



Vcolor 539 M & L

Controllers for food processing cabinets and rooms



ENGLISH

INSTALLER MANUAL ver. 1.1

CODE 144VC539E114



Important

Read this document carefully before installation and before using the device and take all the prescribed precautions. Keep this document with the device for future consultation.

Only use the device in the ways described in this document. Do not use the device as a safety device.



Disposal

The device must be disposed of according to local regulations governing the collection of electrical and electronic equipment.

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1 INTRODUCTION

1.1 Product description

Vcolor 539 is a split controller with a capacitive TFT touch-screen colour graphic display (5" or 7") for flush panel fitting and total management of food processing cabinets or rooms for different types of products such as meat, charcuterie and cheese.

It has manual conservation cycles and automatic aging cycles (up to 30 sequential phases) whose duration, temperature, humidity and ventilation can all be fully configured.

It is possible to set automatic air change and pause/work cycles, as well as managing optional sterilisation, oxygenation and smoking processes either automatically or manually.

Standard 4-20 mA transducers (such as EVHP503) may be used to manage humidity or read the acidity level of a product; alternatively humidity can be controlled using a dedicated probe T+RH EVTHP500 (RH 5-95% / T -20/80°C).

1.2 Table listing the models available, their main features and purchasing codes

The table below lists the models available.

Models available	Vcolor 539 M	Vcolor 539 L	EVC20P52N9XXX10
	5-inch capacitive TFT touch-screen graphic display in glass	7-inch capacitive TFT touch-screen graphic display in glass	Optional 4 relay expansion

The table below shows the main features of the device.

Power supply	Vcolor 539 M	Vcolor 539 L	EVC20P52N9XXX10
Control module	115...230 VAC	115...230 VAC	115...230 VAC
User interface	Powered by the control module	12 VAC	
Analogue inputs	Vcolor 539 M	Vcolor 539 L	EVC20P52N9XXX10
Cabinet probe (PTC/NTC)	•	•	
Evaporator probe (PTC/NTC)	•	•	
Condenser probe (PTC/NTC)	•	•	
Humidity probe EVHTP500 (NTC)	•	•	
Humidity or pH transducer (4-20 mA)	•	•	
Digital inputs (for normally open/normally closed contact)	Vcolor 539 M	Vcolor 539 L	EVC20P52N9XXX10
Door switch	•	•	
Compressor thermal switch	•	•	
Low pressure switch	•	•	
High pressure switch	•	•	
Analogue outputs	Vcolor 539 M	Vcolor 539 L	EVC20P52N9XXX10
PWM (evaporator fan)	•	•	
Digital outputs (electro-mechanical relays; A res. @ 250 VAC)	Vcolor 539 M	Vcolor 539 L	EVC20P52N9XXX10
Configurable K1 (default compressor)	16 A	16 A	
Configurable K2 (default cabinet light)	8 A	8 A	
Configurable K3 (default humidifier)	8 A	8 A	
Configurable K4 (default air change)	8 A	8 A	
Configurable K5 (default heater)	8 A	8 A	
Configurable K6 (default alarm)	16 A	16 A	
Configurable K7 (default condenser fan)	16 A	16 A	
Configurable K8 (default pump-down solenoid valve)	10 A	10 A	
Configurable K9 (default defrost)	10 A	10 A	
Configurable K10 (default steriliser/oxygenator)			30 A
Configurable K11 (default smoker)			16 A
Configurable K12 (default steam generator)			8 A

Configurable K13 (default dehumidifier)			16 A
Communications ports	Vcolor 539 M	Vcolor 539 L	EVC20P52N9XXX10
RS-485 MODBUS	•	•	•
USB	•	•	
Other features	Vcolor 539 M	Vcolor 539 L	EVC20P52N9XXX10
Clock	•	•	
Alarm buzzer	•	•	
Management of automatic aging cycles and manual conservation cycles	•	•	
Fan intensity management	•	•	
HACCP function	•	•	
"Programmes" function	•	•	

For more information see the section 14 "TECHNICAL SPECIFICATIONS".

The table below shows the purchasing codes.

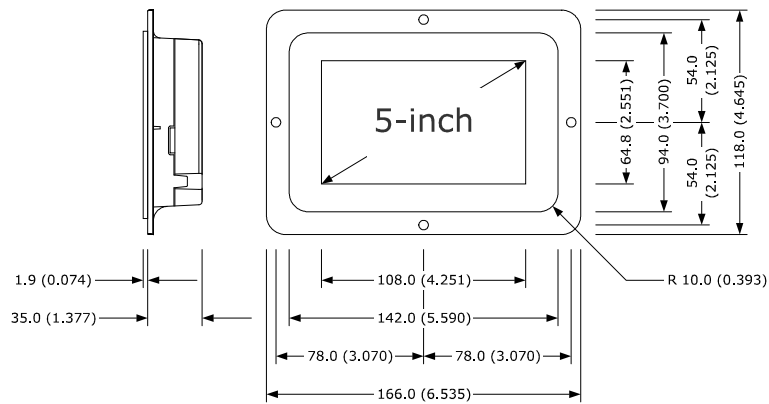
Purchasing codes	EVCMC539N9E Vcolor 539 M (kit control module + user interface 5" with PWM output for EVDFAN1)
	EVCLC539N9E Vcolor 539L (kit control module + user interface 7" with PWM output for EVDFAN1)
	EVDFAN1 cut phase module (PWM 1 KW)
	EVCLC539N9E01 Vcolor 539L out 0..10V (kit control module + user interface 7" with 0... 10 V)
	EVC95E00X7XXX00 cut phase module (0... 10 V 1 KW)
	EVC20P52N9XXX10 (4 relays optional expansion)
	EVHTP523 (4... 20 mA temperature/humidity probe)

For more models contact the EVCO sales network.

2 MEASUREMENTS AND INSTALLATION

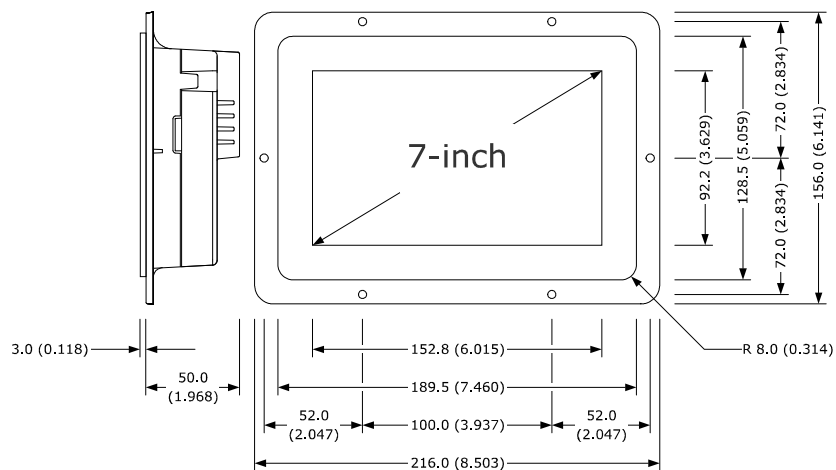
2.1 Vcolor 539 M user interface measurements

The figure below shows the measurements of the 5-inch user interface; measurements are expressed in mm (inches).



2.2 Vcolor 539 L user interface measurements

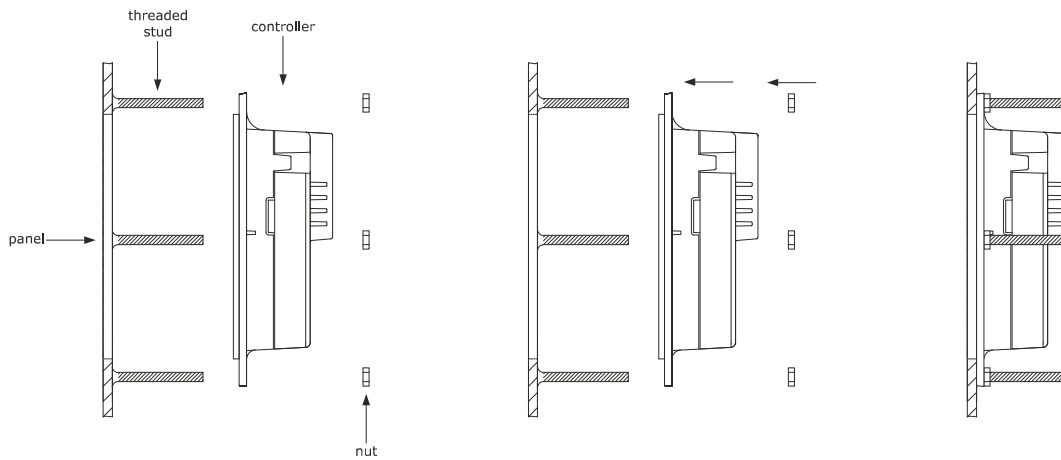
The figure below shows the measurements of the 7-inch user interface; measurements are expressed in mm (inches).



2.3 User interface installation

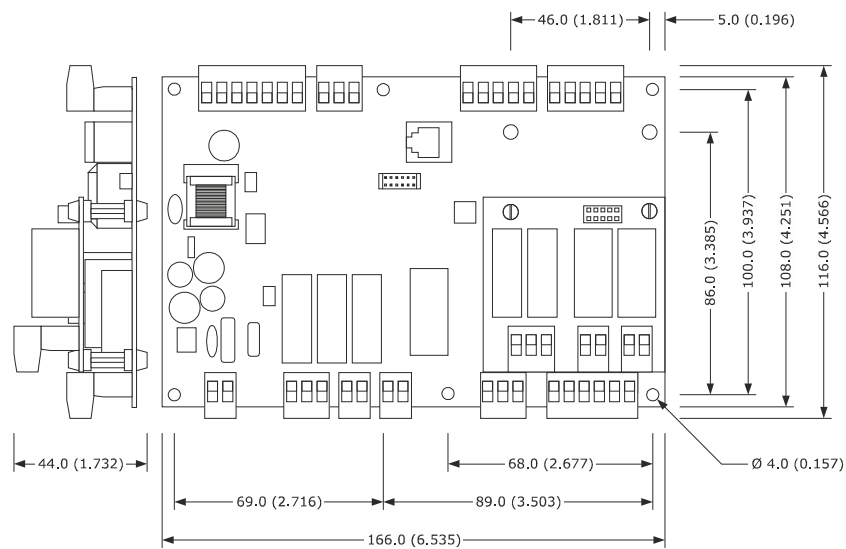
The figure below shows the installation of the user interface.

The user interface installed from behind using threaded studs enables it to be placed flush with the panel thus making it fit perfectly with the design of the unit.



2.4 Control module measurements

The figure below shows the measurements of the control module; measurements are expressed in mm (inches).

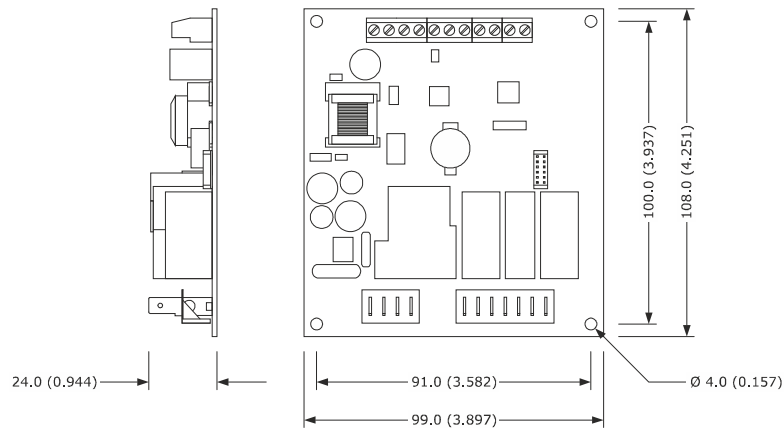


2.5 Control module installation

Installation of the control module is on a flat surface with spacers.

2.6 Expansion measurements EVC20P52N9XXX10

The figure below shows the measurements of the 4 relay expansion.

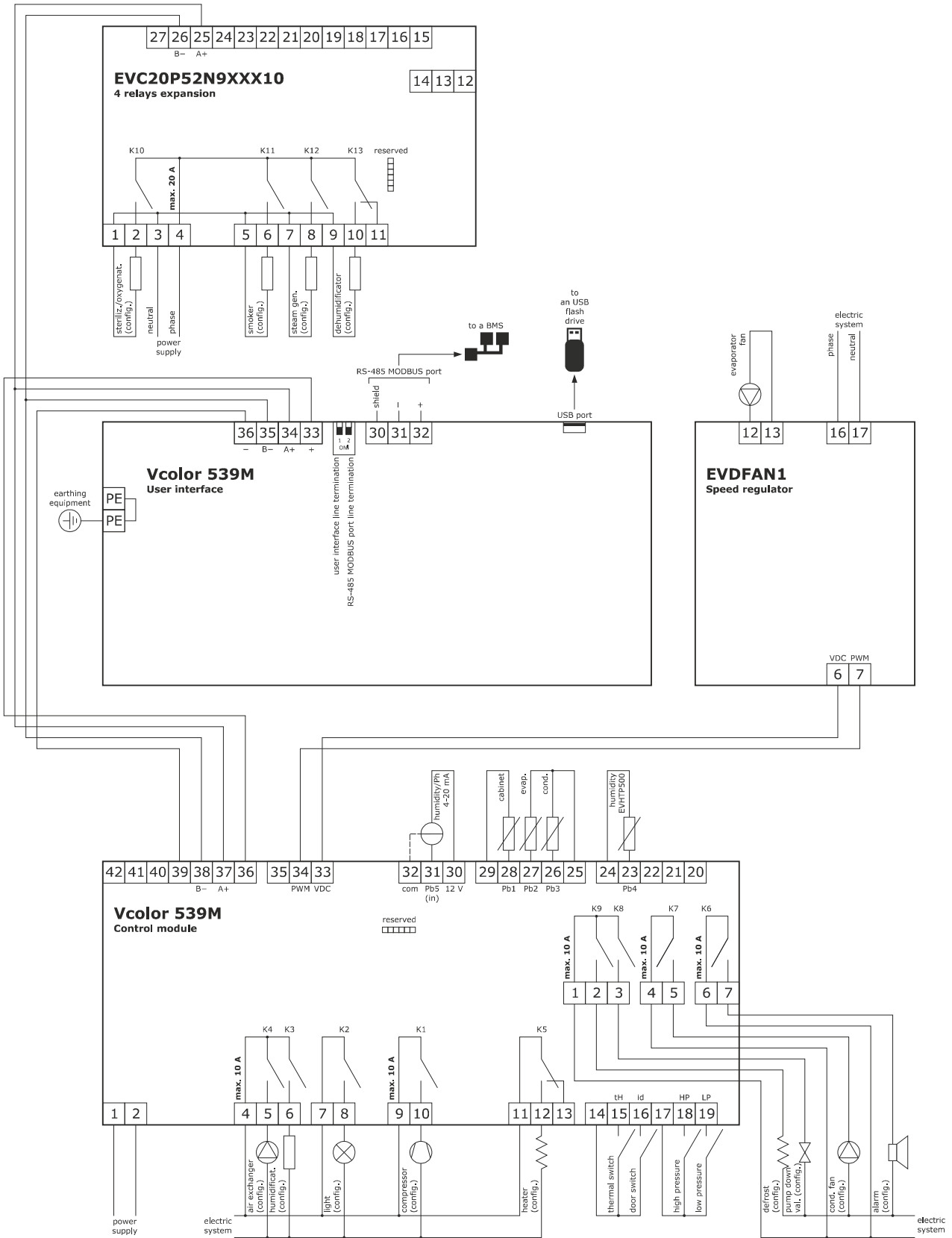


2.7 Installation precautions

- Ensure that the working conditions for the device (operating temperature, humidity, etc.) are within the set limits. See the section 14 "TECHNICAL SPECIFICATIONS".
- Do not install the device close to heat sources (heaters, hot air ducts, etc.), equipment with a strong magnetic field (large diffusers, etc.), in places subject to direct sunlight, rain, damp, excessive dust, mechanical vibrations or shocks.
- Any metal parts close to the control module must be far enough away so as not to compromise the safety distance.
- In compliance with safety regulations, the device must be installed properly to ensure adequate protection from contact with electrical parts. All protective parts must be fixed in such a way as to need the aid of a tool to remove them.

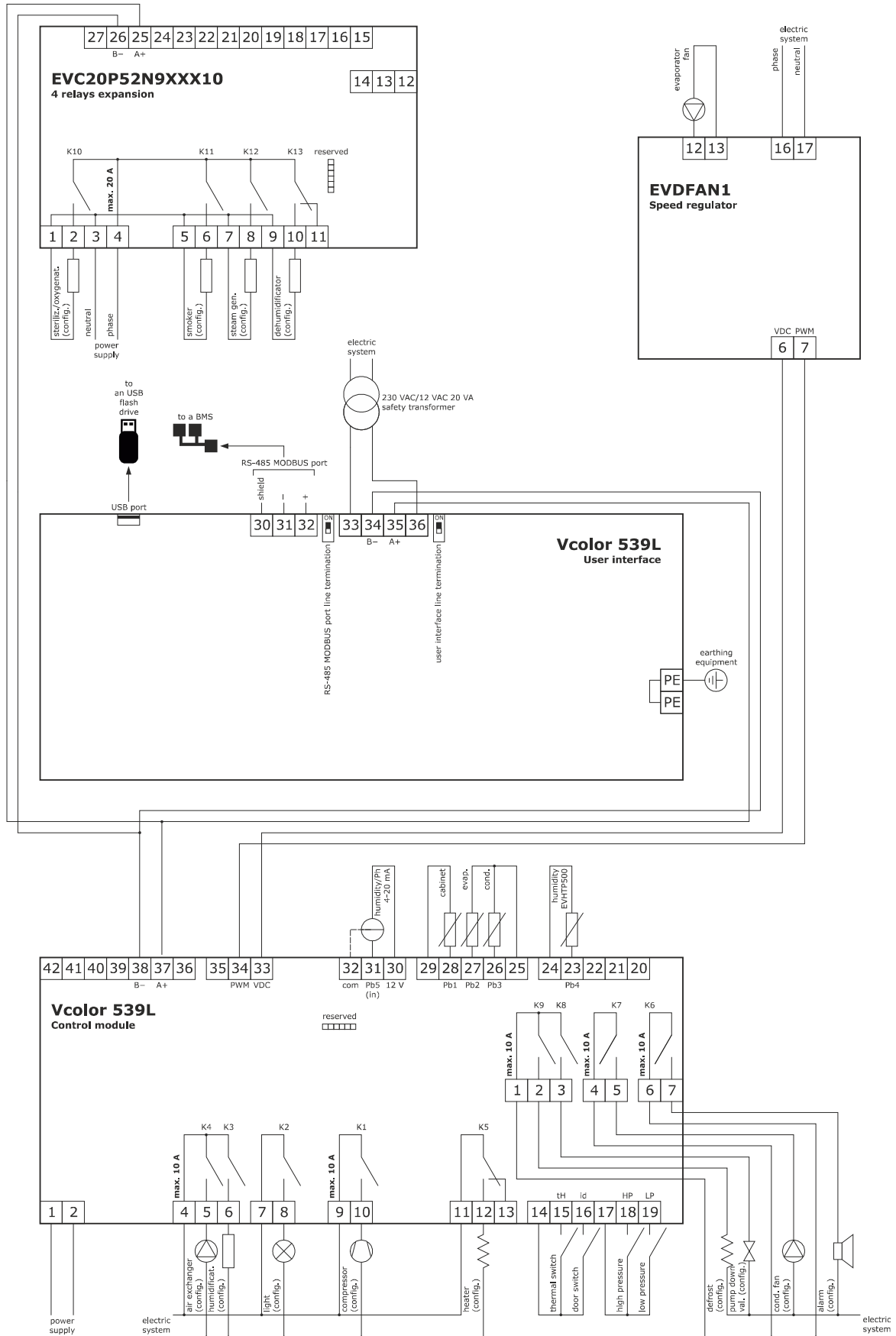
2.8 Vcolor 539M electrical connection

The diagram below shows the Vcolor 539 M electrical connection.



2.9 Vcolor 539L electrical connection

The diagram below shows the Vcolor 539 L electrical connection.



3 FIRST-TIME USE

3.1 Operating modes

The controller has the following operating modes:

- "off" (no power to the device);
- "stand-by" (the device is powered but switched off);
- "on" (the device is powered, switched on and awaiting start-up of an operating cycle);
- "run" (the device is powered, switched on and running an operating cycle).

Terminology: "switch on the device" means moving from "stand-by" to "on" mode and "switch off the device" means moving from "on" to "stand-by" mode.

If there is a power failure, when power is restored the device will return to the mode set before the failure.

3.2 Operating the device

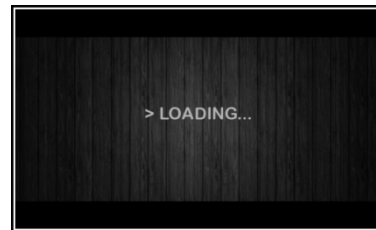
Follow these instructions to operate the device.

1. Install the device as shown in section 2 "MEASUREMENTS AND INSTALLATION", taking all the precautions mentioned in paragraph 2.6 "Installation precautions".
2. Make the electrical connection as shown in section **Errore. L'origine riferimento non è stata trovata.** "ELECTRICAL CONNECTION".
3. Connect the power supply to the device: if parameter E9 is set at 1 (default), the device will show the EVCO splash screen for 10 seconds; if the parameter is set at 0, a system loading screen will be shown:

E9=1

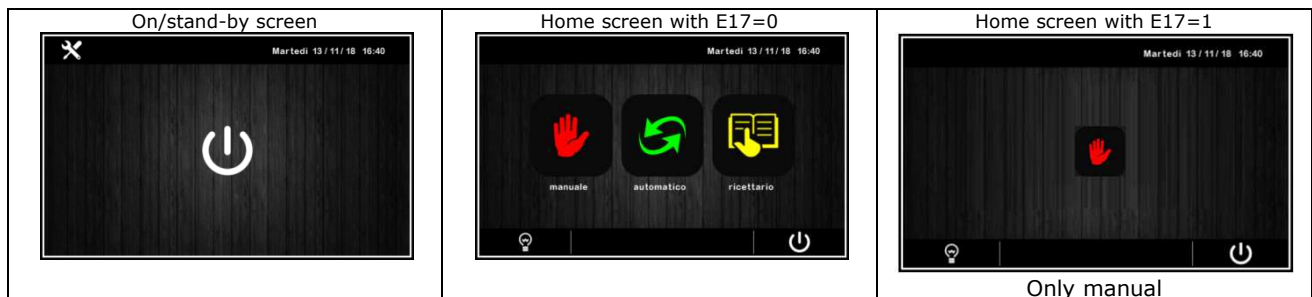




E9=0





Once loading is complete, the device will display the mode it was in before being powered down:

- On/stand-by screen, press the central area to move to the Home screen;
- the Home screen.



To switch the device on, press the central key  on the On/stand-by screen; to switch the device off, press the  key on the lower part of the Home screen.




N.B. If the power supply has been cut off long enough to cause a clock error (RTC alarm), it will be necessary to reset the day and time.

4. When switching on from the settings key  on the On/stand-by screen, enter the SET DATE/TIME menu, touch the data to change and confirm with **OK**.
5. From the settings key  on the On/stand-by screen, enter the SERVICE menu and from here the PARAMETERS menu. Enter the password -19 and configure the device as you wish in the order in which the parameters are listed in the table below. Then check that the remaining parameters have been set in a consistent way. See later sections and in particular the section PARAMETERS.

4 NAVIGATION

4.1 Initial information

Navigating the menus is intuitive, based on touch technology.

- To enter into a procedure, touch the menu or the corresponding icon.
- To exit the procedure and, in general, to return to the previous level, press the Back  key.
- To scroll up and down a menu, use the  and  keys.
- To confirm the settings and/or changes, press the **OK** key.
- To start up a cycle, press **START**.
- To interrupt a cycle, hold down **STOP** for at least 4 seconds.
- To regulate a setting, use the – and + keys or press and drag the relevant bar.
- To silence the buzzer, touch any key while it is sounding. If the buzzer is sounding for the end of an automatic cycle or because the pre-cooling temperature has been reached, the buzzer will be deactivated automatically after the number of seconds set by parameter E11 (unless it is silenced manually).

4.2 Home screen

The Home screen is the departure point for navigating the user interface.

The Home screen displays the functions enabled, the date and the time.



All the end user's selections start from the Home screen.

The 4 interactive keys grant access to the following functions:



MANUAL

select, set and start up a manual conservation cycle of infinite duration



AUTOMATIC

select, set and start up a complete automatic aging cycle



RECIPE BOOK

select and/or change automatic aging cycles saved in the memory

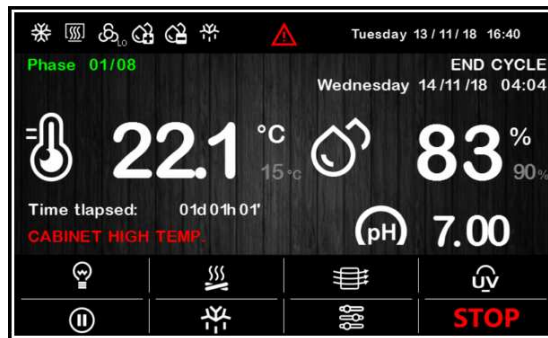
4.3 Run screen

Once a manual or automatic cycle has been started up, the Run screen will appear for the type of cycle selected.

MANUAL



AUTOMATIC



4.3.1 Regulator status icons

While a manual or automatic cycle is being run, the status of the principal loads is displayed as icons on the upper part of the screen. The table below gives their description when switched on:

	compressor active
	heating active
	heating control not active
	fans working and fan speed (LO, HI speed or speed%)
	defrosting in progress
	humidification in progress
	dehumidification in progress
	humidity control not active
	alarm in progress

4.3.2 Function keys

While a manual or automatic cycle is being run, the lower part of the screen displays the function keys, which are as follows.



switch light on/off



access the modify working setpoint/set cycle pages and the service screen



manual activation of rest cycle



manual activation of smoking cycle (presence can be activated/deactivated from parameter)



manual activation of air change cycle



manual activation of sterilisation cycle (presence can be activated/deactivated from parameter), as an alternative to oxygenation



manual activation of oxygenation cycle (presence can be activated/deactivated from parameter), as an alternative to sterilisation



manual activation of defrosting cycle (presence can be activated/deactivated from parameter)



saving and modifying programs and operation data (according to the menu)

4.4 Screen saver

After a period of inactivity set by parameter E8 (from 1 to 240 minutes), the Run screen will switch to the screen saver showing the values detected by the probes in use. This function can be disabled by setting parameter E8 to 0.

Just touch the screen to exit the screen saver. When an alarm is in progress, the Run screen will be restored.


Screen saver with manual cycle

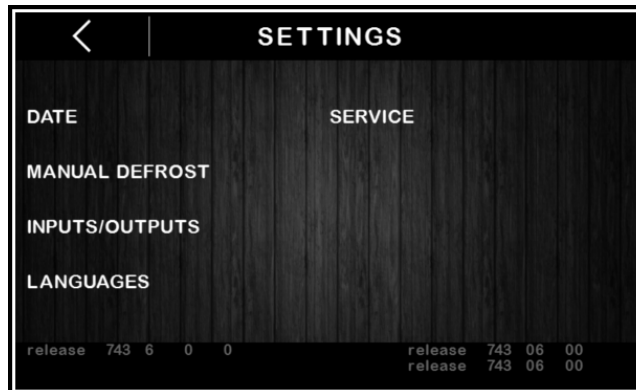


Screen saver with automatic cycle



4.5 Settings screen

The settings key  on the On/Stand-by screen grants access to the Set-up screen with the relevant function menu (for the INPUTS/OUTPUTS STATUS function, data are only displayed). To access the various procedures, touch the screen near the information/function required. The following screen is displayed:

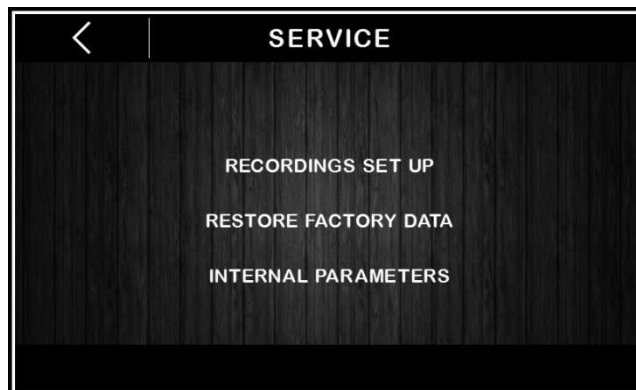


If the heat pump function is enabled with E16=1 there will also be the setting "**MACHINE CONFIGURATION**" for matrix valve settings (use password -19).

If parameter E12 is set at 1, the screen will also display the configuration details for the serial control humidifier.

4.5.1 Service

This option gives access to the following menu:



REGISTRATIONS SET-UP

This enables selection of the variables to be recorded for the HACCP history.

RESTORE FACTORY DATA

Touching on this option grants access to the following password-protected functions (149):

- delete records
- restore default parameters
- delete recipes

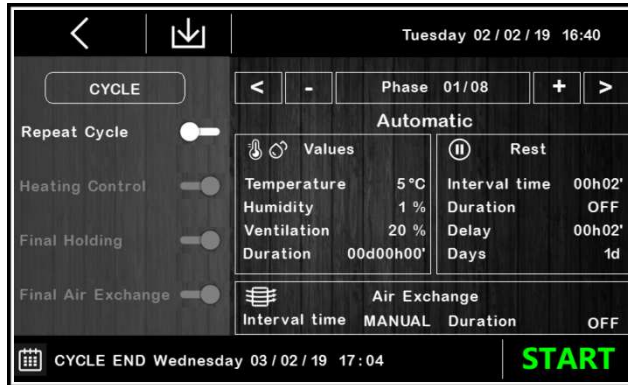
INTERNAL PARAMETERS

Touching on this option grants access to the password-protected parameter configuration (-19); to configure the parameter appropriately, consult the list in the section PARAMETERS.

5 AN OVERVIEW OF THE FUNCTIONS

5.1 Automatic and manual cycles


The controller provides complete control for food processing cabinets or rooms for different types of products such as meat, charcuterie, cheese and other types of product.



After a modification the settings will be saved provided that:

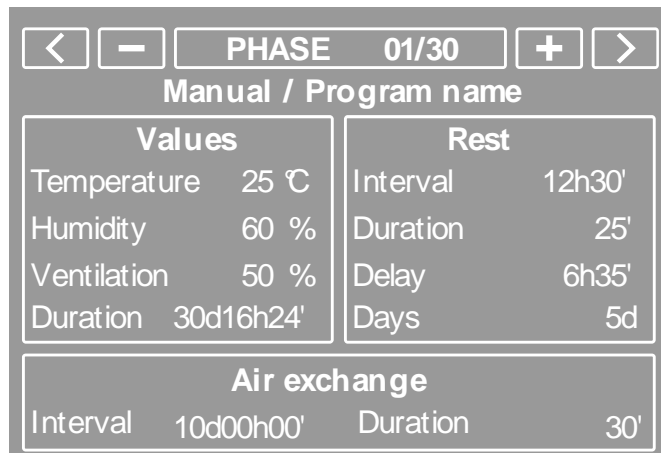
- an immediate START



-  pressure on button saving data if the start is not immediate. Note: pressure on button "<" without saving data will cancel the modifications.

5.2 Settable features for each phase

An automatic aging cycle can consist of a maximum of 30 different sequential phases, for each of which the user can set the following features:




5.2.1 Management of temperature, humidity, ventilation speed, duration

Regulation of temperature and humidity is carried out in the neutral zone. The resolution of the setpoint setting and the temperature reading is 0.1°C, while the resolution of the setting and the humidity reading is 1 %RH.

Heating control can be deactivated by the user for the whole duration of the cycle in progress using the general cycle settings.

Humidity control can be deactivated by the user for some phases: by setting humidity under 0%, the "OFF" value or "humidity control

deactivated for the phase in progress" will be set (the icon  will appear on the display, showing humidity control is not active).

The ventilation, depending on the type chosen by the OEM, may be SINGLE SPEED (in this case it cannot be regulated by the end user), DOUBLE SPEED (in this case the user can select LOW or HIGH speed) or modulating through the external phase cutting module EVDFAN1 (in this case the user can select the speed from the minimum settable by the user to 100%).

Cycle duration can be set from 0 minutes to 30days23h59' with a resolution of 1 minute.

By setting the cycle duration to INF (the equivalent of value 0), the phase will have infinite duration and no following phases will ever be carried out.

5.2.2 Air change management

During the aging process, the air in the cabinet needs changing periodically to ensure it is always rich in oxygen in order to prevent smells or impurities which could ruin the product.

The interval and duration of the air change fan are set by the user phase by phase.

For phases in which NO automatic air change is required (only manual), just set the activation interval to MANUAL (the equivalent of 0).

If the user also wishes to deactivate the MANUAL air change, just set the air change duration to OFF (the equivalent of 0) for the desired phase.

5.2.3 Management of product rest intervals

During the aging process, products need frequent and long periods of complete rest, when the equipment does not regulate either the temperature, humidity or ventilation inside the chamber.

During a rest phase, the only load that can be activated is the recirculation fan and this can be done either automatically or manually (loads which do not concern regulation, such as light, obviously remain on or can be activated).

Product rest periods can be set by the user, phase by phase, in the following way:

- interval: how often the rest period takes place
- duration: how long the rest period lasts
- delay: how long after the beginning of the phase the first rest interval begins
- days: once the initial delay has elapsed, how many days the rest periods are repeated for, with the established interval and duration.

By setting the interval to MANUAL (the equivalent of 0), the rest period will only be manual.

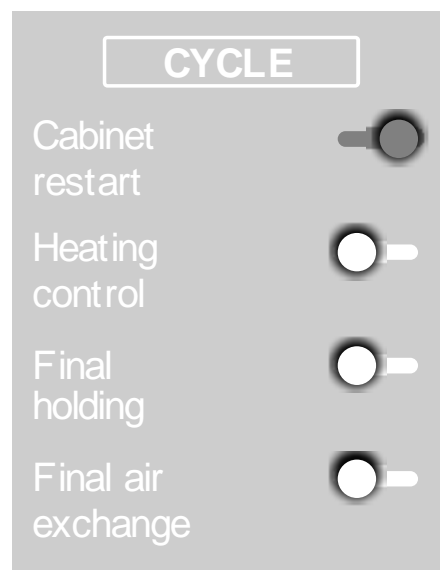
By setting the duration to OFF (the equivalent of 0), manual rest period will also be disabled.

By setting the delay to 0', the rest period will begin immediately at the beginning of the phase.

The number of days can be set from 1 to 30.

5.3 Settable features for the aging cycle

As well as the individual features of each stage, the aging cycle has a number of special features which can be selected/deselected by the user during the setting phase. These are:



5.3.1 Cabinet restart

When the "Cabinet restart" function is enabled at the end of the set aging cycle, a pop-up appears on the display and, by simply touching it, the same aging cycle is restarted.

The next time an automatic programme is entered, the controller will return to the last cycle carried out which can easily be retrieved by the user.

5.3.2 Heating control

By enabling/disabling the "Heating control" function, the heaters (and their connected loads) will be activated/deactivated for the whole duration of the cycle if the cabinet temperature goes below the neutral zone value established.



If heating control is disabled, the icon on the display will stay on for the duration of the cycle.

5.3.3 Final holding

By enabling/disabling the "Final holding" function, the user decides if, at the end of the final phase in the cycle, the equipment must maintain the temperature and humidity in the cabinet at the same values of the last phase before the cycle was STOPPED, or if it must switch off all the regulation loads, losing control of the temperature and humidity.

5.3.4 Final air change

By enabling/disabling the "Final air change" function, the user decides if the equipment must carry out an air change cycle or not at the end of the final phase of the cycle in progress. A final holding can be set to begin after the air change.

5.4 Other functions

During both automatic and manual aging cycles, a series of functions/loads can be activated manually by the end user to further process/transform the products.

All these functions are activated/deactivated from parameter, therefore the function activation keys will only appear on the RUN screen if they have been enabled.

5.4.1 Product sterilisation/oxygenation cycle

This cycle can be activated manually by the user during either an automatic or a manual aging cycle.

Parameter u1 establishes the type of icon to set, depending on the type of load connected: STERILISATION icon or OXYGENATOR icon.

Once the relevant key has been pressed, a pop-up screen will appear which will establish:

- duration of the function (consisting of a sequence of Ton + Toff; duration in hh:mm with value 0 = UP TO MANUAL STOP)
- activation time (in seconds)
- switch-off time (in seconds)

When the switch-off time is set at 0 seconds, the output will be continuously active for the whole duration set by the user.

It is important to save the last value set by the user and repropose it at the next activation request.

The settings default is: duration = MANUAL, Ton = 180sec, Toff = 0sec

The activation of the function lasts for the duration of the cycle: a sterilisation/oxygenation cycle can be activated while an aging cycle is taking place.

If the aging cycle changes phase, the sterilisation/oxygenation cycle continues.

If the aging cycle goes into the rest or air change phase, the sterilisation/oxygenation cycle is paused.

If the door is opened or there is a defrosting cycle, the sterilisation cycle will be SUSPENDED and will resume when the door is closed or after the defrosting cycle and when the ventilation is reactivated.

If the aging cycle ends, the sterilisation/oxygenation cycle continues until the end of its counter time or until it is manually deactivated.

The STERILISATION output is only activated when the EVAPORATOR FAN IS ACTIVATED.

Temperature and humidity are regulated regularly. All the other outputs can be activated/deactivated.

The STERILISATION or OXYGENATION key will become one of 3 colours to indicate the activation, deactivation or pausing of the function/output. They are:



- white icon key = function disabled
- green icon key = function enabled and output activated
- orange icon key = function enabled and output deactivated

5.4.2 Product smoking cycle

This cycle can be activated manually by the user during either an automatic or a manual aging cycle.

Once the relevant key has been pressed, a pop-up screen will appear which will establish the duration of the function (duration in hh:mm with value 0 = UP TO MANUAL STOP).

It is important to save the last value set by the user as it will be repropose at the next activation request.

The settings default is: duration = MANUAL.

The activation of the function lasts for the duration of the cycle: a smoking cycle can be activated while an aging cycle is taking place.

If the aging cycle changes phase, the smoking cycle is stopped.

If the aging cycle goes into the rest or air change phase, the smoking cycle is paused.

If the door is opened or there is a defrosting cycle, the smoking cycle will be SUSPENDED and will resume when the door is closed or after the defrosting cycle.

If the aging cycle finishes, the smoking cycle is stopped. When the cycle is terminated, it is not possible to launch a smoking cycle.

Temperature and humidity are regulated regularly. All the other outputs can be activated/deactivated.

The SMOKING key will become one of 3 colours to indicate the activation, deactivation or pausing of the function/output. They are:



white icon key = function disabled
green icon key = function enabled and output activated
orange icon key = function enabled and output deactivated

5.4.3 Manual rest cycle

The operation of this cycle is described in the section "Management of product rest intervals". Similarly to what happens in the sterilisation/oxygenation and smoking cycles (see previous sections), the relative key will become one of 3 colours to indicate the activation, deactivation or pausing of the function/output.

5.4.4 Manual air change cycle

The operation of this cycle is described in the section "Air change management". Similarly to what happens in the sterilisation/oxygenation and smoking cycles (see previous sections), the relative key will become one of 3 colours to indicate the activation, deactivation or pausing of the function/output.

5.4.5 Manual defrosting

Pressing the appropriate key sets off the manual defrosting cycle. There is also an automatic defrosting cycle which is active at intervals during all the automatic and manual phases. Similarly to what happens in the sterilisation/oxygenation and smoking cycles (see previous sections), the relative key will become one of 3 colours to indicate the activation, deactivation or pausing of the function/output.

5.4.6 Light on/off

This manually switches the light on/off. The switching on/off of the light can also be associated with the digital door switch input status. Similarly to what happens in the sterilisation/oxygenation and smoking cycles (see previous sections), the relative key will become a different colour to indicate the activation or deactivation of the function/output (without the orange output status "paused").

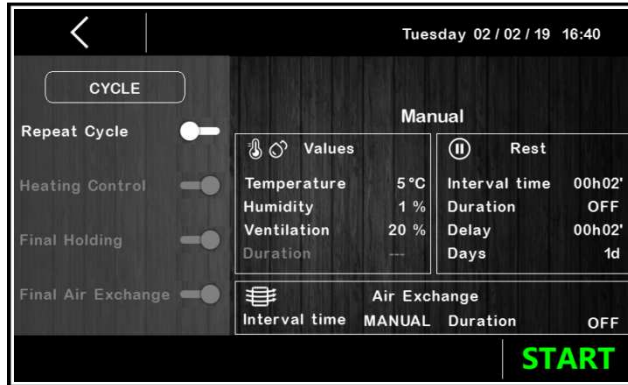
6 MAIN FUNCTIONS

6.1 Manual cycle



This area grants access to a manual product conservation/aging cycle.


First a setting screen for the values will be displayed (the last values set for a manual cycle will be given) and, once they have been confirmed, the manual cycle will start.



After a modification the settings will be saved provided that:

- an immediate START



-  pressure on button saving data if the start is not immediate. Note: pressure on button "<" without saving data will cancel the modifications.


When setting a manual cycle, the "cabinet restart", "final holding", "final air change" and "duration" functions are disabled and cannot be enabled.

The following screen appears during the manual cycle.



The top bar indicates the status of the main regulation outputs/status (hot / cold / humidification / dehumidification / ventilation / defrosting status), any alarm in progress (an alarm icon is always given with the description) and the current time-date.

At the top, above the temperature, the word AGING is displayed every 5 sec (if in progress), alternating with the name of the special cycle in progress. The count-up of the elapsed time from the beginning of the manual cycle will be shown.

By pressing the key  or the whole area of the T and RH display (with a resolution of 0.1°C for the temperature), the setpoint settings screen for the cycle in progress will appear.

If the pH value is enabled from parameter, it is shown in read-only form (to two decimal points) under the relative humidity value.

The area under the temperature indicates:

- the remaining time needed to finish the "special cycle" in progress. Special cycles are: rest cycle, air change cycle, smoking cycle, sterilisation/oxygenation cycle.
- the type of cycle in progress (manual / automatic / name of programme), which may be replaced by the code of an alarm if in progress.

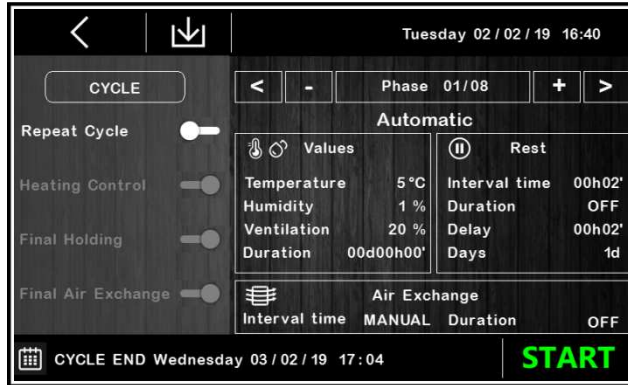
N.B.: duration settings cannot be made in the manual cycle, it can only be stopped manually by pressing the key **STOP**.

6.2 Automatic cycle



6.2.1 Start-up and interruption of an automatic cycle

This area grants access to the following screen where a complete aging cycle can be set, phase by phase:



The automatic cycle starts up when the **START** area is pressed and it terminates automatically at the end of the last set phase, at which time a buzzer sounds.

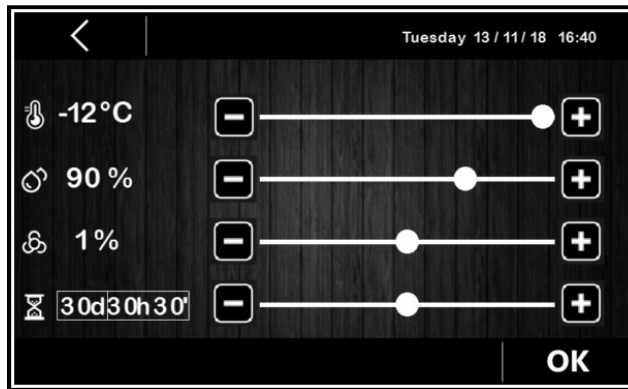
The cycle can be interrupted manually during any phase by holding the **STOP** key down for 4 seconds.

N.B.: the final holding phase is optional (it must be enabled during the general set-up of the cycle) and duration settings cannot be made in it, so if it is enabled, it can only be stopped manually by pressing the key **STOP**.



6.2.2 Setting/Making changes to an automatic cycle

Before starting up a cycle, it is possible to consult and modify the settings of each of the stages in the aging cycle.



Once OK has been pressed each time to confirm the changes, these will be saved and used as the settings for the automatic cycle which is started up:

- by pressing the **START** area
- saving with button
- premendo the modifications will not be saved unless when starting the cycle.

The CYCLE END icon is displayed on the bottom left of the screen: it indicates the day and time for the end of the aging cycle, which is the sum of times set for each individual phase. The date and time of the end of the cycle have no significance as far as the programme being set is concerned, they are just a reference for the user.

6.2.3 Saving an automatic cycle

To save the set cycle before it is started up, press the icon at the top left of the screen: scroll through the pages of the recipe book with the list of recipes using the or keys and choose the desired position in which to save the recipe, giving it a new name or overwriting an existing recipe. When the operation has been completed, press the **OK** key to confirm.



6.3 Recipe book



This area grants access to the MY RECIPES screen listing the automatic/manual aging cycles saved with the name by the user, following the procedure described in the previous section 6.2.3. Users can save up to 10 recipes.

Press the name of the required recipe to gain direct access to the automatic cycle start-up page, from which it is possible to run a cycle or enter the various phases to change the settings and to create a new recipe from it, which can also overwrite an existing recipe or save it with a different name (see section 6.2.3).

N.B.: It is not possible to use dashes in memory names and when such a recipe on the list is pressed there will be no effect.

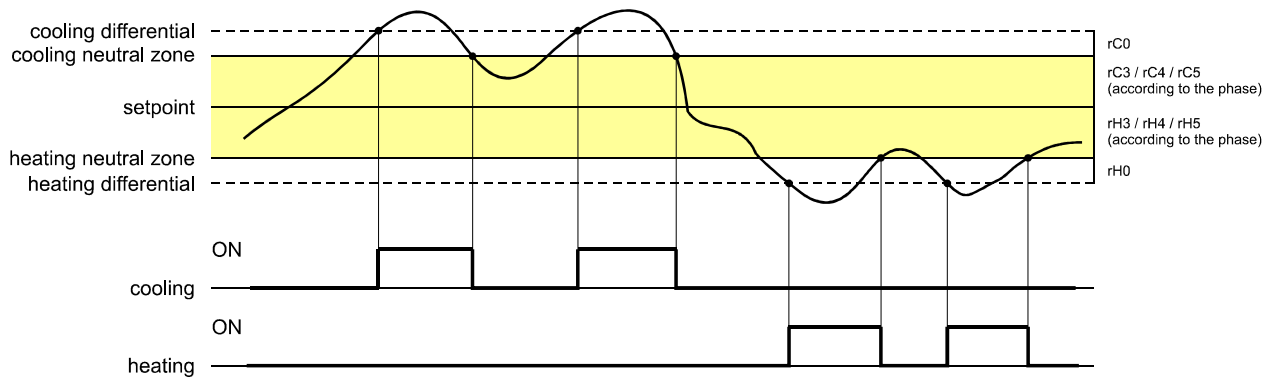
7 REGULATIONS

7.1 Temperature regulation

Temperature regulation for all phases of the equipment is in the neutral zone in which two relative values are set one above and one below the temperature setpoint, thus creating a zone inside which the loads for heating and cooling are not activated.

When the temperature rises above the neutral zone value beyond the threshold set by rC0 (cooling differential), the cooling loads are activated until the temperature returns to the neutral zone value.

Similarly, when the temperature falls below the neutral zone value beyond the threshold set by rH0 (heating differential), the heating loads are activated until the temperature returns to the neutral zone value.



7.1.1 Generating cooling

Cooling is generated by the refrigeration circuit installed in the equipment.

When cooling is required, the compressor output and the pump-down solenoid valve output (if enabled) are activated.

The evaporator fan operates continuously or in parallel with the compressor, according to how the parameters have been configured for each phase and on the basis of the speed set for the phase in progress (single speed, double speed or proportional by the external phase cutting module).

7.1.2 Generating heat

Heat is generated by a heater.

When heating is required, the heater output is activated, with the possibility of running a duty switch on/off cycle (set by parameters rH6 and rH7), so as to limit the heating power if a very powerful heater is being used and thus avoid the cabinet overheating.

The evaporator fan operates continuously or in parallel with the heater output and on the basis of the speed set for the phase in progress (single speed, double speed or proportional by the external phase cutting module).

For certain types of aging cycles, the end user can disable the heating control in the cabinet completely when entering the settings for the cycle.

7.2 TEMPERATURE PRIORITY

If parameter "rU4=1" and the temperature goes outside the control band, the regulator stops dehumidifying using the compressor, in order that the temperature can get the SETPOINT, before dehumidifying again.

The minimum cabinet threshold temperature for humidity regulation is parameter rU14.

7.3 Humidity regulation

In all phases where this is required, the humidity is regulated with a humidity transducer enabled in the neutral zone in which two values are set, one above and one below the humidity setpoint, thus creating a zone inside which the loads for humidification and dehumidification are not activated.

When the humidity rises above the neutral zone value beyond the threshold set by rU5 (dehumidification differential), the dehumidifying loads are activated and they remain active until the humidity returns to the neutral zone value.

Similarly, when the humidity falls below the neutral zone value beyond the threshold set by rU8 (humidification differential), the humidifying loads are activated proportionally and they remain active until the humidity returns to the neutral zone value.

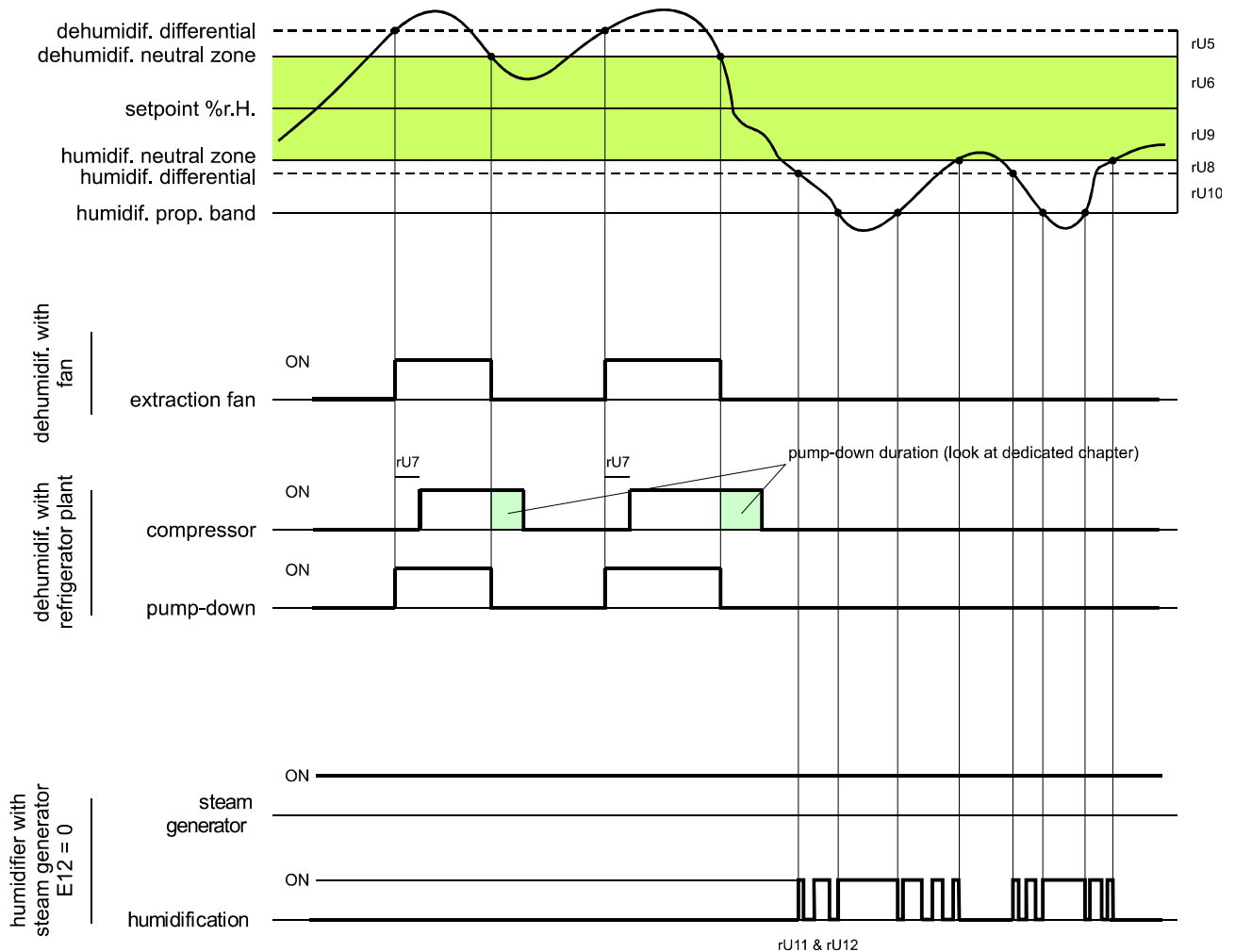
If the humidity setpoint is set to OFF for one phase, humidity control is disabled for the entire phase (the humidity value in the cabinet will be displayed however).

NB.: for managing humidity without a transducer, see section 8.7.

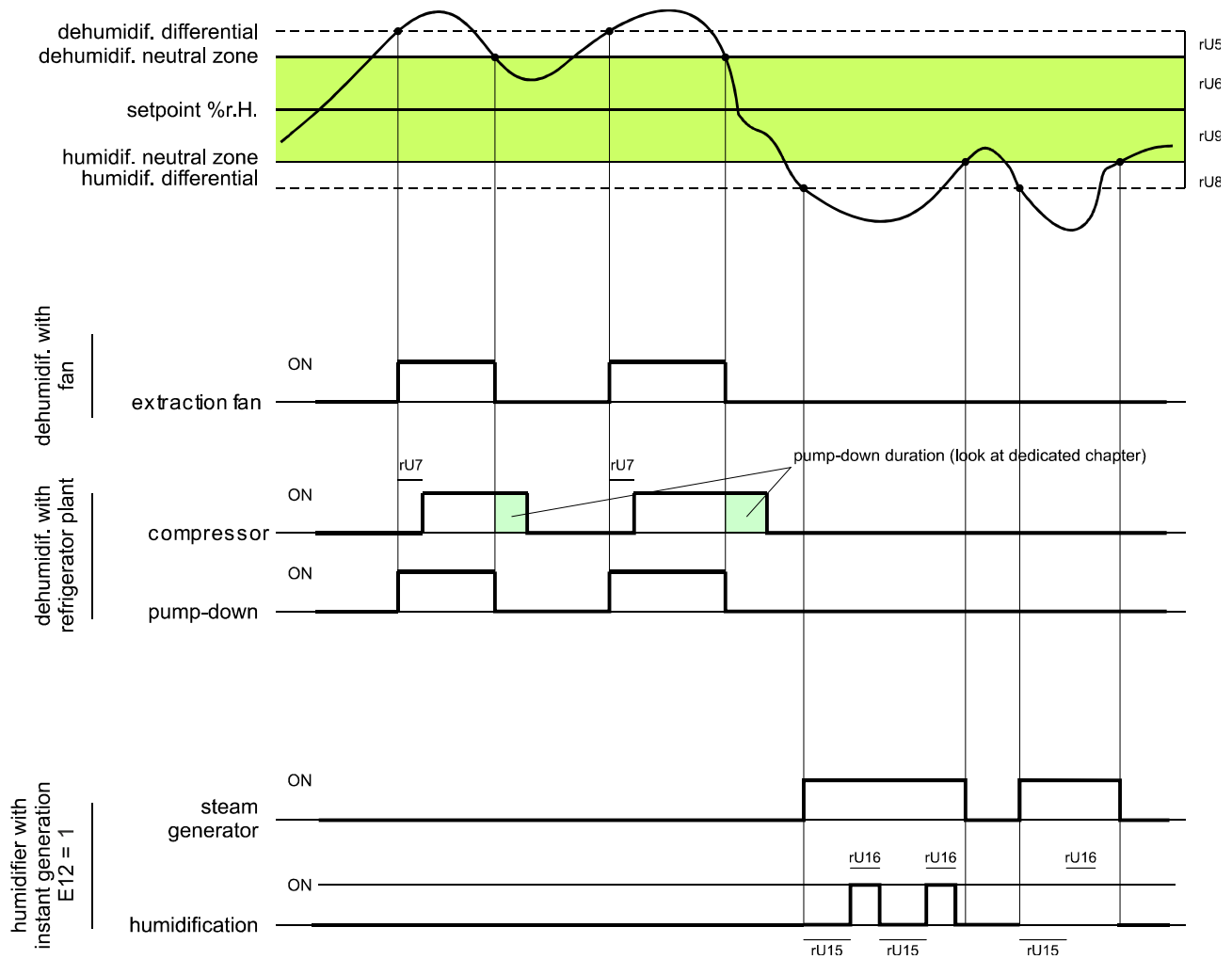
7.3.1 Humidification management

Humidification is managed by two different loads: a humidity generator output and a humidifier output (if enabled by parameter).

If parameter E12 is set at 0, the steam generator output remains active during the phases for which humidification management is required. The humidifier output, on the other hand, is only activated when the humidity value inside the cabinet falls below the neutral zone value (set by parameter rU9) beyond the threshold set by parameter rU8 (humidification differential). The humidifier output activation time percentage is proportional to the humidity value compared to the proportional humidification band value set by parameter rU10. The activation/deactivation cycle time of the humidification output is set by parameter rU11, while the duration of activation is calculated on the basis of the time set by rU12.



If parameter E12 is set at 1, the generator output will only be active when the humidity falls below the neutral zone value (set by parameter rU9) beyond the threshold set by rU8 (humidification differential). However, the humidifier output is activated in on/off cycles when required, always starting at the off time, to allow the steam generator to be ready to generate humidity.



7.3.2 Dehumidification management

Dehumidification can be managed in two different ways: using an extractor fan/dehumidifier (u4=0) or by activating the refrigeration plant (u4=1).

When being managed by an extractor fan/dehumidifier, the output will be activated when the humidity rises above the dehumidification neutral zone value (parameter rU6) beyond the threshold set by parameter rU5 (dehumidification differential) and it is deactivated when the humidity returns to within the dehumidification neutral zone value.

The compressor works in the same way if pump-down solenoid valve management is not enabled (parameter u1=1).

If pump-down solenoid valve management is enabled (parameter u1=0), there will be a first attempt at dehumidification by activating the solenoid valve for a time set by parameter rU7, in an attempt to make use of the high pressure generated during pump-down when the compressor is switched off. Once this time has elapsed, the compressor output will also be activated if further dehumidification is required.

Once the humidity returns to within the dehumidification neutral zone value, the pump-down solenoid valve will be deactivated, after which the compressor will be deactivated by the pump-down algorithm.

8 LOAD MANAGEMENT

8.1 Compressor management

Activation of the compressor depends on the length of the delay between two switch-ons (parameter C1), on the minimum duration of the compressor-off time (parameter C2), on the delayed switch-on of the compressor from the device power-on (parameter C0) and on the minimum duration of the compressor-on time (parameter C3).

The compressor can also be active during a hot gas defrost (parameter d1 = 1). In this situation, in order for the defrost to start, the compressor must be active for at least the time set by parameter d15.

The compressor can also be used for dehumidification, for more details see section 8.8.2.

The compressor switch-off is managed differently if management of the pump-down solenoid valve is required. For more details see the next section.

8.2 Pump-down management

If an output is configured as a pump-down solenoid valve, the controller will manage the interaction between the compressor output and the solenoid valve output as follows:

With timed pump-down (parameter i6 = 0 or 1):

When the compressor is activated, the pump-down solenoid valve will be activated in parallel.

The deactivation of the compressor will be preceded by deactivation of the pump-down solenoid valve. After the time set by u2 the compressor output will also be deactivated.

With pump-down managed by digital input LP (parameter i6 = 2):

When the compressor is activated, the pump-down solenoid valve will be activated in parallel.

The deactivation of the compressor will be preceded by deactivation of the pump-down solenoid valve. The compressor will then be switched off by the action of digital input LP.

If there is no action of the digital input LP within the maximum time set by u2, the compressor will be deactivated and the PUMP DOWN alarm will be activated. Any HIGH PRESSURE alarm will turn off the compressor regardless of the pump-down management.

If pump-down is managed by digital input LP, each time the compressor and solenoid valve output are switched on, a re-arm time will be loaded for digital input LP (parameter i9). When the compressor is switched off, the status of digital input LP will not be affected.

8.3 Evaporator fan management

The evaporator fan is managed based on parameter F0:

- in single speed mode by a digital output
- in double speed mode by two HIGH SPEED and LOW SPEED digital outputs
- with proportional speed set by the user by the analogue output PWM (to be teamed with the phase cutting module EVDFAN1)

The evaporator fan can be configured during the phases of an automatic cycle to work continuously or in parallel with the regulation output, that being in parallel with the compressor, heater, humidification and dehumidification. The way it behaves is set by parameter F1.

It is possible to select a different operating mode for the fan for the final holding phase and during manual operation (parameter F4).

It is also possible to set a regulation output delay at the fan deactivation using parameter F13 and a duty-cycle with a cycle time and On time set by parameters F14 and F15 during deactivation of the main load. If parameters F14 and F15 are set to zero, there will be no activation.

The duty cycle set by parameters F14 and F15 is also valid during THE PRODUCT REST PHASES, to prevent stratification of the air in the cabinet.

During refrigeration phases, the fan will only be active when the evaporator temperature is below the value set by parameter F25.

If the evaporator fan is being managed by a two-speed fan output (HIGH-LOW) or analogue output PWM, it will also be possible to set the fan speed for each phase.

When it is managed by PWM, when the fan is switched on the controller manages its speed (F21) and a start-up time (F22). When the start-up phase ends, the fan speed will keep to the speed set for the phase in progress, compensated between parameters F23 and F24 that set the minimum and maximum fan speed respectively.

During a defrost cycle the fan is in OFF mode. At the end of the defrost cycle, the evaporator fan will remain off for the drip time set by parameter d7 and the subsequent evaporator fan-stop time set by parameter F12.

Evaporator fan calibration procedure managed by the TDF module:

To adapt the phase-cutting regulation (T.D.F.) to all types of 230 VAC single-phase motors, a manual evaporator fan calibration procedure is recommended.


1. Set F23 at 0% and F24 at 100%.
2. Carry out a manual cycle and vary the fan speed, check the minimum percentage below which the fan switches off and the maximum percentage above which the fan runs at maximum.
3. Set these values for F23 and F24 respectively.

8.3.1 MODULATING VENTILATION ACCORDING TO THE STATUS

If **F5=1** it is possible to associate a specific speed to the ventilation, according to the regulation status:

REGULATION STATUS	Value % ventilation output	
Cool request	F6	
Heat request	F7	
Pause regulation (no heating, no cooling, no humidification, no dehumidification)	F8	
Humidification	F9=0 set fix value F10 F9=1 modulating ramp between values the humidity value to the threshold ru9 (in pause F8) and the speed value F10 to the threshold rU8	
Humidification	F10	
De- Humidification	F11	

8.4 Defrost management

Defrost is active during all the operating phases (both automatic and manual cycles) and can be either automatic (time intervals) or manual. Manual defrost can be activated by accessing the relevant menu on the On/stand-by screen by pressing the  key or during a cycle, by the MANUAL DEFROSTING key on the lower part of the screen.

Depending on the value of parameter d1, the machine will perform either electric or hot gas defrost cycles.

If the evaporator probe is enabled (parameter P3=1), the defrost will end when it reaches the end-of-defrost temperature (parameter d2) within a maximum time interval set by parameter d3. If the evaporator probe is not enabled (P3=0) or if it is out of order, defrost will end at the time set by parameter d3.

At the end of a defrost cycle, the controller will allocate a drip time (d7) during which all the regulation outputs will be switched off. When the dripping time finishes, the refrigeration plant will begin working again but activation of the evaporator fan will be further delayed by the time set by parameter F12.

If a hot gas defrost is being carried out, in order for the defrost to start, the compressor must be activated for at least the time set by parameter d15.

8.5 Heater management

When heat is required, the heater output will be activated, also making it possible to manage a switch-on and off duty-cycle controlled by parameters rH6 and rH7.

8.6 Steam generator output management

Management of the steam generator load (if enabled) depends on the setting of parameter E12.

If E12=0: the steam generator output remains active during all the phases in which cabinet humidification is required.

If E12=1: the steam generator output is active when the setting requires humidification

8.7 Humidifier output management

The humidifier load (if enabled) can be managed with or without the use of a humidity transducer (parameter rU0) and it varies according to the type of humidifier selected (parameter E12).

8.7.1 Managing the humidifier output without a transducer (rU0 = 1, E12 = 0 or 1)

In this situation, the humidifier output will remain active for a duty-cycle that varies according to the humidity setpoint for the phase in progress.

The output activation and deactivation duration is set by parameter rU2 (humidification cycle time) and the maximum humidification time needed to obtain 100% humidity within the cabinet (rU3).

The humidification switch-on/off times will be proportional on the basis of the humidity setpoint percentage according to parameter rU3, and they will be repeated for every cycle time set by rU2.

8.7.2 Managing the humidifier output with a transducer and a humidifier with a steamer (rU0 = 0, E12 = 0)

The humidifier output is activated when the humidity value inside the cabinet falls below the neutral zone value (rU9) beyond the threshold set by the humidification differential (rU8).

The duration of the humidifier output activation is proportional to the humidity value compared to the proportional humidification band value set by parameter rU10.

Parameter rU11 sets the cycle time, while parameter rU12 represents the time base used to calculate the output activation duration.

8.7.3 Managing the humidifier output with a transducer and an instant generation humidifier (rU0 = 0, E12 = 1)

The humidifier output is activated when the humidity value inside the cabinet falls below the neutral zone value (rU9) beyond the threshold set by the humidification differential (rU8) performing off/on cycles, the duration being set by parameters rU15 and rU16. The count always starts from the off time.

8.8 Dehumidification management

Dehumidification management is only active when humidity is managed by a humidity transducer (rU0 = 0 or 2).

Dehumidification can be managed in two different ways: using an extractor fan (parameter u4) or by activating the refrigeration plant (compressor and pump-down solenoid valve if present).

8.8.1 Management using an extractor fan/dehumidifier

When managed by an extractor fan/dehumidifier, the output will be activated when the humidity rises above the dehumidification neutral zone value (rU6) plus the differential value (rU5) and it is deactivated when the humidity returns to within the dehumidification neutral zone value.

8.8.2 Management by activating the refrigeration plant

If, however, pump-down solenoid valve management is enabled, there will be a first attempt at dehumidification by activating the pump-down solenoid valve (to make use of the high pressure generated when the compressor is switched off), for a time period set by rU7. After this time has elapsed, the compressor output will be activated.

Once the humidity returns to within the dehumidification neutral zone value, the pump-down solenoid valve will be deactivated, after which the compressor will be deactivated by the pump-down algorithm.

If the pump-down solenoid valve management is not enabled, the compressor will be activated and will stay on until the humidity returns to within the dehumidification neutral zone value.

8.9 Condenser fan management

If the condenser probe is enabled (parameter P4 = 1), the condenser fan will activate when the condenser temperature rises above the value of parameter F16 plus the differential value (F16 + 2.0 °C / 4 °F), regardless of compressor status.


The condenser fan will switch off when the condenser temperature falls below the value of parameter F16.

If the condenser probe is disabled (parameter P4 = 0), the condenser fan will activate in parallel with the compressor, while deactivation will be delayed for the time set by parameter F17.

During CONDENSER OVERHEAT or COMPRESSOR LOCKED alarm, the condenser fan will stay on.

During defrost the fans will be switched off.

8.10 Cabinet light management

The cabinet light will switch-on/off by opening/closing the door or by pressing the  key while manual and/or automatic cycles are being carried out.

8.11 Air change fan management

The air change fan can be activated automatically and manually depending on the user's choice when setting the working cycle.

For phases in which NO automatic air change is required (only manual), the activation interval should be set to MANUAL (the equivalent of 0).

If the user also wishes to deactivate the MANUAL air change, the air change duration should be set to OFF (the equivalent of 0) for the desired phase.

8.12 Sterilisation/oxygenation management

The manufacturer parameter "u1" enables the output to be associated with the STERILISER or OXYGENATOR load (with the relevant icon).

By pressing the relevant key, the end user can manually activate the load, establishing the:

- a) duration of the function (consisting of a sequence of Ton + Toff; duration in hh:mm with value 0 = UP TO MANUAL STOP)
- b) activation time (Ton in seconds)
- c) switch-off time (Toff in seconds); when the switch-off time is set to 0 seconds, the output will be continuously active for the whole duration set by the user).

If the aging cycle goes into the rest or air change phase, the sterilisation/oxygenation cycle is paused.

If the door is opened, if there is a defrosting cycle or if the evaporator fan is deactivated, the sterilisation cycle will be SUSPENDED and will resume when the evaporator fan is reactivated.

If the aging cycle finishes, the sterilisation/oxygenation cycle is stopped.

The STERILISATION output is only activated when the EVAPORATOR FAN IS ACTIVATED.

Temperature and humidity are regulated regularly. All the other outputs can be activated/deactivated.

8.13 Smoker management

By pressing the relevant key, the end user can manually activate the load, establishing the duration of the function (duration in hh:mm with value 0 = UP TO MANUAL STOP)

If the aging cycle changes phase, the smoking cycle is stopped. If the aging cycle goes into the rest or air change phase, the smoking cycle is paused.

If the door is opened or there is a defrosting cycle, the smoking cycle will be SUSPENDED and will resume when the door is closed after the defrosting cycle.

If the aging cycle finishes, the smoking cycle is stopped. When the cycle is terminated, it is not possible to launch a smoking cycle.

Temperature and humidity are regulated regularly. All the other outputs can be activated/deactivated.

8.14 Alarm output management

The alarm output is activated/deactivated according to the value of parameter A5 when there is an alarm situation. It is activated/deactivated once the alarm situation has disappeared.

9 MANAGEMENT OF EQUIPMENT WITH HEAT PUMP

9.1 Food processing rooms with heat pump

The controller has a special operating mode for equipment with a heat pump, which can be enabled by setting parameter E16 = 1

When the heat pump mode is enabled, the controller always uses the refrigeration plant for cabinet cooling (and dehumidification) requests, whereas it uses the coupled compressor + 4-way valve for cabinet heating requests.

Parameter u3 establishes the delay between the activation/deactivation of the 4-way valve in relation to the deactivation/activation of the compressor.

If the operating mode is enabled with the heat pump in the SERVICE menu, a new menu is enabled called "EQUIPMENT CONFIGURATION" (protected by password -19) which contains the following configuration matrix:

VALVE 1	ON	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF
VALVE 2	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
VALVE 3	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
VALVE 4	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
VALVE 5	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
VALVE 6	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
VALVE 7	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

OK

Using the matrix, it is possible to decide the operating logic of up to 7 different VALVES (from V1 to V7) according to the different machine status during the aging cycle.

EXAMPLE

Valve 1 is:

- ON during a cooling request
- OFF during a heating request
- OFF during a dehumidification request
- OFF during a humidification request
- ON during a defrosting request
- ON during a special air change cycle
- OFF during a special rest cycle
- OFF during a pause between two phases (new parameter to insert)
- OFF when both the temperature and humidity values are within the neutral zone value.

If E16 = 1, each of the VALVES from V1 to V7 can be associated with a relay output from K1 to K13.

If the operating mode is enabled with the heat pump, the parameters from u01c to u13c increase their maximum settable value from 17 to 23, including the 7 CONFIGURABLE VALVES.

u01c	0	15 (23)	----	0	Load associated with output K1 0 = compressor 1 = cabinet light 2 = humidification 3 = air change 4 = heater 5 = defrosting 6 = pump-down solenoid valve 7 = condenser fan 8 = alarm 9 = steriliser/oxygenator 10 = smoker 11 = steam generator 12 = dehumidification
------	---	---------	------	---	--

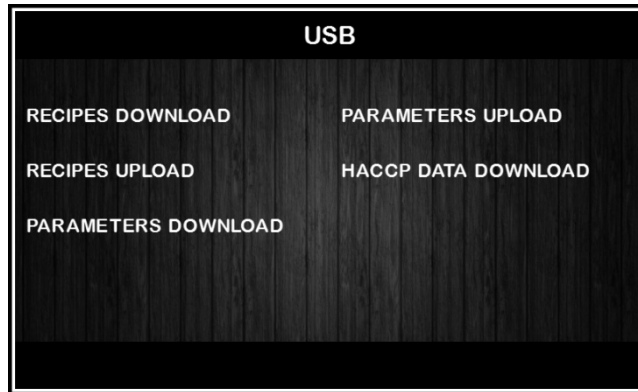
					13 = evaporator fan
					14 = low speed evaporator fan
					15 = high speed evaporator fan
					16 = 4-way valve
					17 = Valve V1
					18 = Valve V2
					19 = Valve V3
					20 = Valve V4
					21 = Valve V5
					22 = Valve V6
					23 = Valve V7

10 USB PORT MANAGEMENT

The USB port provides the following functions:

- download to a USB flash drive the data relating to the cycles performed (HACCP history)
- download to a USB flash drive the recipes saved in the controller
- download to a USB flash drive the parameters saved in the controller
- upload to the controller the recipes in the USB flash drive
- upload to the controller the parameters in the USB flash drive

Before inserting the flash drive into the USB port on the machine, switch to the On/stand-by screen and the menu shown below will appear.

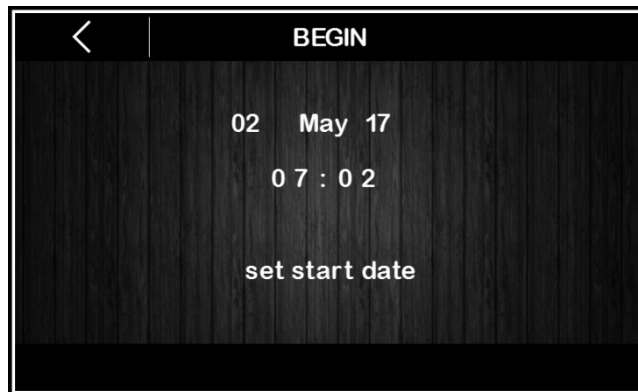


If the heat pump management is active E16=1 there will also be two settings:

VALVE SETUP DOWNLOAD To save the matrix map into an USB flash key

VALVE SETUP UPLOAD To load the matrix map from an USB flash key

To download historical data select the date to begin downloading HACCP data.



11 PARAMETERS

The table below describes the configuration parameters of the device.

Par.	Min	Max	Unit	Default	Analogue inputs
CA1	-25	25	°C	0	cabinet probe offset
CA2	-25	25	°C	0	evaporator probe offset
CA3	-25	25	°C	0	condenser probe offset
CA4	-25	25	% r.H.	0	humidity probe offset
CA5	-5.00	5.00	---	0.00	pH probe offset
P0	0	1	----	1	type of probe 0 = PTC 1 = NTC
P2	0	1	----	0	temperature measurement unit 0 = °C 1 = °F NB.: <u>variations to the value of parameter P2 are only effective after the board has been reset</u>
P3	0	1	----	1	enable evaporator probe 0 = disabled 1 = enabled
P4	0	1	----	0	enable condenser probe 0 = disabled 1 = enabled
P5	0	60	min	15	duration of the power failure above which the alarm "power failure" is displayed
P6	----	----	----	----	unused
P7	0	P8	% r.H.	0	lower calibration limit of the humidity transducer (corresponding to 4 mA)
P8	P7	100	% r.H.	100	upper calibration limit of the humidity transducer (corresponding to 20 mA)
P9	0	1	----	0	enable pH probe (only if rU0 = 1 or 2) 0 = disabled 1 = enabled
P10	-5.00	P11	% r.H.	0.00	lower calibration limit of the pH transducer (corresponding to 4 mA)
P11	P10	10.00	% r.H.	7.00	upper calibration limit of the pH transducer (corresponding to 20 mA)
Par.	Min	Max	Unit	Default	Cooling regulator
rC0	1	15	°C	2	cooling regulation differential
rC1	-99	99	°C	-20	minimum setpoint that can be set
rC2	-99	99	°C	20	maximum setpoint that can be set
rC3	0	10	°C	1	cooling neutral zone value
Par.	Min	Max	Unit	Default	Heating regulator
rH0	1	15	°C	2	heating differential
rH3	0	10	°C	1	neutral zone value
rH6	1	600	s	60	cycle time for heater switch-on if heating is required (see also rH7)

rH7	1	600	s	45	heater switch-on time within the rH6 cycle time
rH8	0	600	min	15	duration pause at beginning of phase
+Par.	Min	Max	Unit	Default	Humidity regulator
rU0	0	2	- - - -	0	humidity management mode: 0 = with humidity probe 4 -20 mA 1 = without humidity probe, time intervals based on the percentage set 2 = with humidity probe EVHTP500
rU1	-99	99	°C	0	minimum cabinet temperature for inhibiting humidification control
rU2	1	600	s	60	cycle time for humidifier switch-on (only for rU0 = 1, see also rU3)
rU3	1	600	s	30	humidifier switch-on time rU2 cycle time to generate 100% humidity in cabinet (only for rU0 = 1, see also rU2)
rU4	0	1	- - - -	0	temperature priority 0= no 1= yes (temperature setpoint is satisfied and then the device controls the humidity)
rU5	1	100	% r.H.	5	dehumidification differential
rU6	0	100	% r.H.	2	dehumidification neutral zone value
rU7	0	255	s	10	duration of dehumidification attempt with pump-down solenoid valve
rU8	1	100	% r.H.	5	humidification differential
rU9	0	100	% r.H.	2	humidification neutral zone value
rU10	0	50	% r.H.	10	humidification proportional band value (only for E12=0)
rU11	0	255	s	30	cycle time for humidification proportional regulation (only for E12=0)
rU12	0	1	- - - -	0	time base for humidification proportional regulation cycle time (only for E12=0): 0 = seconds 1 = minutes
rU13	0	100	%	80	maximum humidity setpoint that can be set
rU14	-99	99	°C	0	minimum cabinet temperature for inhibiting dehumidification control
rU15	0	300	s	60	humidifier pause time (only if E12=1)
rU16	0	60	s	3	humidifier activation time (only if E12=1)
Par.	Min	Max	Unit	Default	Compressor protection
C0	0	240	min	0	compressor switch-on delay from device switch-on
C1	0	240	min	2	delay between two compressor switch-ons
C2	0	240	min	0	minimum compressor-off duration
C3	0	240	s	0	minimum compressor-on duration
C4	0	240	min	0	compressor activation time during dehumidification
C6	0	199	°C	70	condensation temperature above which the condenser overheat alarm sounds
C7	0	199	°C	80	condensation temperature above which the compressor locked alarm sounds
C8	0	15	min	1	compressor locked alarm delay

C9	0	999	min	10	time compressor ON during temperature probe error
C10	0	999	min	10	time compressor OFF during temperature probe error
Par.	Min	Max	Unit	Default	Defrosting
d0	0	99	h	6	automatic defrost interval 0 = defrost at intervals is never repeated
d1	0	2	----	0	type of defrost 0 = electrical (during defrosting the compressor is switched off, the defrost output is activated and the evaporator fan switched off). 1 = hot gas (during defrosting the compressor is switched on, the defrost output is activated and the evaporator fan is switched off). 2 = when cycle is reversed (remember to enable an output as the 4-way valve and operation as heat pump)
d2	-99	99	°C	8	defrost end threshold (evaporator temperature); see also parameter d3
d3	0	99	min	30	if parameter P3 is set at 0, defrost duration if parameter P3 is set at 1, maximum defrost duration; see also parameter d2 0 = defrost is never activated
d5	0	99	min	30	reserved
d7	0	15	min	2	drip time (during dripping the compressor and evaporator fan will remain off and the defrost output will be deactivated)
d15	0	99	min	0	minimum consecutive compressor-on duration for starting hot gas defrost when defrost interval elapses (only if parameter d1 is set at 1)
Par.	Min	Max	Unit	Default	Temperature alarms
A1	0	99	°C	70	evaporator temperature above which the evaporator high temperature alarm is activated; see also parameter A2
A2	-1	240	min	1	delay evaporator high temperature alarm 1 = yes -1 = alarm not enabled
A3	0	99	°C	70	cabinet temperature above which the cabinet high temperature alarm is activated; see also parameter A4
A4	-1	240	min	-1	delay high cabinet temperature alarm -1 = alarm not enabled
A5	0	1	----	0	Polarity of alarm relay output 0 = NO 1 = NC
Par.	Min	Max	Unit	Default	Evaporator and condenser fan
F0	0	1	----	2	Type of evaporator fan management 0 = single speed on relay output 1 = double speed (HIGH/LOW) on two relay outputs 2 = variable speed on PWM output and TDF EVFDAN1 module
F1	0	1	----	0	evaporator fan activity during the aging phases 0 = parallel function with the compressor 1 = continuous function
F2	0	1	----	0	temperature and humidity management during special air change


					cycles 0 = management T + RH disabled 1 = management T + RH enabled
F4	0	1	----	0	evaporator fan activity during the final holding phase and during the manual cycle 0 = parallel function with the main loads 1 = continuous function
F5	0	1	----	0	common or separated fan speed 0= common (the value depends on "Ventilation" and can be changed for dehumidification using F11). 1= separated with F6/F7/F8/F9/F10/F11. The fan value is cancelled from the display and can not be changed (just like when the EVDFAN module is not connected). The value is loaded according the active function
F6	10	100	%	100	Evaporator fan speed in Cooling with "F05=1".
F7	10	100	%	100	Evaporator fan speed in Heating with "F05=1".
F8	0	100	%	0	evaporator fan speed in rest regulation with "F05=1" (when cooling, heating, humidifying and dehumidifying is not active). 0= not active, stop fan.
F9	0	1	----	0	evaporator fan mode in humidifying with "F05=1": 0= normal fix fan with value F10 1= modulating (according to a ramp)
F10	10	100		50	evaporator fan speed in humidifying umidifica With "F05=1" and "F9=1" the speed depends on the humidity value: moving from the active speed at the moment of the humidification request (threshold rU9) to the value F10 (threshold rU8). Uphill or downhill according to the parameters.
F11	0	100	%	100	evaporator fan speed common if F5=0 in dehumidification if F5=1
F12	0	15	min	2	fan stop after the drip phase
F13	0	250	s	0	evaporator fan switch-off delay from main load switch-off
F14	1	600	s	0	evaporator fan cycle time with compressor switched off (applies both during normal operation and during a product rest phase). If set at 0, cyclical fan switch-on will be deactivated
F15	1	600	s	0	evaporator fan switch-on time within the F14 cycle time (applies both during normal operation and a product rest phase)
F16	0	99	°C	20	condenser temperature above which the condenser fan is switched on (irrespective of the compressor status)
F17	0	240	s	5	condenser fan switch-off delay from compressor switch-off (only applies if the condenser probe is disabled)
F18	0	240	s	15	evaporator fan switch-on delay from when the door is closed, or the door switch input is deactivated
F19	0	100	%	20	minimum evaporator fan speed that can be set
F20	0	100	%	100	maximum evaporator fan speed that can be set
F21	0	100	%	75	evaporator fan start-up speed

F22	1	10	s	5	start-up time when the evaporator fan is switched on
F23	0	100	%	35	evaporator fan min. speed calibration value
F24	0	100	%	65	evaporator fan max. speed calibration value
F25	-50	99	°C	1	evaporator temperature below which the evaporator fan is activated
Par.	Min	Max	Unit	Default	Digital inputs
i0	0	2	----	2	effect of the door opening, or when the door switch input is activated 0 = no effect 1 = the compressor, evaporator fan and heaters are switched off, the cabinet light is switched on 2 = the evaporator fan and heaters are switched off, the cabinet light is switched on If the door is opened, the humidifier, steriliser/oxygenator and smoker are switched off
i1	0	1	----	1	door switch input contact type 0 = normally open (input active with contact closed) 1 = normally closed (input active with contact open)
i2	-1	120	min	5	door open alarm signal delay -1 = alarm not signalled
i3	0	1	----	1	effect caused by activation of the high pressure input 0 = no effect 1 = the compressor and evaporator fan are switched off, the condenser fan is switched on
i4	0	1	----	0	high pressure input contact type 0 = normally open (input active with contact closed) 1 = normally closed (input active with contact open)
i5	-1	240	s	5	high pressure alarm signal delay -1 = alarm not signalled
i6	0	3	----	2	effect caused by activation of the low pressure input 0 = no effect 1 = <u>ALARM</u> The compressor and evaporator fan are switched off 2 = <u>PUMP-DOWN AND ALARM MANAGEMENT</u> While the compressor is being switched off, the digital input will act to switch off the compressor output to end the pump-down phase. During the activation phases of the refrigeration plant, the digital input will act to switch off the compressor and evaporator fan. 3 = <u>COMPRESSOR THERMAL SWITCH ALARM</u> The compressor is switched off
i7	0	1	----	0	low pressure input contact type 0 = normally open (input active with contact closed) 1 = normally closed (input active with contact open)
i8	-1	240	s	10	low pressure alarm signal delay -1 = alarm not signalled
i9	0	240	s	40	re-arm time for the low pressure switch when the compressor is switched on (only if i6 = 2)
i10	0	1	----	0	thermal switch input contact type 0 = normally open (input active with contact closed) 1 = normally closed (input active with contact open)
i11	-1	240	s	5	thermal switch alarm signal delay

Par.	Min	Max	Unit	Default	Digital outputs
					-1 = alarm not signalled
u1	0	1	----	0	Type of icon associated with the steriliser/oxygenator key and load 0 = steriliser 1 = oxygenator
u2	0	240	s	90	if i6 = 0 or 1: compressor deactivation delay from pump-down valve switch-off (pump-down being switched off) if i6 = 2: maximum pump-down duration in compressor switch-off mode without activating the low pressure input, causing the compressor to switch off and the pump-down alarm to sound 0 = no alarm signal
u3	0	600	s	15	compressor activation/deactivation delay in relation to the 4-way valve when heat pump is in operation
u4	0	1	----	1	Dehumidification management type 0 = dehumidifier/extractor fan (with this setting parameters rU5 and rU6 are relevant) 1 = management by activating the refrigeration plant
u01c	0	15 (23)	----	0	Load associated with output K1 0 = compressor 1 = cabinet light 2 = humidification 3 = air change 4 = heater 5 = defrosting 6 = pump-down solenoid valve 7 = condenser fan 8 = alarm 9 = steriliser/oxygenator 10 = smoker 11 = steam generator 12 = dehumidification 13 = evaporator fan 14 = low speed evaporator fan 15 = high speed evaporator fan 16 = 4-way valve 17 = Valve V1 18 = Valve V2 19 = Valve V3 20 = Valve V4 21 = Valve V5 22 = Valve V6 23 = Valve V7
u02c	0	15 (23)	----	1	Load associated with output K2 (see u01c)
u03c	0	15 (23)	----	2	Load associated with output K3 (see u01c)
u04c	0	15 (23)	----	3	Load associated with output K4 (see u01c)
u05c	0	15 (23)	----	4	Load associated with output K5 (see u01c)
u06c	0	15 (23)	----	8	Load associated with output K6 (see u01c)
u07c	0	15 (23)	----	7	Load associated with output K7 (see u01c)

u08c	0	15 (23)	----	6	Load associated with output K8 (see u01c)
u09c	0	15 (23)	----	5	Load associated with output K9 (see u01c)
u10c	0	15 (23)	----	9	Load associated with output K10 (see u01c), only with expansion
u11c	0	15 (23)	----	10	Load associated with output K11 (see u01c), only with expansion
u12c	0	15 (23)	----	11	Load associated with output K12 (see u01c), only with expansion
u13c	0	15 (23)	----	12	Load associated with output K13 (see u01c), only with expansion
Par.	Min	Max	Unit	Default	Serial communication (serial port type RS-485 with MODBUS communication protocol)
L1	1	240	min	10	internal data sampling time
LA	1	247	----	247	device address
Lb	0	3	----	2	baud rate 0 = 2,400 baud 1 = 4,800 baud 2 = 9,600 baud 3 = 19,200 baud
LP	0	2	----	2	parity 0 = none 1 = odd 2 = even
Par.	Min	Max	Unit	Default	Other
E7	-99	99	---	0	password to unlock screen saver 0 = not enabled
E8	0	240	min	1	inactivity period for enabling screen-saver 0 = not enabled
E9	0	1	----	1	display EVCO splash screen at power-on 0 = neutral screen 1 = EVCO splash screen
E11	0	120	s	10	duration of buzzer at end
E12	0	1	----	0	type of humidifier 0 = humidifier with steamer 1 = humidifier with instant generation
E13	0	240	min	10	duration of "cycle completed" display 0 = not enabled
E14	----	----	----	----	unused
E15	0	1	----	0	Enable 4 relay expansion EVC20P52N9XXX10
E16	0	1	----	0	Enable heat pump operation 0 = disabled 1 = enabled If set to 1, the only type of defrost possible is with the 4-way valve
E17	0	1	----	0	Disable programs 0= No 1=Yes
E18	0	1	---	0	Use matrix valve during dehumidification with compressor 0= 1st column compressor 1= 3rd column dehumidification

12 ALARMS

An alarm event is signalled by a prolonged buzzer sound and it can be seen when the  icon appears on the upper part of the screen. The type of alarm is shown in text on the lower part of the screen. The text does not appear on the settings page and if an alarm situation happens while the display is in screen-saver mode, the menu currently in use appears on the display.

To silence the buzzer, touch the screen at any point, while to remove the signal icon touch the screen over this and access the page listing the alarms on which those that are active are shown with the word ON alongside.

The table below lists the alarms that may be signalled.

Alarm	Meaning
HIGH TEMP. EVAPOR.	<p>Maximum evaporator temperature alarm.</p> <p>To correct:</p> <ul style="list-style-type: none"> - check the evaporator temperature - check the value of parameters A1 and A2 <p>Main results:</p> <ul style="list-style-type: none"> - all loads are deactivated
HIGH TEMP. CABINET	<p>Maximum cabinet temperature alarm.</p> <p>To correct:</p> <ul style="list-style-type: none"> - check the cabinet temperature - check the value of parameters A3 and A4 <p>Main results:</p> <ul style="list-style-type: none"> - all the loads are deactivated until the alarm stops - the word alarm will disappear only when that area is pressed.
DOOR OPEN	<p>Door open alarm.</p> <p>To correct:</p> <ul style="list-style-type: none"> - check the condition of the door - check the value of parameters i0, i1 and i2. <p>Main results:</p> <ul style="list-style-type: none"> - the effect set by parameter i0.
HIGH PRESSURE	<p>High pressure alarm.</p> <p>To correct:</p> <ul style="list-style-type: none"> - check the state of the high pressure input - check the value of parameters i3, i4 and i5. <p>Main results:</p> <ul style="list-style-type: none"> - the effect set by parameter i3.
LOW PRESSURE	<p>Low pressure alarm.</p> <p>To correct:</p> <ul style="list-style-type: none"> - check the state of the low pressure input - check the value of parameters i6, i7, i8 and i9. <p>Main results:</p> <ul style="list-style-type: none"> - the compressor and evaporator fan are switched off
COMPRESSOR THERMAL SWITCH	<p>Compressor thermal switch alarm.</p> <p>To correct:</p> <ul style="list-style-type: none"> - check the state of the compressor thermal switch input. - check the value of parameters i6, i7 and i8. <p>Main results:</p> <ul style="list-style-type: none"> - the compressor is switched off
THERMAL SWITCH	<p>Thermal switch alarm.</p> <p>To correct:</p> <ul style="list-style-type: none"> - check the state of the thermal switch input. - check the value of parameters i10 and i11. <p>Main results:</p>

	<ul style="list-style-type: none"> - all loads are deactivated
POWER FAILURE	<p>Power failure during a cycle run alarm (if the power failure is greater than P5)</p> <p>To correct:</p> <ul style="list-style-type: none"> - check the device-power supply connection
CONDENSER OVERHEAT	<p>Condenser overheat alarm.</p> <p>To correct:</p> <ul style="list-style-type: none"> - check the condenser temperature - check the value of parameter C6. <p>Main results:</p> <ul style="list-style-type: none"> - the condenser fan will be switched on.
COMPRESSOR LOCKED	<p>Compressor locked alarm.</p> <p>To correct:</p> <ul style="list-style-type: none"> - check the condenser temperature - check the value of parameters C7 and C8 - disconnect the device from the power supply and clean the condenser. <p>Main results:</p> <ul style="list-style-type: none"> - if the error occurs during an operating cycle, the cycle will be interrupted.
PUMP-DOWN	<p>Pump-down alarm</p> <p>To correct:</p> <ul style="list-style-type: none"> - check the maximum pump-down time set by parameter u2 - the alarm will be re-armed when the compressor is next activated or by pressing the buzzer silencing key <p>Main results:</p> <ul style="list-style-type: none"> - compressor switched off
CABINET PROBE	<p>Cabinet probe error.</p> <p>To correct:</p> <ul style="list-style-type: none"> - check the value of parameter P0 - check the integrity of the probe - check the device-probe connection - check the cabinet temperature. <p>Main results:</p> <ul style="list-style-type: none"> - if the error occurs during "stand-by", it will not be possible to start up an operating cycle - if the error happens during a cycle, the compressor will work according to C9-C10 - the dehumidification with compressor is suspended
EVAPORATOR PROBE	<p>Evaporator probe error.</p> <p>To correct:</p> <ul style="list-style-type: none"> - the same as for the cabinet probe error but with reference to the evaporator probe. <p>Main results:</p> <ul style="list-style-type: none"> - if parameter P3 is set to 1, defrosting will last for the time set by parameter d3
CONDENSER PROBE	<p>Condenser probe error.</p> <p>To correct:</p> <ul style="list-style-type: none"> - the same as for the cabinet probe error but with reference to the condenser probe. <p>Main results:</p> <ul style="list-style-type: none"> - the condenser fan will operate in parallel with the compressor - the condenser overheat alarm will never be activated - the compressor locked alarm will never be activated
HUMIDITY PROBE	<p>Humidity transducer error.</p> <p>To correct:</p> <ul style="list-style-type: none"> - check transducer integrity

	<ul style="list-style-type: none"> - check the device-transducer connection - check cabinet relative humidity. <p>Main consequences if parameter rU0 is set to 0:</p> <ul style="list-style-type: none"> - if the error happens during "stand-by", it will not be possible to start up humidity management cycles - if the error happens during a humidity control cycle, the cycle will be temperature controlled.
RTC	<p>Clock error.</p> <p>To correct:</p> <ul style="list-style-type: none"> - re-set the date and time. <p>Main results:</p> <ul style="list-style-type: none"> - the device is unable to start up automatic cycles - any automatic cycles in progress will be blocked.
POWER BOARD INCOMP.	<p>User interface-control module compatibility error.</p> <p>To correct:</p> <ul style="list-style-type: none"> - check that the user interface and the control module are compatible. <p>Main results:</p> <ul style="list-style-type: none"> - cycle in progress interrupted.
NO COMMUN.	<p>User interface-control module communication error.</p> <p>To correct:</p> <ul style="list-style-type: none"> - check the user interface-control module connection. <p>Main results:</p> <ul style="list-style-type: none"> - cycle in progress interrupted
ESP INCOMPATIBILITY	<p>Humidifier user interface compatibility error with the EASYSTEAM serial control (if E12 = 1).</p> <p>To correct:</p> <ul style="list-style-type: none"> - check that the user interface and the humidification module are compatible.
NO ESP COMMUN.	<p>Humidifier user interface with EASYSTEAM serial control communication error (if E12 = 1).</p> <p>To correct:</p> <ul style="list-style-type: none"> - check the user interface-humidification module connection.

13 ACCESSORIES

13.1 Non-optoisolated RS-485/USB serial interface

The interface enables the device to be connected to the Parameters Manager set-up software system.



13.2 USB plug for panel installation

The plug makes the USB communications port of the device more accessible.

To connect the device to the plug, connecting cable 0810500018 or 0810500020 must be used (to be ordered separately).



13.3 Connecting cables 0810500018/0810500020

These cables are used to connect the USB plug for panel installation 0812000002 to the device.

Cable 0810500018 is 2 m long; cable 0810500020 is 0.5 m long.



13.4 4GB USB flash drive EVUSB4096M

The flash drive makes it possible to upload and download the settings and the data recorded by the device.



14 TECHNICAL SPECIFICATIONS

14.1 Technical specifications

Purpose of the control device:	function controller.	
Construction of the control device:	built-in electronic device.	
Housing:	user interface	control module
	open frame board behind glass.	open frame board.
Category of heat and fire resistance:	D	
Measurements:	user interface	control module
	Vcolor 539 M: 166.0 x 118.0 x 35.0 mm (6.535 x 4.645 x 1.377 in; L x H x D). Vcolor 539 L: 216.0 x 156.0 x 50.0 mm (8.503 x 6.141 x 1.968 in; L x H x D).	166.0 x 116.0 x 44.0 mm (6.535 x 4.566 x 1.732 in; L x H x D).
Mounting methods for the control device:	user interface	control module
	installed from behind using threaded studs	on a flat surface with spacers.
Degree of protection:	user interface	control module
	IP65 (front).	IP00.
Connection method:	user interface	control module
	plug-in screw terminal blocks for wires up to 1.5 mm ² , type A female USB connector (USB port).	plug-in screw terminal blocks for wires up to 2.5 mm ²
	Maximum permitted length for connection cables: <ul style="list-style-type: none"> - user interface-control module connection: 10 m (32.8 ft) - power supply: 10 m (32.8 ft) - analogue inputs: 10 m (32.8 ft) - digital inputs: 10 m (32.8 ft) - analogue outputs: 10 m (32.8 ft) - digital outputs: 100 m (328 ft) - RS-485 MODBUS port: 1,000 m (3,280 ft) - USB port: 1 m (3.28 ft). 	
Operating temperature:	from 0 to 55 °C (from 32 to 131 °F)	
Storage temperature:	from -10 to 70 °C (from 14 to 158 °F).	
Operating humidity:	relative humidity without condensate from 10 to 90%.	
Pollution status of the control device:	2.	
Environmental standards	<ul style="list-style-type: none"> - RoHS 2011/65/EC - WEEE 2012/19/EU - REACH (EC) Regulation no. 1907/2006. 	

EMC standards	<ul style="list-style-type: none"> - EN 60730-1 - IEC 60730-1. 	
Power supply:	user interface	control module
	Vcolor 539 M: powered by the control module. Vcolor 539 L: 12 VAC 20 VA.	115... 230 VAC ($\pm 15\%$), 50 / 60 Hz (± 3 Hz), 10 VA max.
Rated impulse-withstand voltage:	4 KV.	
Over-voltage category:	III.	
Software class and structure:	A.	
Clock:	built-in (with secondary lithium battery).	
	Clock drift: ≤ 60 s/month at 25 °C (77 °F).	
	Clock battery autonomy in the absence of a power supply: > 6 months at 25 °C (77 °F)	
	Clock battery charging time: 24 h (the battery is charged by the power supply of the device).	
Analogue inputs:	5 inputs, 3 of which for PTC/NTC inputs (cabinet probe, evaporator probe and condenser probe), 1 for 4-20 mA input (humidity or pH probe), 1 for EVCO humidity probe EVHTP500	
	<i>PTC type analogue inputs</i>	
	Type of sensor:	KTY 81-121 (990 Ohm @ 25 °C, 77 °F).
	Measurement field:	from -50 to 150 °C (from -58 to 302 °F).
	Resolution:	1 °C (1 °F).
Protection:	none.	
<i>NTC type analogue inputs</i>		
Type of sensor:	B3435 (10 K Ohm @ 25 °C, 77 °F).	
Measurement field:	from -40 to 105 °C (from -40 to 221 °F).	
Resolution:	1 °C (1 °F).	
Protection:	none.	
<i>4-20 mA type analogue inputs</i>		
Measurement field:	can be configured.	
Protection:	none.	
<i>analogue inputs for EVHTP500</i>		
Measurement field:	5-95 %rH	
Protection:	none.	
Digital inputs:	4, dry contact (door switch, compressor thermal switch, low and high pressure switch).	
	<i>Dry contact</i>	
	Type of contact:	5 VDC, 2 mA.
	Power supply: none	

Analogue outputs:	1 for PWM signal (for phase cutting speed regulator for single-phase EVDFAN1 fans).
Digital outputs:	<p>9 outputs (electro-mechanical relays):</p> <ul style="list-style-type: none"> - 1 16 A res. @ 250 VAC type SPST (K1) configurable - 1 8 A res. @ 250 VAC type SPDT (K2) configurable - 1 8 A res. @ 250 VAC type SPST (K3) configurable - 1 8 A res. @ 250 VAC type SPST (K4) configurable - 1 8 A res. @ 250 VAC type SPDT (K5) configurable - 1 16 A res. @ 250 VAC type SPST (K6) configurable - 1 16 A res. @ 250 VAC type SPST (K7) configurable - 1 10 A res. @ 250 VAC type SPST (K8) configurable - 1 10 A res. @ 250 VAC type SPST (K9) configurable <p>On 4 relay expansion board EVC20P52N9XXX10</p> <ul style="list-style-type: none"> - 1 30 A res. @ 250 VAC type SPST (K10) configurable - 1 16 A res. @ 250 VAC type SPST (K11) configurable - 1 8 A res. @ 250 VAC type SPST (K12) configurable - 1 16 A res. @ 250 VAC type SPDT (K13) configurable
Displays:	5 or 7-inch TFT touch-screen graphic display, 16K colours, 800 x 480 pixel resolution The presence of imperfection points on the display is within the tolerance limits as established by the reference standards.
Type 1 or Type 2 actions:	Type 1.
Additional features of Type 1 or Type 2 actions:	C.
Communications ports:	<p>2 ports:</p> <ul style="list-style-type: none"> - 1 RS-485 MODBUS port - 1 USB port
Warning and alarm buzzer:	built-in.

Vcolor 539 M & L

Controller for food processing cabinets and rooms

Installer manual ver. 1.1

GA - 08/20

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