutes	120
F3.28	Alarm inhibition time after defrost	After a defrost cycle, temperature alarms will only be activated after this time has elapsed.	0 [0 ÷ 1]	9999	minutes	30
F3.29	High condenser temperature alarm (S3 sensor)	When the condenser temperature (sensor S3) is above this value, the alarm (buzzer) will be activated. To disable this alarm, a temperature differential of 4°C (7.2°F) will be considered. If function F3.46 is set to 0 [0 ÷ 1], this functionality will be disabled.	-50,0 (-58,0)	105,0 (221,0)	°C (°F)	10,0 (50,0)
F3.30	Time for alarm of compressor on without reaching setpoint	If the compressor remains on for a time longer than that configured in this function without reaching the setpoint, the alarm (buzzer) will be activated. If set to 0 [0 ÷ 1], this alarm will be disabled.	0 [0 ÷ 1]	9999	minutes	0 [0 ÷ 1]
F3.31	Time to silence the alarm automatically	Once activated, the alarm (buzzer and relay) will be automatically silenced after this time has elapsed. If set to 59 [0 ÷ 1], the alarm will be active until the user silences it by pressing the silence key or until the alarm condition clears.	59 [0 ÷ 1]	9999	seconds	600
F3.32	Delay for triggering the alarm relay	After the alarm (buzzer) is activated, the alarm relay will only be activated after this time has elapsed. If set to 0 [0 ÷ 1], the alarm relay will be activated simultaneously with the buzzer. Note 1: The alarm relay will only be activated in the following situations: - High or low temperature alarm; - Simulation of high or low temperature alarm; - Failure in the S1 temperature sensor; - Failure in the S4 temperature sensor; - Power failure if enabled in F3.36. Note 2: If function F3.33 is set to 0 [0 ÷ 1], the alarm relay will not be activated.	0 [0 ÷ 1]	9999	seconds	10
F3.33	Alarm on relay time	Set the behavior of the alarm relay after its activation. If both parameters are enabled, the relay alternates and is on for the time set in F3.33 and off for the time set in F3.34. If F3.33 is 0 [0 ÷ 1], the alarm relay will not turn on. Otherwise, if F3.34 is 0 [0 ÷ 1], the relay will remain on continuously.	0 [0 ÷ 1]	9999	seconds	60
F3.34	Alarm off relay time					
F3.35	Enable alarm output in low and high temperature simulation (alarm test)	Delay time for activating the alarm relay only in high and low temperature alarm simulation commands, accessed from the quick menu. If enabled, the simulation will behave like a normal low or high temperature alarm. If set to 9 [0 ÷ 1], the simulation will last for 10 seconds and will terminate without triggering the relay.	9 [0 ÷ 1]	9999	seconds	600
F3.36	Enable alarm output on power failure	Delay time for activating the alarm relay only when there is a power failure. If set to 0 [0 ÷ 1], only the buzzer will be activated, according to the logic described in parameter F3.62.	0 [0 ÷ 1]	9999	minutes	1

FUN	FUNCTION	DESCRIPTION	MIN	MAX	UNIT	DEFAULT
F3. 37	Minimum voltage (DC) for the controller power supply	If the controller power supply voltage drops below this value, the alarm (buzzer) is activated.	10,6	F3. 38	Vdc	11,0
F3. 38	Maximum voltage (DC) for the controller power supply	If the controller power supply voltage surges over this value, the alarm (buzzer) is activated.	F3. 37	16,0	Vdc	16,0
F3. 39	Controller power supply voltage (DC) alarm time	Minimum time spent in high or low voltage (DC) condition to activate the respective alarm. If set to 0 [0 f f], the alarm is activated as soon as its condition is satisfied.	2	30	seconds	5
F3. 40	Power supply voltage (DC) offset	Allows compensating for any deviations in the supply voltage reading.	-5,0	5,0	Vdc	0,0
F3. 41	Selection of the ambient temperature sensor to control the refrigeration process	Defines which ambient temperature sensor will be used for process control. Note 1: Even if sensor S4 is selected, the value measured by sensor S1 will still be displayed on the screen, and temperature alarms will be triggered by S1. Note 2: If the selected sensor fails, the other sensor will be used to control the process and temperature alarms, provided it is enabled (in the case of S4, by F3. 47 - sensor S1 is always enabled).	S1 (Glycerol)	S4 (Air)	-	S1 (Glycerol)
F3. 42	Intensity of the digital filter applied to sensor S1 (ambient 1 - glycerol)	Time for the recorded temperature to vary by 0.1°C when the temperature rises or falls. Note 1: If sensor S1 is selected in F3. 41 and fails, F3. 42 will be used as a filter applied to sensor 4, if it is enabled in F3. 47. Note 2: A typical use for this type of filter is in freezers for ice cream and frozen foods. When the door is opened, a quantity of hot air will fall directly on the sensor, causing a rapid rise in the temperature reading and, often, activating the compressor unnecessarily.	0 [0 f f]	20	seconds	0 [0 f f]
F3. 43	Intensity of the digital filter applied to sensor S4 (ambient 2 - air)		0 [0 f f]	20	seconds	0 [0 f f]
F3. 44	S1 sensor (ambient 1 - glycerol) indication offset	It allows compensating for possible deviations in the reading of the temperature sensor when changing the sensor or changing the cable length.	-20,0 (-36,0)	20,0 (36,0)	°C (°F)	0,0 (0,0)
F3. 45	S2 sensor (evaporator) indication offset		-20,0 (-36,0)	20,0 (36,0)	°C (°F)	0,0 (0,0)
F3. 46	S3 sensor (condenser) indication offset		-20,1 (-36,2) [0 f f]	20,0 (36,0)	°C (°F)	-20,1 (-36,2)
F3. 47	S4 sensor (ambient 2 - air) indication offset		-20,1 (-36,2) [0 f f]	20,0 (36,0)	°C (°F)	-20,1 (-36,2)
F3. 48	S5 (drawer 1) sensor indication offset		-20,1 (-36,2) [0 f f]	20,0 (36,0)	°C (°F)	-20,1 (-36,2)
F3. 49	S6 (drawer 2) sensor indication offset	Allows you to compensate for any deviations in the temperature reading of the sensor in question, arising from the change of the sensor or change in the cable length. The sensor can be disabled by setting the function to the minimum value [0 f f]. In this condition, all functions that depend on the reading of the sensor in question stop working.	-20,1 (-36,2) [0 f f]	20,0 (36,0)	°C (°F)	-20,1 (-36,2)
F3. 50	S7 (drawer 3) sensor indication offset		-20,1 (-36,2) [0 f f]	20,0 (36,0)	°C (°F)	-20,1 (-36,2)
F3. 51	S8 (drawer 4) sensor indication offset		-20,1 (-36,2) [0 f f]	20,0 (36,0)	°C (°F)	-20,1 (-36,2)
F3. 52	S9 (drawer 5) sensor indication offset		-20,1 (-36,2) [0 f f]	20,0 (36,0)	°C (°F)	-20,1 (-36,2)
F3. 53	S10 (drawer 6) sensor indication offset		-20,1 (-36,2) [0 f f]	20,0 (36,0)	°C (°F)	-20,1 (-36,2)
F3. 54	Sampling period (time between memory records)	Interval between periodic datalogger records. Sets the duration time of the datalogger approximately.	30	999	seconds	300
F3. 55	Minimum variation in temperature to force writing data to memory	Minimum variation in ambient temperature in relation to the last datalogger record to force the writing of a new record before the time set in F3. 54. If set to 0 [0 f f], no records will be written due to temperature variation. Note: Inserting a record due to variation does not affect the datalogger period, that is, the next periodic record will be made at a fixed interval in relation to the last periodic record.	0,0 (0,0) [0 f f]	20,0 (36,0)	°C (°F)	0 [0 f f]
F3. 56	Variation of digital input, voltage monitor or outputs to force writing data	If enabled, it forces the writing of a new record before the time set in F3. 54 if there a change in a digital input, relay or the mains voltage. If set to 0 [0 f f], no records will be written due to temperature variation. Note: Inserting a record due to variation does not affect the datalogger period, that is, the next periodic record will be made at a fixed interval in relation to the last periodic record.	No	Yes	-	No
F3. 57	Overwrite old records when memory is full	If enabled, when the datalogger memory is full, new records will be written over the oldest records, that is, the oldest data will be lost. If disabled, when the datalogger memory is full, new records will not be saved, that is, the most recent data will be discarded.	No	Yes	-	Yes
F3. 58	Minimum AC operating voltage	If the mains voltage is outside this range, it activates the alarm (buzzer) and deactivates the loads. If the F3. 62 emergency mode control is enabled, the emergency system activation process is started.	90	F3. 54	Vac	90
F3. 59	Maximum AC operating voltage		F3. 53	265	Vac	140

FUN	FUNCTION	DESCRIPTION	MIN	MAX	UNIT	DEFAULT
F3.60	AC voltage validation time	Minimum time spent under AC voltage out of range or power failure condition to activate the respective alarm. If set to 0 [0 ff], the alarm is activated as soon as its condition is satisfied.	0 [0 ff]	99	seconds	3
F3.61	AC voltage validation time upon powering on the equipment	If the F3.62 emergency mode control is enabled, wait this time when powering up the equipment to ensure mains stability.	0 [0 ff]	999	seconds	30
F3.62	Enables emergency mode control	It must be enabled if the equipment has an emergency system with a battery and inverter to activate the loads in case of power failure or AC voltage outside the operating range.	No	Yes	-	Yes
F3.63	Minimum time in emergency mode	After detecting a fault in the mains and activating the emergency system, the controller will be powered by the emergency system for a period equal to or longer than that set in this function, even if power is restored earlier. This function is ignored if function F3.62 is set to 0 [0 ff].	2	20	minutes	15
F3.64	AC voltage indication offset	Allows you to compensate for any deviations in the voltage reading of the mains power.	-20	20	Vac	0
F3.65	Maintenance interval	After this length of time the controller will display a warning message requesting periodic maintenance to be performed. The maintenance counter can be reset from the maintenance menu. If set to 0 [0 ff], no warning will be displayed to the user, but time will be counted. Note: Time is counted in days. For a day to be counted, the equipment must be powered continuously for 24 hours.	0 [0 ff]	12	months	0 [0 ff]
F3.66	Temperature unit	Selects the temperature unit for the display and parameter setting.	Celsius (°C)	Fahrenheit (°F)	-	Celsius (°C)
F3.67	Device address on the RS-485 network	Address for communication with the Sitrad supervisory. The device address must be unique in the network.	1	247	-	1

12. PROCESS CONTROL

The refrigeration process control takes into account the temperatures measured in the ambient sensors (S1 or S4) and in the evaporator sensor (S2):

- The ambient sensor is used to control the temperature inside the F2.01 equipment and to detect the end of a defrost process F3.15;
- The evaporator sensor serves to detect the end of the defrost process (F3.14), to allow the start of a manual defrost cycle (F3.12) and to control the F3.22 and F3.23 fan actuation.



Note: The condenser (S3) and drawer (S5-S10) sensors do not influence the thermal process control.

12.1 Selection of Ambient Temperature Sensor:

The equipment provides two sensors for measuring ambient temperature:

- S1: Sensor located inside a capsule containing glycerol, to simulate the thermal behavior of the stored vaccines;
- S4: Sensor in direct contact with the air inside the equipment cabinet.

Only one of these sensors is used for control, according to parameter F3.41 - Selection of ambient temperature sensor for control. Based on this parameter, the following logic is respected:

- If F3.41 = S1 (Glycerol):
 - The S1 temperature is used for process control, display and alarms.
- If F3.41 = S4 (Air):
 - The S4 temperature is used for process control;
 - The S1 temperature is used for display and alarms.

If the sensor selected in F3.41 fails, the other sensor is used as backup, for process control, display and alarms.



Attention: When sensor S4 is not enabled, i.e., F3.47 - Sensor S4 (ambient 2 - air) indication offset = Off, parameter F3.41 is ignored. In this configuration, sensor S4 also cannot function as a substitute in case of failure of sensor S1.

13. EMERGENCY SYSTEM

This controller for vaccine refrigerators supports an emergency system, with inverter and battery logic. The emergency system is activated whenever there is a power outage or the mains voltage is outside the defined range.

The emergency system can be enabled by parameter F3.62 - Enable emergency mode control.

The following parameters interfere with the emergency system control:

- F3.58 - Minimum AC operating voltage;
- F3.59 - Maximum AC operating voltage;
- F3.60 - AC voltage validation time;
- F3.61 - AC voltage validation time when powering up the equipment;
- F3.62 - Enables emergency mode control;
- F3.63 - Minimum time in emergency mode.

13.1 Operation with the Emergency System Enabled

When the emergency system is enabled (F3.62 = Yes), the following rules are followed:

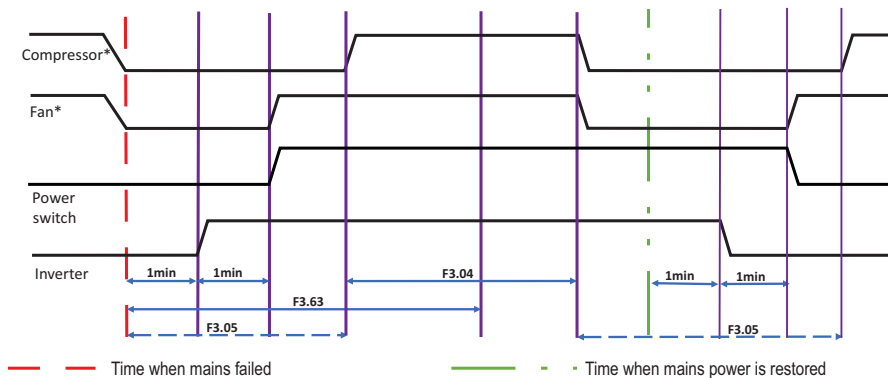
- It is considered a power supply failure when the mains voltage exceeds the limits defined in F3.58 and F3.59 for a time longer than F3.60;
- The mains voltage is considered reestablished when the mains voltage is back within the limits defined in F3.58 and F3.59 for a time longer than F3.60;
- When starting the equipment, the process control is only enabled after the time set in F3.61 has elapsed without mains voltage failure;
- When the mains is out, the **Compressor**, **Defrost** and **Fan** outputs are switched off;
- The Inverter relay is activated **1 minute** after the power outage;
- The Power Switch relay is activated **1 minute** after the Inverter relay;
- After the Power Switch relay is activated, the outputs are powered by the emergency system, and the **Compressor** and **Fan** outputs can be activated;
- Compressor activation always respects the time set in F3.05 - Minimum compressor off time;
- After the mains voltage is restored and after the time set in F3.63 has elapsed. The inverter output will remain activated for 1 minute and will then switch off.

Note: The inverter output will only switch off together with the compressor and fan outputs. If F3.04 > F3.63.

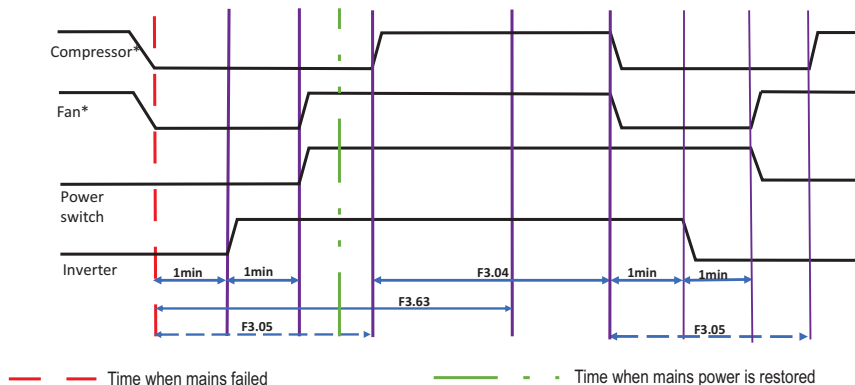
If the compressor is on, the time set in F3.04 - Minimum compressor on time is also respected before switching off the outputs;

- The **Power Switch** relay is deactivated **1 minute** after the Inverter relay;
- After turning off the power switch relay, the outputs are powered again by the mains, and all outputs can be activated when the time set in F3.05 elapses.
- When operating with the emergency system, the **Defrost relay is never activated**. If a defrost cycle occurs during this period, the defrost will proceed as **Natural**.

Example of power outage for a period longer than that set in F3.63

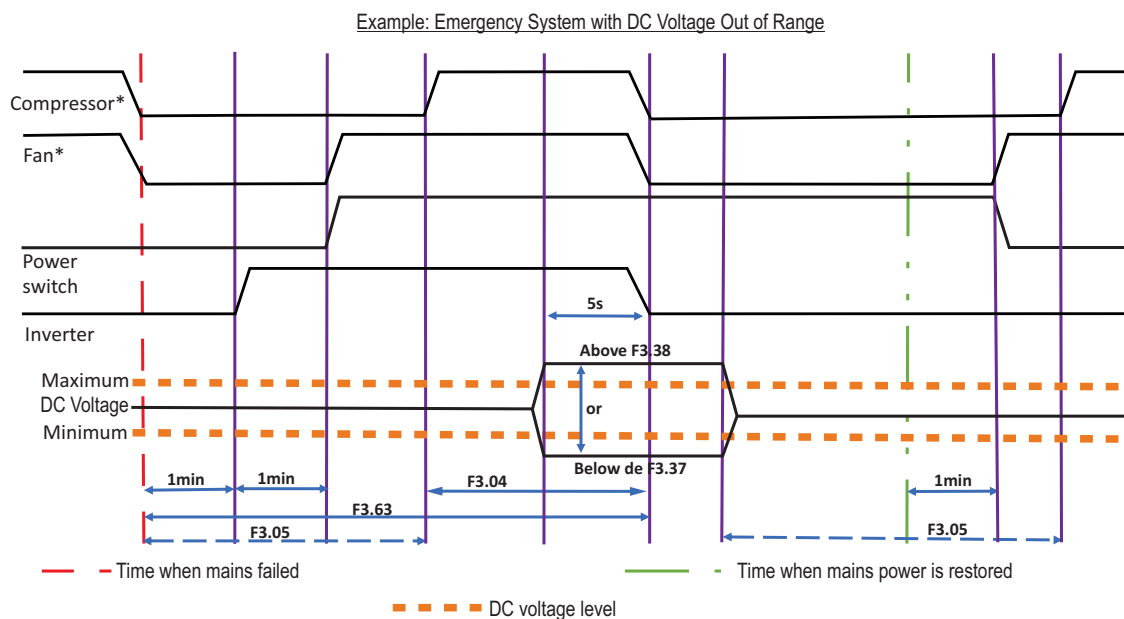


Example of a power outage for a period shorter than that set in F3.63



In the graphic, the activation of the Compressor and Fan relays indicate that the process control is allowed to activate these outputs. Depending on the control variables, they may or may not be switched on at this time.

If the DC voltage is outside the range set in F3.37 (Minimum DC voltage for the controller power supply) and F3.38 (Maximum DC voltage for the controller power supply) for a set period of 5s, all outputs will be turned off, including the inverter output, and only the Power Switch output will remain on. The equipment will remain in this condition until the AC power has returned and the set time of 1 min has elapsed to switch off the Power Switch relay.



Notes: The equipment leaves this state even if the DC voltage is outside this range, if AC power has returned.

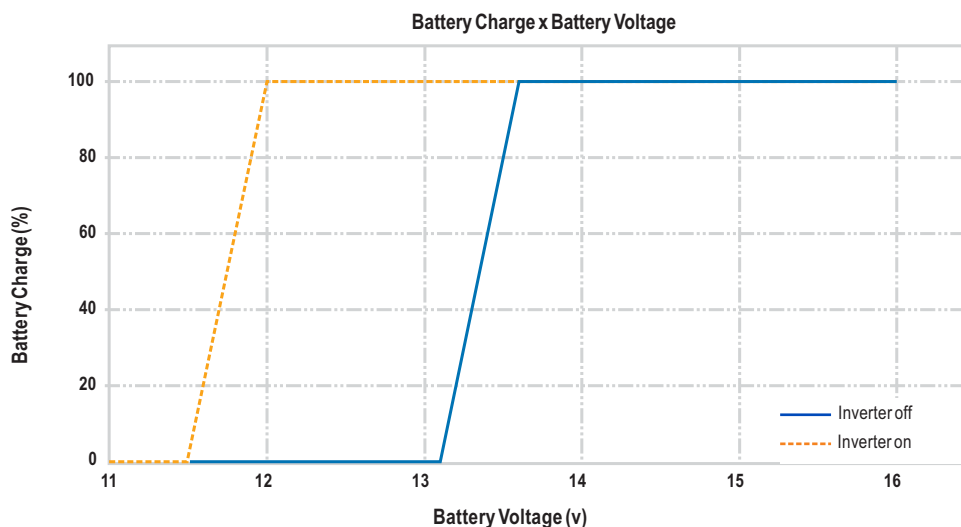
13.2 Operation with the Emergency System Disabled

When the emergency system is **disabled** (F3.62 = No), the following rules are followed:

- It is considered a power supply failure when the mains voltage exceeds the limits defined in F3.58 and F3.59 for a time longer than F3.60;
- The mains voltage is considered reestablished when the mains voltage is back within the limits defined in F3.58 and F3.59 for a time longer than F3.60;
- When the mains is out, the **Compressor**, **Defrost** and **Fan** outputs are switched off;
- When the mains voltage is restored, the outputs can be switched on again. Compressor activation respects the time set in F3.05 - Minimum compressor off time.

13.3 Battery Charge

The emergency system also monitors the equipment's battery charge. This is the battery charge as estimated from the equipment's supply voltage. The load over voltage percent ratio is calculated differently when the equipment is connected to the mains power and when it is not, as displayed in the graph below.



The battery charge percentage is displayed to the right of the Status Bar, next to the battery icon. The ratio is described in Table 1.

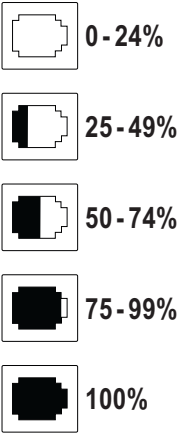
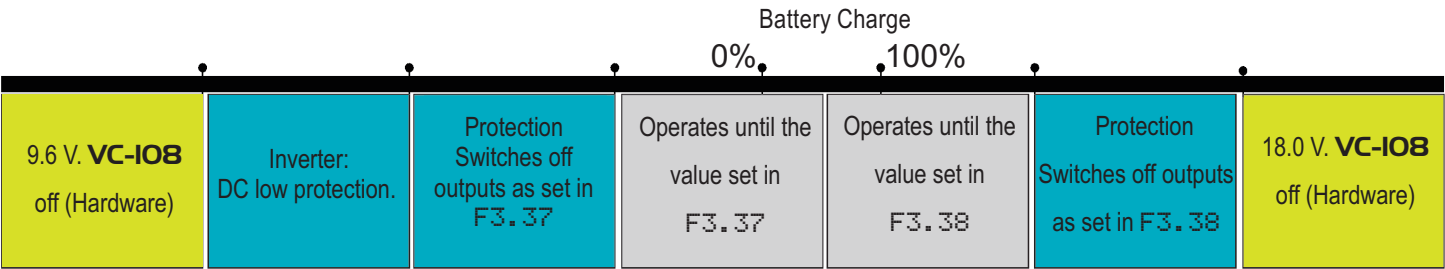


Table 1 - Battery Charge Percentage

When the equipment is disconnected from the mains, the charge icon represents exactly the value described in the table, and a stationary battery symbol  is displayed on the Status Bar. When the equipment is connected to the mains, the charging icon is an animation, alternating between the levels in the table and a power plug symbol  displayed in the Status Bar.

Instrument behavior with battery level variation:



14. ALARMS

The vaccine refrigerator controller has an alarm system with several different logics and many alarm levels. It has visual and audible alarms (buzzer), auxiliary relay activation and dialer support. It also has an alarm history, which displays the start and end times of each alarm. The table below shows the complete list of alarms and the outputs that are triggered by each one of them:

Alarm table		Outputs		
Code	Description	Buzzer	Message	Relay (Dialer)
ALR01	PPPP - Invalid parameters	●		
ALR02	ECAL - Calibration failure			
ALR03	Invalid date/time	●	●	
ALR04	Datalogger memory full	●	●	
ALR05	Low temperature	●	●	1
ALR06	High temperature	●	●	1
ALR07	Low temperature simulation	●	●	2
ALR08	High temperature simulation	●	●	2
ALR09	High condenser temperature	●		
ALR10	Setpoint not reached	●		
ALR11	Door open	●	●	
ALR12	DC voltage low	●	●	●
ALR13	DC voltage high	●	●	●
ALR14	AC voltage low	3		
ALR15	AC voltage high	3		
ALR16	Power outage (AC voltage)	4	●	4
ALR17	S1 temperature sensor failure	●		1
ALR18	S2 temperature sensor failure			
ALR19	S3 temperature sensor failure			
ALR20	S4 temperature sensor failure	●		1
ALR21	S5 temperature sensor failure			
ALR22	S6 temperature sensor failure			
ALR23	S7 temperature sensor failure			
ALR24	S8 temperature sensor failure			
ALR25	S9 temperature sensor failure			
ALR26	S10 temperature sensor failure			
ALR27	Hardware at fault: RTC	●	●	
ALR28	Hardware at fault: Internal memory	●	●	

In some cases, activation of the buzzer and the alarm/dialer relay depend on some parameters, listed below:

- F3.32 - Delay for switching on the alarm relay;
- F3.35 - Enables alarm output in low and high temperature simulation;
- F3.36 - Enables alarm output on power failure;
- F3.62 - Enables emergency mode control.

These cases are represented by numbers in the following alarms table:

1. The alarm/dialer relay is switched on after the time set in F3.32 has elapsed;
2. Depends on F3.35:
 - If F3.35=9 [Off], the alarm/dialer relay will not turn on.
 - If F3.35 >9 - The alarm/dialer relay is switched on after the time set in F3.32 has elapsed;
3. Depends on F3.62:
 - If F3.62=No - Buzzer is activated normally;
 - If F3.62=Yes - Buzzer is activated every 3 minutes.
4. Depends on F3.36 and F3.62:
 - If F3.36=0 [Off]:
 - If F3.62=No - Buzzer is activated normally;
 - If F3.62=Yes - Buzzer is activated every 3 minutes;
 - If F3.36 >0 - The alarm/dialer relay is switched on after the time set in F3.36 has elapsed.

14.1 Silencing Alarms:

All alarms can be silenced, i.e. the activation of the buzzer and the alarm/dialer relay can be interrupted. The alarms are silenced in two ways: automatically by time or by the **MUTE** key.



Notes: The ALR14, ALR15, and ALR16 alarms **cannot be silenced** if they are operating with the **buzzer triggered every 10 minutes** (F3. 62 = Yes).

14.1.1 Alarm Silencing by Time:

The silencing of alarms by time depends on parameter F3. 31.

- Time to silence alarm automatically, and follows the following logic:
- If F3. 31 = 59 [Off] - The buzzer and the alarm/dialer relay remain activated until the **MUTE** key is pressed or until the equipment exits the condition that generated the alarm.
- If F3. 31 > 59 [Off] - The buzzer and the alarm/dialer relay remain activated until the time set in F3. 31 elapses, until the **MUTE** key is pressed or until the equipment exits the condition that generated the alarm.



Notes: The parameter F3. 31 - Time to silence the alarm automatically must be configured very carefully, because if this time is **shorter** than the one configured in F3. 32 (or F3. 36), the **alarm relay will not be activated**.

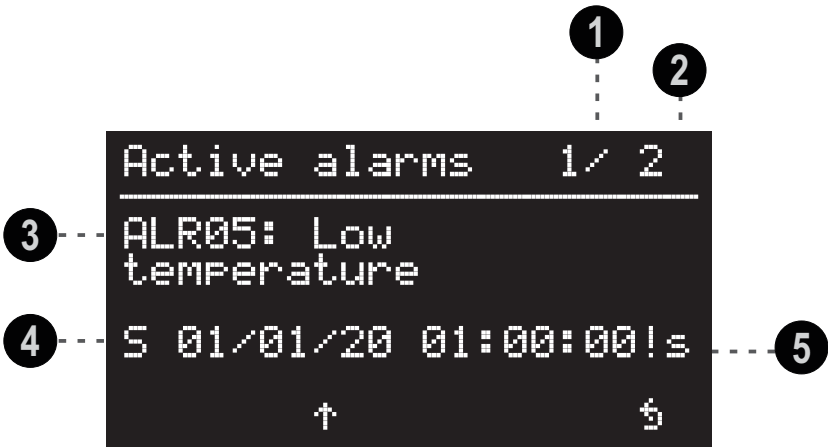
14.2 Active Alarms Display:

Whenever an alarm is active, an alarm icon  is displayed on the Status Bar (see 10.1.1). Some more critical alarms are displayed in the message area on the Main Screen (see 10.1), as indicated in the Alarm Table. To view which alarm is active and get more information, access the Active Alarms Display Screen by pressing the **ALARMS** key from the Main Screen.



To return to the Main Screen, press the **BACK** key.
The screen elements of the active alarms display are listed below:

- 1 - Order of occurrence of the alarm (most recent first);
- 2 - Number of active alarms;
- 3 - Code and name of the alarm;
- 4 - Alarm start time;
- 5 - Observations about the alarm.



When there is more than one active alarm, you can browse the alarms by pressing the **UP** and **DOWN** keys. The observation field can have the following information:



Alarm started with clock not set. The registered time is invalid.

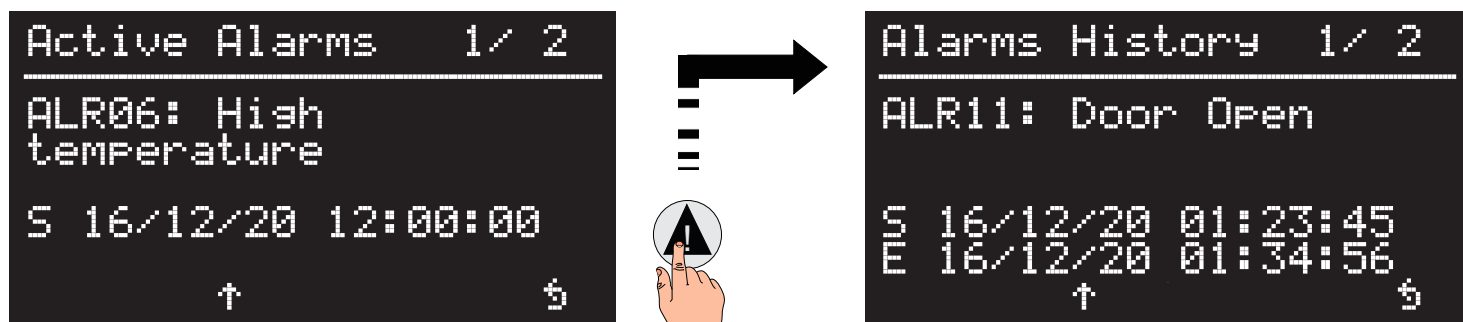


Alarm has been silenced (by time or by the user).

14.3 Alarm History View:

The vaccine refrigerator controller stores in its memory a history of the alarms that have occurred. In total 99 alarm records can be stored (including active alarms, i.e., if there are 2 active alarms, there can be a maximum of 97 alarm history records).

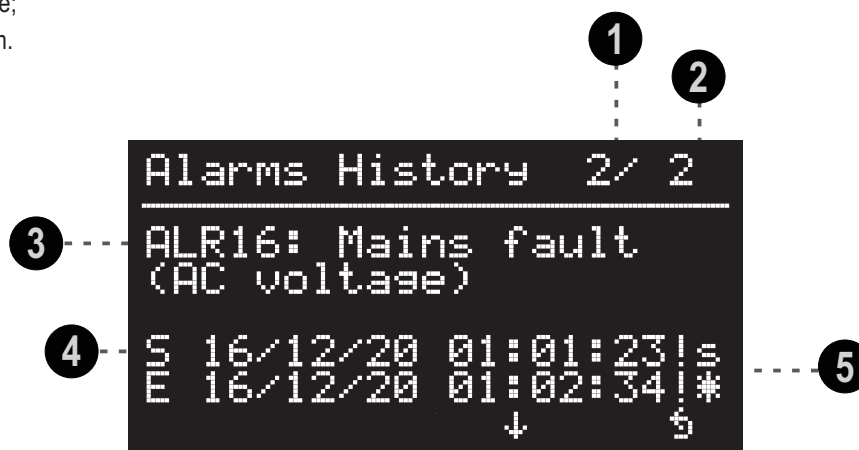
To display the Alarm History Screen, press the **ALARMS** key from the Active Alarm Display Screen. Press the **ALARMS** key again to return to the Active Alarms Display Screen.



To return to the Main Screen, press the **BACK** key.

The screen elements of the active alarms display are listed below:

- 1 - Order of occurrence of the alarm (most recent first);
- 2 - Number of active alarms;
- 3 - Code and name of the alarm;
- 4 - Alarm start (I) and end (F) time;
- 5 - Observations about the alarm.



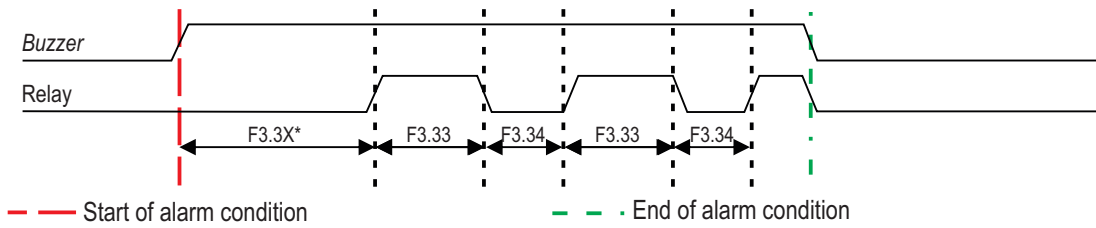
When there is more than one active alarm, you can browse the alarms by pressing the **UP** and **DOWN** keys. The observation field can have the following information:

-  Alarm started with clock not set. The registered time is invalid.
-  The alarm was switched off upon the startup of the equipment, because the equipment was turned off with the alarm still active.
-  Alarm has been silenced (by time or by the user).

14.4 Alarm/dialer relay activation:

In the case of alarms that enable the alarm/dialer relay output (see Table 2), the activation can be alternating or continuous. It is also possible to not activate the relay. Activation is defined by the following parameters:

- F3 . 33 - Alarm on relay time;
- F3 . 34 - Alarm off relay time.

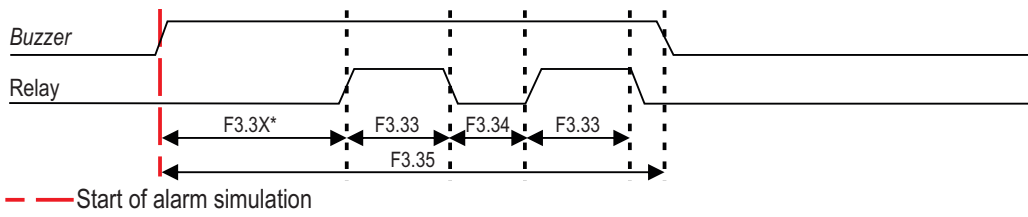


*The delay time for activating the relay can be F3 . 32 or F3 . 36.

When the alarm/dialer relay is active, a shield icon is displayed in the Status Bar (see 10.1.1).

14.5 Alarm Simulation:

In order to test the alarm outputs, the instrument has an alarm simulation function. Alarm simulation can be started or ended through items 1 . 03 Low temperature simulation and 1 . 04 High temperature simulation from the Quick Menu (see 10.3.2). When the alarm simulation is started, the equipment activates the buzzer and displays the message Temperature Simulation in the message area on the Main Screen. The simulation duration depends on the function F3 . 35 - Enable alarm output in the temperature simulation.



*The delay time for activating the relay can be F3 . 32 or F3 . 36.

When function F3 . 35 is set to 9 Off, the alarm simulation lasts for **10 seconds**, and the alarm/dialer relay is **not activated**.

 **Notes:** If parameter F3 . 35 is configured with a time **shorter** than that configured in F3 . 32 the alarm **relay will not be activated**.

15. DATALOGGER

The vaccine refrigerator controller has a datalogger function, designed to store records for over a decade*. The records include the following information:

- Date and time;
- Temperatures read from sensors S1 to S10;
- Battery charge percentage;
- Mains voltage;
- Process stage;
- Alarms;
- Values of inputs and outputs (relays).

* Capacity estimated with the default sampling period and with event logging **disabled**.

The datalogger is **always enabled**, and stores records in intervals determined by function F3.54 - Datalogger sampling period.

15.1 Event Logs

In addition to the periodic records, it is possible to store records based on events identified by the controller. These event logs can be enabled by the following functions:

- F3.55 - Minimum temperature variation to generate a log record:
 - If it is different from 0 [°C], a record will be stored when the temperature change in the ambient sensor (S1 or S4) since the last record is greater than the value set in this function;
- F3.56 - Generates a log record due to change in an input or output:
 - If set to Yes, a record will be stored if:
 - The digital input value changes (door sensor);
 - Any of the outputs (relays) value changes;
 - The mains voltage varies by $\pm 10\%$ compared to the last record.



Notes: Event logging does not affect the periodic logging interval.

15.2 Storage capacity

Sampling period (seconds)	Capacity* (days)	Capacity* (years)
30	955	2,6
120	3822	
300 (padrão)	9557	26,2
900	28672	



* Value estimated considering event logging **disabled**.

Table 3 - Datalogger Storage Capacity

When the datalogger memory is full, the equipment generates an alarm recording this event and displays the message Datalogger Full in the message area on the Main Screen. In this situation, the oldest records are overwritten by the newest ones. It is possible to disable the overwriting of records in parameter F3.57 - Overwrites older log records. When overwriting is disabled, the equipment does not create new datalogger records while the memory is full.



Notes: To avoid losing datalogger records, always try to synchronize with Sitrad^{PRO} or export and clear the datalogger periodically.

15.3 Export Datalogger

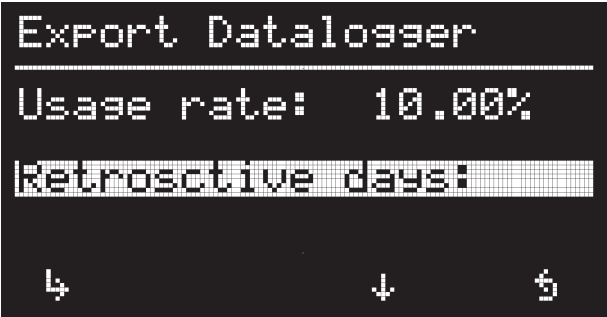
Datalogger records can be exported to a file on a flash drive for further analysis using Sitrad^{PRO}.



Notes: The flash drive used in the export must have enough space to store the records, which can **occupy up to 128 MiB**.

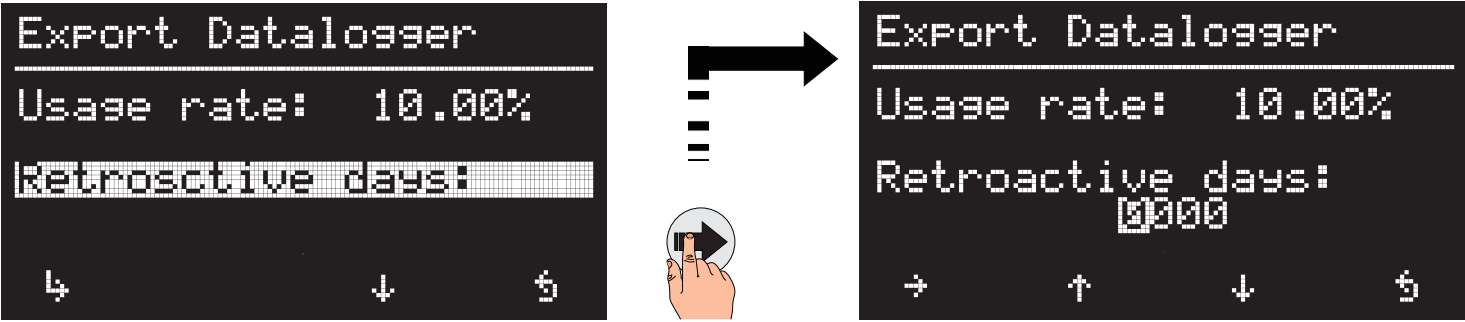
From the Main Screen, when a flash drive is inserted into the USB port, the controller displays the Export Datalogger screen. This screen can also be accessed at any time by selecting item 1 - 05 Export Datalogger from the Quick Menu.

The datalogger memory use percentage is displayed on the screen.

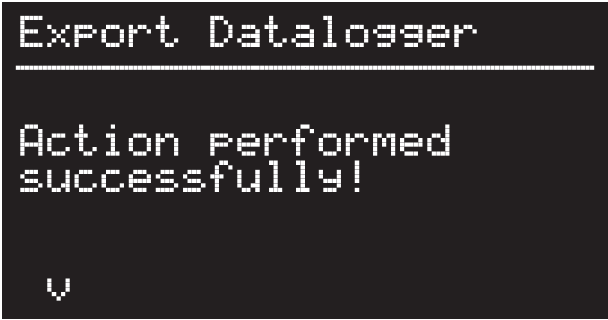
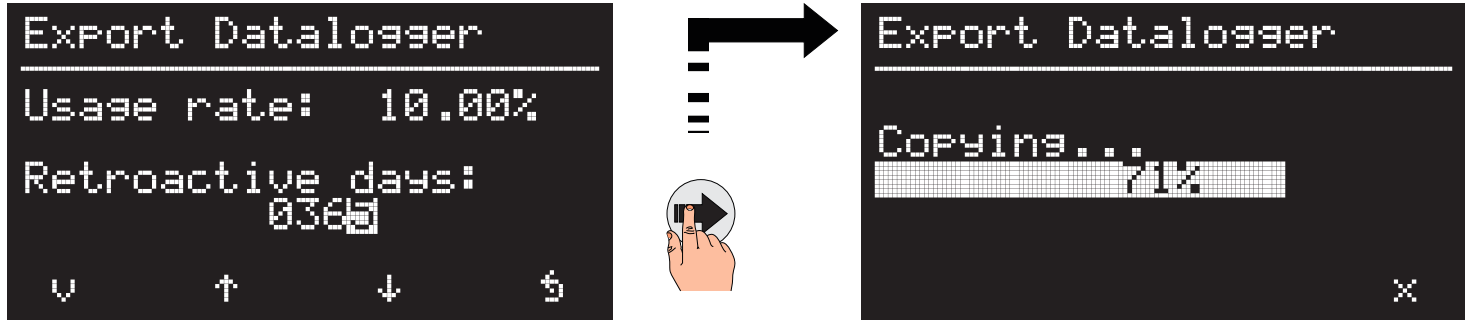


- The export can be done in two ways:
- **Retroactive days:** Only the last days of records are exported, and the number of days is defined by the user;
 - **Complete:** All records are exported.

By default, the option Retroactive Days is selected. Press the **SET** key to select the number of days.



Then select the number of days, setting each digit with the **UP** and **DOWN** keys. To advance or go back, press **SET** or **BACK**. When the last digit is selected, pressing **SET** starts the export.

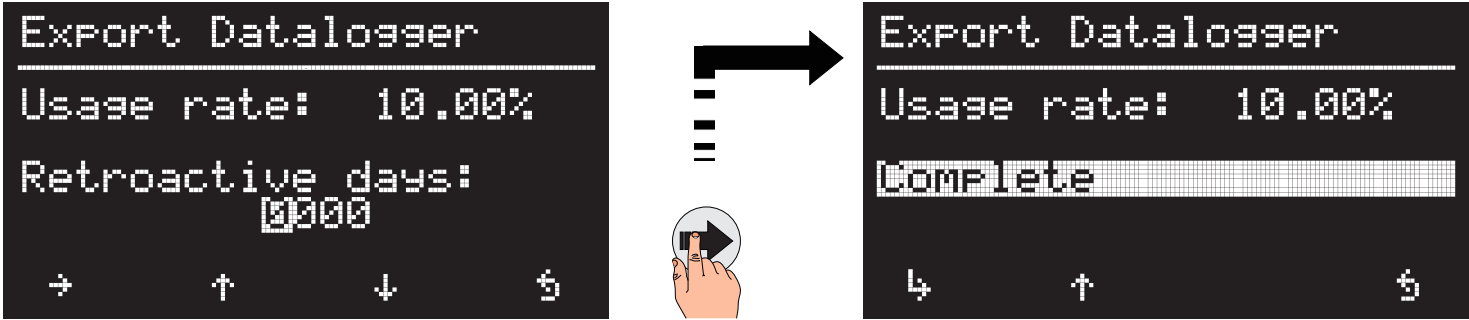


If necessary, the export can be stopped at any time by pressing the **BACK** key.



Notes: For each **retroactive day**, **24 hours** are considered. For example, if the export starts at 8 am and 1 day is selected, records from 8 am of the previous day until 8 am of the current day are exported. In the specific case of selecting **0 days**, the export starts at **midnight of the current day**.

To export all datalogger records press the **DOWN** key in the first screen. The Complete option is displayed. Press **SET** to start the export.



Notes: Complete datalogger export may take several minutes, depending on the number of records.



Warning: During the datalogger export process, **DO NOT REMOVE THE FLASH DRIVE** from the USB port and **DO NOT TURN OFF THE EQUIPMENT**.

The datalogger records are exported to a file named according to the following format:

VC-108_YYMMDDhhmm.fgd

,where:

- YYMMDD: Current date, in the year, month, day format;
- hhmm: Current time, in the hour, minute format.

The file is saved in the **VC-108 log** directory in the flash drive's root file system. If the directory does not exist, it will be created when exporting.

Notes: If the **VC-108 log** directory already has a file with the same name, a number is appended to the end of the file name, according to the format **VC-108_YYMMDDhhmm_1.fgd**.

15.4 Clear Datalogger Memory

To erase all the datalogger records, follow the steps in subchapter 10.5.7 Clear Datalogger.

16. FIRMWARE UPDATE

▼ Pen Drive
▼ VC-108

VC-108_V01R01.ffg
VC-108_V01R02.ffg
VC-108_V01R03.ffg

The controller firmware update is done through the USB port, using a flash drive. Update files are provided by Full Gauge in binary format with **.ffg** extension, and should be placed into a directory named **VC-IO8 log** located in the flash drive's root file system.

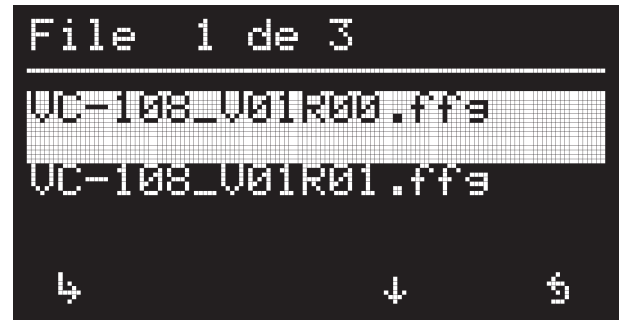
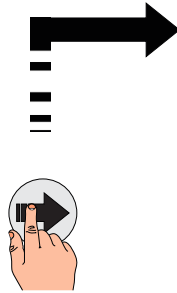
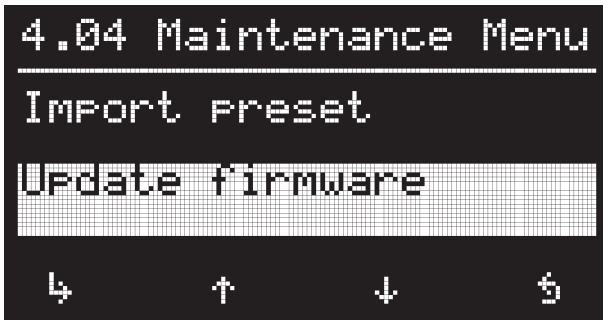


Notes: The equipment can list a maximum of 32 firmware files. To ensure they are displayed properly, it is recommended that filenames, including extensions, do not exceed 42 characters.

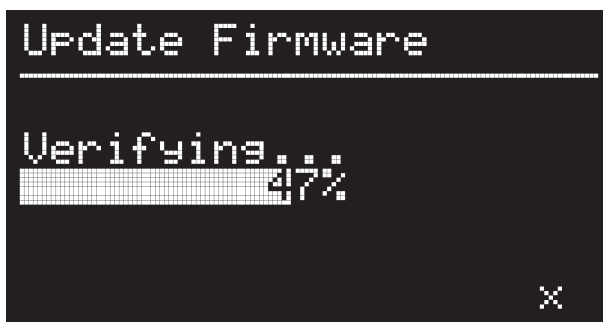
The update is done in three steps:

- The first consists of validating the binary file selected for update;
- The second is copying the contents of the file to the controller's data memory;
- Finally, the third step is writing the firmware content to the program memory.

To update the equipment firmware, insert the flash drive in the USB port, access the Maintenance Menu (10.5), select item 4 . 04 Update firmware and press the **SET** key.



Next, a list of the **.ffg** files present in the **VC-IO8 log** directory should be displayed. Browse to the desired file using the **UP** and **DOWN** keys and press **SET**.

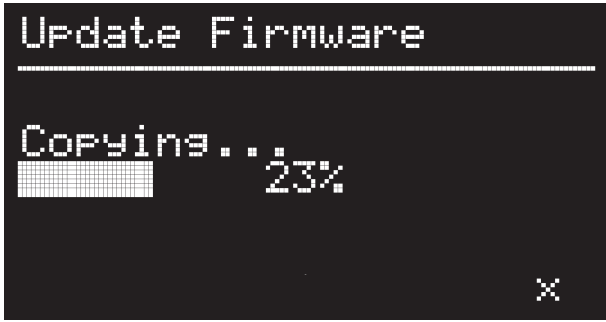


At that point the update process will start. First, the controller checks the integrity and version of the selected file. If it is corrupted, an error message will be displayed and it is not possible to proceed.

During verification, the version of the Parameter Table included in the new firmware is also checked. If it is different from the current one, the message at the side is displayed, requesting user's authorization to proceed. If this message is displayed, at the end of the update **all parameters** are set to **factory default**, including the Equipment Name and Language.



If you wish to proceed anyway, press the **SET** key. If you wish to do something before updating, press the **BACK** key to stop the update process.

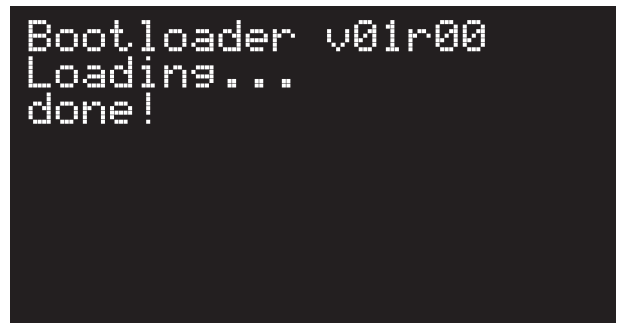
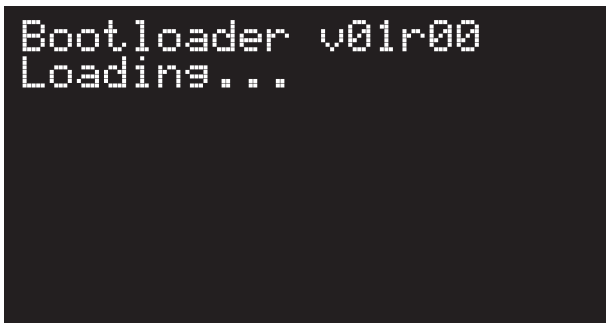


If there is no change in the Parameters Table version or if the user chooses to proceed with the update, the step of copying the file to the data memory is started. At the end of this step, the equipment is restarted.



Notes: During the first and second steps, it is possible to cancel the update by pressing the **BACK** key. If this occurs, in order to update the equipment, all steps must be redone.

The last step starts after the equipment is restarted. The bootloader is responsible for copying the firmware to the program memory. After a few seconds, a success message will be displayed briefly and the equipment should restart.



The newly copied firmware version is displayed on the Startup Screen. It is also possible to check the firmware version, as well as the Parameters Table version, on the About Screen (10.3.10).



Warning: During the firmware update process, **DO NOT REMOVE THE FLASH DRIVE** from the USB port and **DO NOT TURN OFF THE EQUIPMENT**.

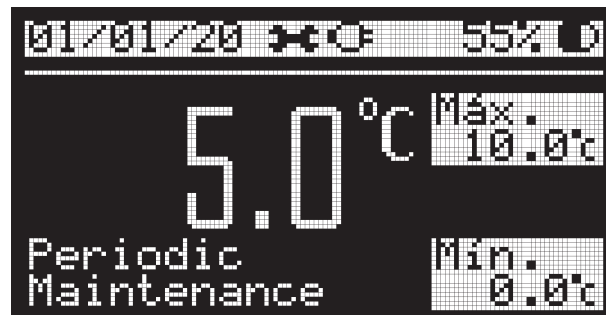
17. PERIODIC MAINTENANCE

This controller has periodic maintenance control. The maintenance interval is set from 1 to 12 months, by parameter F3.65 - Maintenance interval. Maintenance control can be disabled by setting this parameter to 0 [0FF].

The maintenance interval is counted in days. In order for the maintenance counter to compute a day, the equipment must be powered on continuously for 24 hours.

 **Notes:** The maintenance counter is incremented even if parameter F3.65 - Maintenance interval is set to 0 [0FF].

When the counter reaches the number of months set as the maintenance interval, an alert message is displayed in the Main Screen message area, and a wrench icon  is displayed in the Status Bar.



When a user sees this notice, he must contact the technician responsible for the equipment, so that maintenance can be carried out. When the maintenance service is concluded, the technician must reset the counter by accessing function 4.05 Maintenance reset (see 10.5.5).

18. CONTROL REDUNDANCY SUPPORT

The vaccine refrigerator controller has Control Redundancy Support. The redundant system operates concurrently with the main system, if the main control system presents any failure or is out of operation, the **VC-IOB Log** ensures that the redundant control system is always active/on.

The redundant control system is turned off:

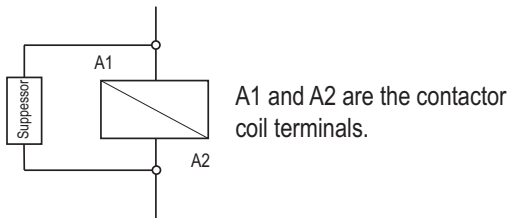
- During the defrost process;
- When the Alarm Inhibit Time after defrost has not elapsed;
- When the Temperature Alarm Inhibit Time upon power-up has not elapsed.

19. IMPORTANT

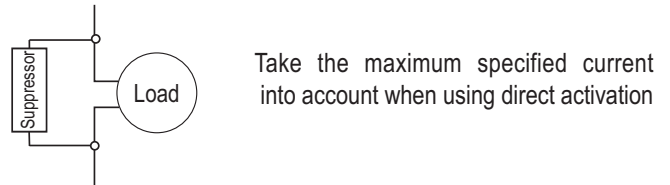
As instructed by standard NBR 5410:

- 1: Install surge protectors on the power supply
- 2: Sensor cables and computer signals can run alongside, however not in the same conduit as the power supply and load cables.
- 3: Install transient suppressors (RC filter) in parallel to the loads, as a way to increase the working life of the relays.

Wiring diagram for suppressors in the contactors



Wiring diagram for suppressors on direct loads



Suppressors are available for purchase from Full GaugeControls.

20. WARRANTY TERM



ENVIRONMENTAL INFORMATION

Packing:

The materials used in the packaging of Full Gauge products are 100% recyclable. Try to dispose of it through specialized recycling agents.

Product:

The components used in Full Gauge controllers can be recycled and reused if disassembled by specialized companies.

Disposal:

Do not burn or dispose of controllers that reach the end of their life span in household trash. Observe the existing effective legislation in your region regarding the disposal of electronic waste. In case of any doubts, contact Full Gauge Controls.

WARRANTY TERM - FULL GAUGE CONTROLS

The products manufactured by Full Gauge Controls, from May 2005, have a warranty period of 02 (two) years directly with the factory and 01 (one) year with accredited resellers/dealers, from the date of the consigned sale on the invoice. After this year with resellers, the warranty will continue to be effective if the instrument is sent directly to Full Gauge Controls. This period is valid for the Brazilian market. Other countries have a 2 (two) year warranty. The products are guaranteed in case of manufacturing failure that makes them improper or unsuitable for the applications for which they are intended. The warranty is limited to the maintenance of instruments manufactured by Full Gauge Controls, disregarding other types of expenses, such as indemnification due to damages caused to other equipment.

EXCEPTIONS TO WARRANTY

The Warranty does not cover transport and / or insurance costs for sending products with indications of defect or malfunction to Technical Assistance. The following events are also not covered: natural wear of parts, external damage caused by falls or improper packaging of products.

LOSS OF WARRANTY

The product will automatically lose its warranty if:

- The instructions for use and assembly in the technical description and the installation procedures present in Standard NBR5410 are not observed;
- It is subjected to conditions beyond the limits specified in its technical description;
- It is violated or repaired by a person who is not part of Full Gauge's technical team;
- The damage is caused by a fall, blow and / or impact, water infiltration, overload and / or atmospheric discharge.

WARRANTY USE

To be covered and benefit from the guarantee, the customer must send the product properly packed, together with the corresponding purchase invoice, to Full Gauge Controls. Shipping costs for products are at customer's costs. It is also necessary to send as much information as possible regarding the detected defect, thus making it possible to streamline the analysis, testing and service.

These processes and eventual product maintenance will only be carried out by Full Gauge Controls' Technical Assistance, at the Company's headquarters- Rua Júlio de Castilhos, 250, CEP 92120-030 - Canoas - Rio Grande do Sul - Brazil.