d CORE +ECO Ver.02   t CORE +ECO Ver.02

DIGITAL REFRIGERATION CONTROLLER WITH TOUCH-SENSITIVE KEYS

⚠ Have this manual in the palm of your hand using the **FG Finder** application.

Power save mode	Touch screen	Manual defrost	Function lock	Turn off control functions	Sound alarm	Serial programming	Variable compressor

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WARNING

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

⚡ **PRECAUTIONS WHEN INSTALLING THE PRODUCT:**
Before performing any procedure on this instrument, disconnect it from the power source;
Make sure that the instrument has adequate ventilation, avoiding installation on panels containing devices that may cause it to operate outside the specified temperature range;
Install the product away from sources that may generate electromagnetic disturbances, such as: motors, contactor, relays, solenoid valves, etc;

AUTHORIZED SERVICE:
Product installation or maintenance may only be performed by qualified professionals;

ACCESSORIES:
Use original Full Gauge Controls accessories only.
If you have any questions, please contact technical support.

AS IT CONSTANTLY EVOLVING, FULL GAUGE CONTROLS RESERVES THE RIGHT TO CHANGE THE INFORMATION CONTAINED IN THE MANUAL AT ANY TIME, WITHOUT PRIOR NOTICE.

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1. DESCRIPTION

d *CORE +ECO* and **t** *CORE +ECO* are electronic controllers for refrigeration dedicated to freezers, beverage displays and refrigerated cabinets. These controllers can activate cooling, defrost, fan and lighting system. In addition, it allows to pre-define up to 4 operating temperatures that are easily changed by its touch-sensitive keyboard (touchpad) for freezers with rotation of different products.

The controller supports 2 temperature sensors for the control of the refrigerated environment and intelligent defrost control (start and end of defrost by time or temperature). For a better use for energy, it can control ventilation during the cycle of the compressor and use Smooth Defrost, a defrosting technique that reduces the final temperature of the electrical resistance and the amount of heat emitted.

Using its digital input, door opening, economic setpoint activation, defrost or Fast-freezing can be monitored. The Fast-freezing function is an alternative for speed up the cooling process, recommended for use after the process of replacing products in the freezer.

In addition **t** *CORE +ECO* controller has system voltage monitoring where the operation of the equipment can be limited to only a safe voltage range, reducing the chance of electrical damage due to the power supply.

The *+ECO* line adds control of the variable capacity compressors (VCC - Variable Capacity Compressor). The *+ECO* controllers provide a series of benefits to the cooling system, such as: reduced energy consumption, less temperature fluctuation, greater speed in reaching the desired temperature. From the configuration of its parameters it is possible to make the controller compatible with the main brands of variable compressors on the market.
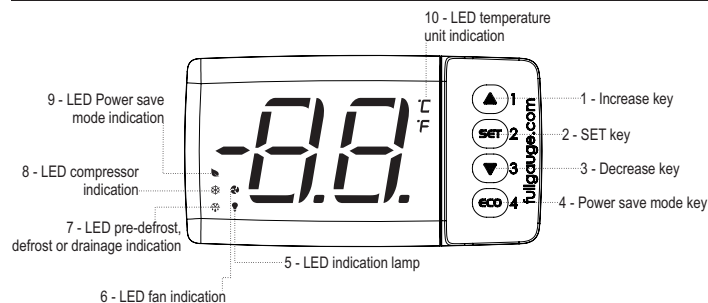
2. APPLICATIONS

- Beverage displays;
- Freezers;

3. TECHNICAL SPECIFICATIONS

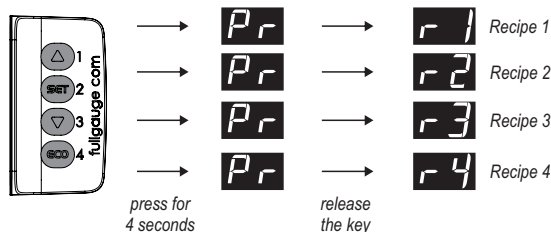|	
Controller supply	85~240Vac (50/60Hz)
Temperature control	-50 to 60°C (-58 to 99°F)
Operating temperature	0 to 60°C (32 to 140°F)
Resolution	0.1°C between -9.9 and 9.9°C and 1°C in the remainder of the range. 1°F across the range
Maximum relay current	COMP: 10(8)A / 250Vac 1HP - compressor output DEFR: 7A / 250Vac - defrost output FAN: 3(2)A / 250Vac - 1/10HP - fan output LIGHT: 2(2)A / 250Vac - lamp output
Digital input	Configurable dry contact type
Output frequency	12Vcc (±10%) 0...300Hz (duty-cycle=50%)
Operating humidity	10 to 90% UR (without condensation)
Front dimension (with frame)	100 x 54 x 22mm (3,9 x 2,1 x 0,8")
Front cutout dimension	91 x 45mm (3,6 x 1,7")
Base module dimension	116 x 88 x 27mm (4,6 x 3,5 x 1,1")

4. INDICATIONS AND KEYS

- 10 - LED temperature unit indication
- 9 - LED Power save mode indication
- 8 - LED compressor indication
- 7 - LED pre-defrost, defrost or drainage indication
- 6 - LED fan indication
- 5 - LED indication lamp
- 1 - Increase key
- 2 - SET key
- 3 - Decrease key
- 4 - Power save mode key

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5. BASIC OPERATIONS

### 5.1 Change the recipe (preset)

To select the desired recipe, press the corresponding key for 4 seconds until the message appears Pr, then release it.

Pr →	r1	Recipe 1
Pr →	r2	Recipe 2
Pr →	r3	Recipe 3
Pr →	r4	Recipe 4

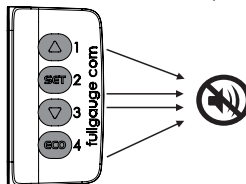*press for 4 seconds* — *release the key*

5.2 Turn the economy mode on / off

To turn power save mode on / off, press the **ECO** key for 8 seconds until the **[EC]** message appears, then release it.

EC → On (On) / OF (Off)

press for 8 seconds — *release the key*
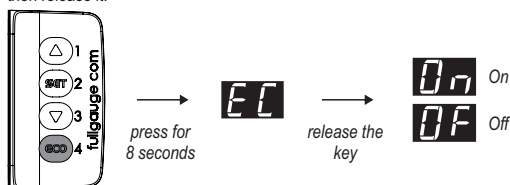
5.3 Disable the alarm

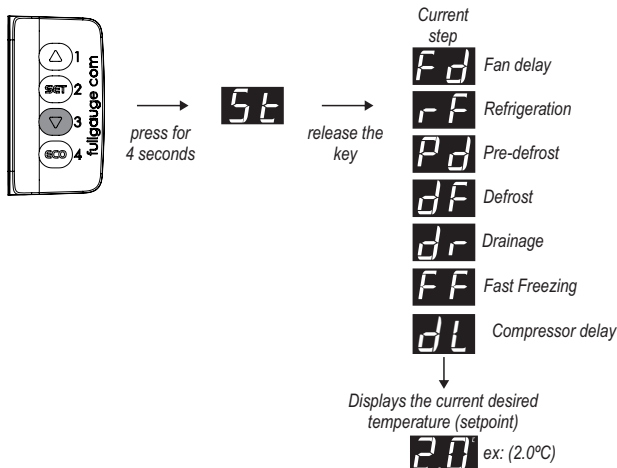To disable the audible alarm, quickly press any of keys 1 , 2, 3 or 4.

5.4 Manual defrost

To start/stop a manual defrost, regardless of programming, press key 1 for 8 seconds until the message dF appears, then release it. The message On will be shown when it starts, and OF when it is stopped.

dF → On (On) / OF (Off)
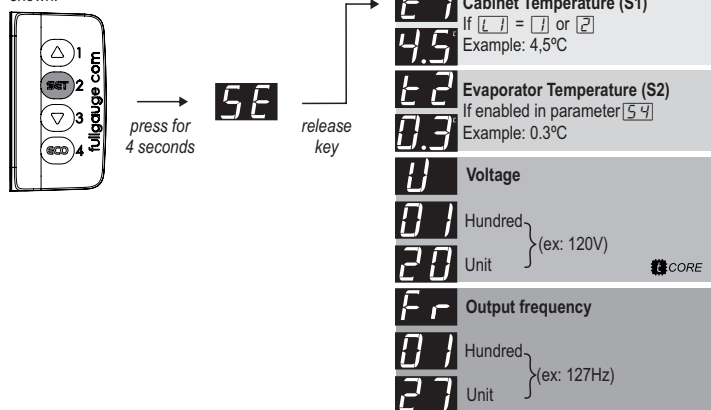
press for 8 seconds — *release the key*
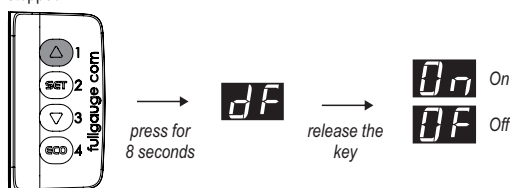
5.5 View process step and current desired temperatures (setpoint)

To check which process step is being performed, press key "3" for 4 seconds until the St message appears, then release it. The current process step is displayed and then the desired operating temperature setpoint relative to the operating mode (normal/power save).
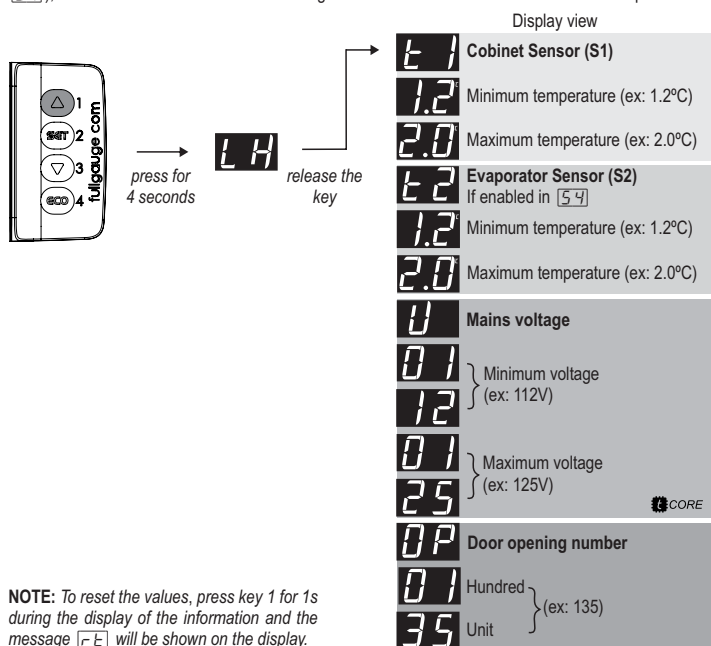
St →

Current step
- Fd — Fan delay
- rF — Refrigeration
- Pd — Pre-defrost
- dF — Defrost
- dr — Drainage
- FF — Fast Freezing
- dL — Compressor delay

press for 4 seconds — *release the key*

↓

Displays the current desired temperature (setpoint)

2.0 *ex: (2.0ºC)*

5.6 View current sensor temperature, mains voltage and frequency of the frequency output

Press key 2 for 4 seconds until the $5E$ message appears, then release it. The following information will be shown:

$t\,1$ 4.5	**Cabinet Temperature (S1)** If $L\,1$ = 1 or 2 Example: 4,5°C
$t2$ 0.3	**Evaporator Temperature (S2)** If enabled in parameter 54 Example: 0.3°C
U 01 20	**Voltage** Hundred Unit }(ex: 120V)
Fr 01 27	**Output frequency** Hundred Unit }(ex: 127Hz)

5.7 Minimum and maximum temperatures, voltage and number of the open door

Press key 1 for 4 seconds until the message LH appears, then release it. The controller displays the minimum and maximum temperatures of sensors S1 and S2 (52 is only displayed if enabled in function 54), as well as minimum and maximum voltages and the number of times the door has been opened.

Display view

$t\,1$ 1.2 2.0	**Cobinet Sensor (S1)** Minimum temperature (ex: 1.2°C) Maximum temperature (ex: 2.0°C)
$t2$ 1.2 2.0	**Evaporator Sensor (S2)** If enabled in 54 Minimum temperature (ex: 1.2°C) Maximum temperature (ex: 2.0°C)
U 01 12 01 25	**Mains voltage** Minimum voltage (ex: 112V) Maximum voltage (ex: 125V)
OP 01 35	**Door opening number** Hundred }(ex: 135) Unit

NOTE: *To reset the values, press key 1 for 1s during the display of the information and the message rt will be shown on the display.*

5.8 Select temperature unit

The controller temperature can be in either Celsius (°C) degrees or Fahrenheit (°F) degrees. To configure the unit, press keys 1 and 3 simultaneously for 2 seconds until $5L$ appears in the display, then release it. Select the Cd menu (press key 2 quickly) enter code 31 and confirm. The message Un will be
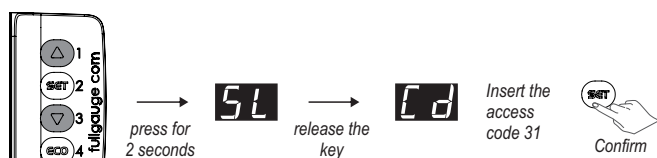

Note: Each time the unit is changed the parameters are reset as they assume the "factory default" values.

5.9 Fast Freezing

In Fast Freezing mode, the control uses the temperature limit parameter for fast freezing ($o\,1$, $o2$, $o3$, $o4$) to accelerate the refrigeration or freezing process. Upon reaching this temperature or the maximum

To start or stop Fast Freezing mode, press key 4 for 8 seconds until the FF message appears, then release it. The On message is displayed when it starts and OF when it is interrupted.
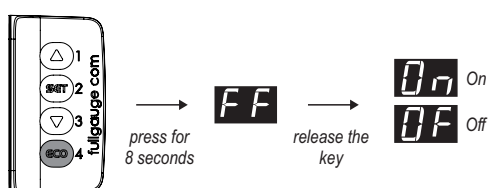
Note: If by activating fast freezing mode the controller identifies that there is a defrost programmed to start the time over during this period, the defrost will be anticipated and then starts fast freezing mode.

5.10 Configure the setpoint

To configure the selected recipe setpoint press key 2 for 8 seconds until the message $5P$ appears, then release it. The current setpoint value is displayed. Use keys 1 and 3 to adjust the desired value (setpoint).
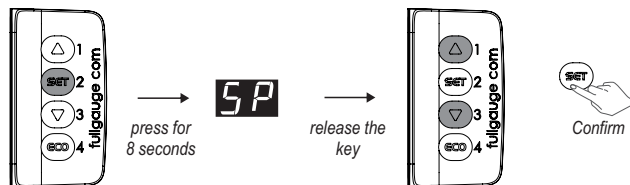
6. ADVANCED OPERATIONS

6.1 Configured parameters display

It is possible view controller settings without being able to edit them. To do this, press keys 1 and 3 simultaneously for 2 seconds until the message $5L$ appears, then release it. It is possible to view all controller settings. Navigate between menus using the 1 (increase) and 3 (decrease) keys. Confirm selection with key 2.
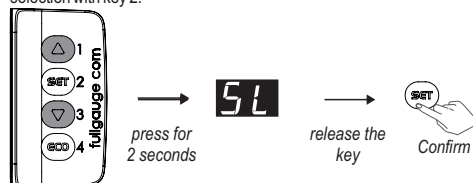

Pressing for 4 secs. returns to the main screen.

6.2 Changing the configured parameters

Press keys 1 and 3 simultaneously for 2 seconds until the message $5L$ appears, then release it. Select the Cd menu (short touch key 2) enter code 23 and confirm. It is possible to view all controller settings. Navigate between menus using the 1 (increase) and 3 (decrease) keys. Confirm selection with key 2.

Pressing for 4 secs returns to the main screen.

6.3 Function Lock

Using the function lock makes operating the instrument safer, with it active, the recipes and other parameters are visible to the user, but protected against undue changes ($L4$ = 2). Or it can be set to allow changes on the recipes, setpoint and locks all other parameters ($L4$ = 1). When function lock is activated and there is a try to change parameters, the message LL is displayed.
To enable the function lock, configure the time for function lock 15 to 60 seconds in parameter $L5$. This is the time to press for validation of the function lock. To lock or unlock the keypad, press keys 2 and 4 for the time set in $L5$ until the message LL appears, then release it. An On message will be displayed when it is locked and OF when it is unlocked.
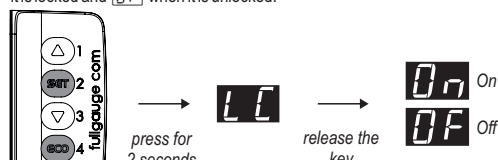

Hold pressing for the time set in $L5$.

6.4 Turning the control functions off (Monitoring only)

When turning off the control functions ($L6$), the controller will only operate as a temperature and voltage indicator with all outputs disabled. This function can operate as follows:
0 Does not allow control functions to be turned off.
1 Allow to turn control functions on and off only if the functions are unlocked.
2 Allow to turn control functions on and off even if the functions are locked. To switch control functions on/off, press key 3 for 8 seconds until message appears Ct, then release it:
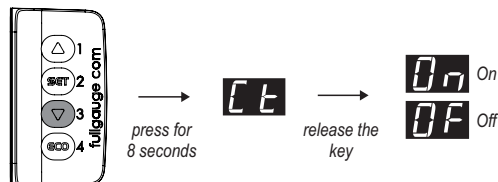

Note: When reconnecting control functions, the controller continues to respect the functions. $C\,1$ (minimum compressor off time) and $C5$ (Defrost when energizing controller).

6.5 Functions table

FUN	FUNCTION	DESCRIPTION	CELSIUS (FAHRENHEIT) MIN	MAX	UNIT.	DEFAULT
E1	Desired Temperature (setpoint) (r1)	This is the control temperature of the normal operating mode. When the temperature of sensor S1 (cabinet) is less or equal of the value configured in this function, the compressor turns OFF.	M1	M2	ºC (°F)	-9.0 (16)
E2	Desired Temperature (setpoint) (r2)		M1	M2	ºC (°F)	-6.0 (21)
E3	Desired Temperature (setpoint) (r3)		M1	M2	ºC (°F)	-1.0 (30)
E4	Desired Temperature (setpoint) (r4)		M1	M2	ºC (°F)	2.0 (36)
E1	Desired Temperature (economic setpoint) (r1)	This is the control temperature when the economic operating mode is active. If the sensor temperature S1 (cabinet) is less or equal of the value configured in this function, the compressor turns OFF.	M1	M2	ºC (°F)	-4.0 (25)
E2	Desired Temperature (economic setpoint) (r2)		M1	M2	ºC (°F)	-1.0 (30)
E3	Desired Temperature (economic setpoint) (r3)		M1	M2	ºC (°F)	4.0 (39)
E4	Desired Temperature (economic setpoint) (r4)		M1	M2	ºC (°F)	7.0 (45)
M1	Minimum desired temperature (setpoint) permitted for the user	Limits designed to prevent unintentional temperatures from being configured by mistake high or low temperature setpoint, which may result in high power consumption power for keeping the system continuously on.	-50 (-58)	M2	ºC (°F)	-50 (-58)
M2	Maximum desired temperature (setpoint) permitted for the user		M1	60 (99)	ºC (°F)	60 (99)
H1	Differential control (hysteresis)	It is the acceptable temperature variation interval to turn ON the compressor above the setpoint.	0.1 (01)	8.0 (14)	ºC (°F)	3.0 (05)
H2	Power Save Differential control (hysteresis)		0.1 (01)	8.0 (14)	ºC (°F)	3.0 (05)
S1	Digital filter operation mode	Defines whether parameters S2 and S3 interfere with the control or just the temperature display: 0 = Acts on display visualization and control routines 1 = Acts only when viewing the display	0	1	-	0
S2	Digital filter intensity applied to sensor S1 (Cabinet) (Rise)	The value configured in this function represents the time (in seconds) for the temperature upadates 0.1° C (or 1°F) as the temperature rises or falls. *Note: A typical application for this type of filter is freezers (such as ice cream displays). As the door of the freezer is opened for short periods of time, hot air may directly hit the sensor causing miss reading of the actual temperature of the cabinet, and unnecessarily activations of the compressor.*	0 [of]	20	seconds	0 [of]
S3	Digital filter intensity applied to sensor S1 (Cabinet) (Rise)		0 [of]	20	seconds	0 [of]
S4	Offset of the cabinet sensor indication (sensor S1)	Allows compensation for any deviations in the sensor reading due to changes it or by change of cable length.	-9.9 (-09)	9.9 (09)	ºC (°F)	0.0 (0)
S5	Offset of the Evaporator Sensor (sensor S2)	It allows compensation for any deviations in the evaporator temperature reading (S2), exchange or change in cable length. The S2 sensor can is disabled by setting the function to the minimum value until the message OF. appears. When sensor S2, all functions that depend on the reading of sensor S2 are disabled.	-10 [of]	9.9 (09)	ºC (°F)	0.0 (0)
o1	Temperature limit for Fast Freezing (r1)	This is the minimum temperature the instrument can reach during the Fast Freezing.	-50 (-58)	60 (99)	ºC (°F)	-14 (7)
o2	Temperature limit for Fast Freezing (r2)		-50 (-58)	60 (99)	ºC (°F)	-11 (12)
o3	Temperature limit for Fast Freezing (r3)		-50 (-58)	60 (99)	ºC (°F)	-6.0 (21)
o4	Temperature limit for Fast Freezing (r4)		-50 (-58)	60 (99)	ºC (°F)	-3.0 (26)
o5	Tempo máximo de Fast Freezing	This in the duration of the Fast Freezing process	0	99	hours	5
d1	Defrost type	0 = Electric defrost (eletric heaters), only the defrost output is actived 1 = Hot gas defrost, compressor and defrost outputs are actived. 2 = Natural defrost, only the fan output is actuated.	0	2	-	0
d2	Defrost start condition	0 = Defrost started by time; 1 = Temperature-initiated defrost (sensor S2); 2 = Defrost initiated by temperature difference S1-S2; 3 = Defrost initiated by (sensor S2) and temperature difference S1-S2.	0	3	-	0
d3	Interval between defrosts if d2 = 0 or Maximum time without defrost if d2 = 1, 2 or 3	Determines how much time for defrost and the time counted from the end of the previous defrost. If the controller is configured to perform temperature defrost (d2 = 1, 2 ou 3), this time acts as safety in situations where the evaporator temperature (sensor S2) does not reach the programmed values in d5 ou d6. This function determines the maximum time the controller remains without defrosting.	1	99	hours	12
d4	Additional time at end of the first cooling cycle	It serves to increase the time interval to start the first defrost only. In multiequipment installations, it is possible to avoid peaks in demand by not matching the defrost start time of each equipment. *Note: Time less tha 10 hours, displays decimal point. E.g: value 1.5 corresponds to 1 hour and 30 min. E.g: value corresponds to 15 hours.*	0.0 [of]	99	hours.minutes	0.0 [of]
d5	Temperature of evaporator to start defrost if d2 = 1 or 3	When the evaporator temperature (sensor S2) reaches the value configured in this function, the controller starts the confirmation time count to start the defrost (d7).	-50 (-58)	60 (99)	°C (°F)	-20 (-4)
d6	Temperature difference to start defrost (S1-S2) if d2 = 2 or 3	When the difference between the cabinet temperature (sensor S1) and the temperature of the evaporator (sensor S2) reaches the value configured in this function, the controller starts confirmation time count to start the defrost	-50 (-58)	60 (99)	°C (°F)	15 (59)
d7	Low temperature confirmation time (sensor S2) to initiate pre-defrost if d2 = 1, 2 ou 3	If the controller is configured to perform temperature defrost, at the moment the sensor S2 reaches the configured temperature value for defrost, then it starts for pre-defrost process. If this temperature rises above the configured value, the system returns to the refrigeration step.	1	99	minutes	10
d8	Defrost when energizing the controller	Enables defrosting at the moment the controller is energized, such as when the power returns (in case of power failure).	0 [of]	1 [on]	-	1 [on]
b1	Smooth Defrost	Smooth Defrost mode allows for a smoother defrost, saving energy and preventing the room temperature from rising as much as a standard defrost. In this mode, the defrost output remains on as long as the evaporator temperature (sensor S2) is less than 2°C (36°F), as the temperature is superated the defrost output cycles between ON and OFF as the percentage of time interval (2 min) configured in this function (x10). This mode is active only if sensor S2 and electric defrost is enabled (d1 = 0).	1	10 [of]	-	10 [of]
b2	Enable tray defrosting	With this function active, the FAN output operates as a second defrost output. This output is triggered during pre-defrost, defrost and drainage. *Note: With b2 = On the fan control functionality is disregarded.*	0 [of]	1 [on]	-	0 [of]
b3	Pre-defrost time (gas pickup)	When defrosting starts, the controller will only activate the fan during this time, in order to harness the residual energy if b2 = off.	0 [of]	99	minutes	0 [of]
b4	Evaporator temperature (sensor S2) to end defrost	If the temperature in the evaporator (sensor S2) reaches the set value, the end of the defrost happens by temperature. It can optimize the defrost process.	-50 (-58)	60 (99)	°C (°F)	40 (99)
b5	Cabinet temperature (sensor S1) to end defrost	If cabinet temperature (sensor S1) reaches the configured value, the end of defrost happens by temperature.	-50 (-58)	60 (99)	°C (°F)	20 (68)

FUN	FUNCTION	DESCRIPTION	CELSIUS (FAHRENHEIT)			
			MIN	MAX	UNIT.	DEFAULT
b6	Maximum defrost time (for safety)	This function configures the maximum defrost duration time. If, within this period, the defrost is not ended by temperature, a dot will flash on the lower right corner of the display (if enabled in A8), indicating that defrost termination occurred by time rather than temperature. This can happen when the temperature configured is too high, the time limit is insufficient, sensor S2 is disconnected or it is not in contact with the evaporator.	1	99	minutes	30
b7	Drain (dripping) time	Time required for dripping, i.e. to drain the last drops of water from the evaporator. During this time, all outputs remain off. If this step is not desired, adjust this time to OF.	0 [of]	99	minutes	1
F1	Fan operation mode	0 - Automatic by time: the fan will be on when the compressor when compressor is actuaded. When the compressor is off, the fac actives according to times F2 and F3. 1 - Automatic by temperature: the fan is on always when the compressor is active. When the compressor is OFF, fan turns On. When the temperature is 60% of the differential and turns off when is less than 20% of differential to setpoint. 2 - Continuous: the fan is always active. 3 - Dependent: the fan starts along with the compressor. 4 - Time after turning off compressor: after turning off the compressor the fan remains on for the time configured in F2. *Note: With Sensor 2 enabled, modes 0 and 1 are only active if evaporator sensor (S2)*	0	4	-	4
F2	Fan time on if F1 = 0 and 4	This is how long the fan remains ON.	1	99	minutes	2
F3		This is how long the fan remains OFF.	1	99	minutes	8
F4	Turn off the fan when opening the door	Enable fan to be turned off when opening door On or keep fan on OF within the time the door is opened.	0 [of]	1 [on]	-	0 [of]
F5	Evaporator high	Shutdown the evaporator fan if the evaporator temperature is equal or higher than this temperature. During operation if the evaporator temperature exceeds the configured value, the dan is turned OFF, it only restarts with 2°C/4°F differential. This function is used on start-ups, after refilling with merchandise cabinet.	-50 (-58)	60 (99)	ºC (°F)	60 (99)
F6	Temperature and evaporator for fan return after drain (dripping) time	After defrost and drainage, the fan delay cycle starts. The compressor is startedimmediately because the evaporator temperature is high, but the fan will only be started after the evaporator temperature drops from the configured value. This function is used to remove the heat that still exists in the evaporator because of the defrost, avoiding putting it into the environment.	-50 (-58)	60 (99)	ºC (°F)	2.0 (36)
F7	Maximum fan return time after drainage (fan-delay)	For safety, if the evaporator temperature does not reach the value set in the function F6 or the sensor S2 is disconnected, the fan will return after the time configured in this function.	0 [of]	30	minutes	1
P1	Digital input 1 operation mode	oF = Digital input disabled 1 = NO Contact - Door Sensor 2 = NC Contact - Door sensor 3 = NO contact - External alarm (indication only) 4 = NC contact - External alarm (indication only) 5 = NO contact - Turn off control 6 = NC Contact - Turn off control 7 = NO pulse - Power save mode 8 = NC pulse - Power save mode 9 = NO pulse - Fast Freezing 10 = NC pulse - Fast Freezing 11 = NO pulse - Defrost 12 = NC pulse - Defrost	0 [of]	12	-	2
P2	Door opening time for instantaneous defrost	If the door is kept open longer than what is defined in this function instantaneous defrost starts as long as the evaporator temperature (sensor S2) is less than b4 and the room temperature (sensor S1) is less than b5.	0 [of]	99	minutes	30
P3	Door open time to shut down compressor and fan	If the time the door is open is longer than the time configured in this function, both compressor and fan are turned off.	0 [of]	99	minutes	5
P4	Door closed time to turn off the light	With the door closed, this parameter defines how long for light turn off . It contributes to energy saving. With this function set to the 0 value OF, the lamp activation functions are ignored and the output remains off.	0 [of]	99	hours	2
P5	Door closed time to enable for economy mode	With the door closed, this parameter defines how much time to active economic mode. On the economy mode the light output will be disabled and the operation setpoint will be controller for the economy setpoint. This time only starts counting after the temperature reaches the setpoint for the first time. *Note: Scale hours. Minutes - time less than 10.0 displays decimal point. Ex: value 1.5 corresponds to 1 hour and 30 minutes.*	0.0 [of]	99	hours.minutes	2.0
P6	Maximum time in economy mode with door closed	Allows you to configure a maximum power save mode actuation time while the door is closed. After this time, the setpoint returns to normal operating mode. This time is calculated in hours. *Note: Time less tha 10 hours, displays decimal point. E.g: value 1.5 corresponds to 1 hour and 30 min. E.g: value corresponds to 15 hours.*	0.0 [of]	99	hours.minutes	0.0 [of]
C1	Minimum time of the compressor turned on	This is the minimum time the compressor will remain on, i.e. the time between the last start and the next stop. It serves to prevent short cycle and high voltage surges.	0 [of]	5	minutes	0 [of]
C2	Minimum time of the compressor turned off	This is the minimum time the compressor will remain off, i.e. the time between the last stop and the next start. It serves to relieve the discharge pressure and increase the service life of the compressor.	0 [of]	5	minutes	0 [of]

FUN	FUNCTION	DESCRIPTION	MIN	MAX	UNIT.	DEFAULT
			CELSIUS (FAHRENHEIT)			
			MIN	MAX	UNIT.	DEFAULT
$C3$	Time of the compressor on in case of cabinet sensor (sensor S1)	If the cabinet sensor (sensor S1) is disconnected or out of range, the compressor turns ON according to the parameters configured in these functions.	0	99	minutes	20
$C4$	Time of the compressor off in case of sensor error S1 (room)	If the cabinet sensor (sensor S1) is disconnected or out of range, the compressor turns off according to the parameters configured in these functions.	0	99	minutes	10
$C5$	Delay time on power up controller	When the instrument is turned on, remains with the control disabled during the period configured in this function. During this time, it only works as a temperature indicator. It serves to prevent spikes in electricity demand, power grid instability, when there are several equipment connected on the same line. For this, simply configure different times for each equipment. This delay may be of the compressor or defrost (when there is defrost at startup).	0 [of]	99	minutes	2
$i1$	Type of Compressor	Define the type of compressor: 0 = On - Off type compressor (relay output); 1 = VCC type compressor (frequency output). **Note:** If $i1$ = 0 the parameters $i2$ to $J7$ are ignored and normal control is carried out through the compressor relay.	0	1	-	1
$i2$	Proportional Gain (P)	Determines the proportional gain of the PID control algorithm.	1.0	99	-	2.0
$i3$	Total Time (I)	Determines the total time of the PID control algorithm.	1	99	seconds	50
$i4$	Derivative Time (D)	Determines the derivative time of the PID control algorithm.	0 [of]	99	seconds	0
$i5$	Minimum frequency for variable compressor PID control	Defines the minimum working frequency or the variable compressor in automatic control mode (PID algorithm). **Note:** check the technical manual of the variable compressor.	3.0	$i6$	Hz (x10)	6.0
$i6$	Maximum frequency for variable compressor PID control	Defines the maximum working frequency of the variable compressor in automatic control mode (PID algorithm). **Note:** check the technical manual of the variable compressor.	$i5$	$i7$	Hz (x10)	12
$i7$	Maximum frequency for variable compressor operation	Defines the maximum operating frequency of the compressor. This frequency is used when it is necessary to quickly cool the controlled environment, for example, a high ambient temperature (parameter $J7$), Fast Freezing process or after a defrost cycle. **Note:** check the technical manual of the variable compressor.	3.0	30	Hz (x10)	15
$i8$	Compressor stop frequency (switch-off)	Defines the output frequency to inform the compressor to stop. This frequency is lower than the minimum working frequency. **Note:** check the technical manual of the variable compressor.	0.0	5.0	Hz (x10)	3.0
$i9$	Variable compressor frequency during a hot gas	Sets the frequency of the variable compressor during the hot gas defrost process, when set $d1$ = 1.	$i5$	$i7$	Hz (x10)	12
$J1$	Variable compressor frequency in the event of an error in sensor S1 (ambient)	Defines the frequency of the variable compressor if an error is detected for temperature sensor S1 (ambient). This parameter works in conjunction with parameters $C3$ and $C4$.	$i5$	$i6$	Hz (x10)	10
$J2$	Variable compressor smooth start frequency	When switching on the variable compressor, it is kept at a low speed for a few seconds, as set in parameter $J3$. The purpose of this feature is to improve the lubrication of the compressor.	$i5$	$i6$	Hz (x10)	6.0
$J3$	Variable compressor smooth start time	Time that the variable compressor will continue at the smooth start frequency (parameter $J2$). The purpose of this feature is to improve the lubrication of the compressor.	1	99	seconds	30
$J4$	Variable compressor time on after reaching the setpoint	After reaching the temperature setpoint, it is possible to keep the compressor running at a speed calculated by the PID control algorithm. The objective is to avoid successive starts of the compressor, obtaining a reduction in energy consumption (energy efficiency) as well as low oscillation of the ambient temperature (sensor S1). If set to $0F$, the variable compressor is switched off immediately after reaching the temperature setpoint. If set to $0n$, the compressor will always be on. In case the temperature reaches the low temperature limit (parameter $J9$), the compressor is switched off and will start again according to the sepoint and the control	0.0 [of]	99 [on]	hours.minutes	2.0
$J5$	Variable compressor time below limit frequency $J7$ for lubrication	Time the variable compressor must be on with the frequency below the limit set in $J7$ to operate at the frequency set in $i7$ for the time configured in $J6$. This process of periodically accelerating the control frequency promotes lubrication of the variable compressor through the migration of lubricating oil. **Note**: Hours.minutes scale - time less than 10 displays decimal point. Example: value 1.5 corresponds to 1 hour and 30 minutes.	0.0 [of]	99	hours.minutes	0.0 [of]
$J6$	Variable compressor time on frequency $i7$ for lubrication	Time that the variable compressor will be on at the frequency defined in $i7$ for compressor lubrication.	10	99	segundos	30
$J7$	Minimum frequency for lubrication control of variable compressor	Limit frequency for the instrument to use the variable compressor lubrication process.	$i5$	$i6$	Hz (x10) 8.0	8.0
$J8$	Maximum time of variable compressor on maximum frequency	Maximum variable compressor time at maximum frequency. This parameter works in conjunction with parameter $i7$. **Note**: Hours.minutes scale - time less than 10 displays decimal point. Example: value 1.5 corresponds to 1 hour and 30 minutes.	0.0 [of]	99	horas.minutos	10
$J9$	Low temperature limit (differential for the temperature setpoint)	Sets the low temperature limit to turn off the variable compressor. In this parameter the differential for the setpoint is adjusted. Example: setpoint = -6.0 , $J6$ = 3.0 . In this case, the temperature limit for turning off the compressor will be -9.0 (-6.0 – 3.0)	1.0 (2) [of]	99 (90)	°C (°F)	3.0 (5)
$n1$	High temperature limit (differential to temperature setpoint)	Sets the high temperature threshold to drive the variable compressor at its frequency operating maximum. The purpose of this parameter is to quickly lower the temperature of the controller environment. In this parameter, the differential for the setpoint is adjusted. the hysteresis of this parameter is fixed at 1°C (2°F). Example: setpoint = -6.0 , $n1$ = 11 In this case, the compressor will operate at maximum speed $i7$ when the temperature is above 5.0 (-6.0 + 11), and it will return to normal speed operation (between $i5$ and $i6$) when the temperature is below 4.0 (-6.0 +	1.0 (2) [of]	99 (90)	°C (°F)	11 (20)

FUN	FUNCTION	DESCRIPTION	CELSIUS (FAHRENHEIT)			
			MIN	MAX	UNIT.	DEFAULT
A1	Lamp output mode (LIGHT)	0 = Output off; 1 = Light; 2 = Alarm logic. *Note: If A1 = 2 , alarm logic, the lamp output will be activated according to parameters*	0	2	-	1
A2	Low temperature alarm difference from setpoint	It is the temperature difference in relation to the current setpoint to activate the alarm (buzzer) for LOW room temperature. *Example: Setpoint = 3.0, A2 = 2.0. In this case, the alarm will only be active if cabinet temperature is below 1.0 (3.0 – 2.0).*	0 [of]	99 (90)	°C (°F)	10 (18)
A3	High temperature alarm difference from setpoint	It is the temperature difference in relation to the current setpoint to activate the alarm (buzzer) foe HIGH room temperature. *Example: Setpoint = 3.0, A3 = 10. In this case, the alarm will only be active if the cabinet temperature is higher than 13 (3.0 + 10).*	0 [of]	99 (90)	°C (°F)	50 (90)
A4	Time the door is open for audible alarm	When the door is opened, the message OP will appear on the display and timing for the open door starts. If this time is longer than the time configured in this function, the audible alarm (buzzer) sounds.	0 [of]	99	minutes	1
A5	Temperature alarm bypass time	This function is for inhibiting the alarm for a period of time due to possible temperature rise from the defrost, and during defrost, drainage and fan-delay, the alarm is not active.	0 [of]	99	minutes	0 [of]
A6	Powering up alarm bypass	During this time, the alarm stays off while waiting for the system to go into operation.	0 [of]	99	minutes	0 [of]
A7	Maximum time of compressor ON alarm without reaching setpoint	Alarm to indicate maximum time in hours of compressor ON without reaching the desired temperature (setpoint)	0 [of]	30	hours	0 [of]
A8	Defrost alarm indication ended by time	When defrosting is completed by time rather than temperature, the user is notified by a blinking dot in the lower right corner of the display ( ).	0 [of]	1 [on]	-	0 [of]
L1	Preferred Display indication	0 = Temperature S1 1 = Temperature S2 2 = Current setpoint	0	2	-	0
L2	Temperature indication locked during defrost	0 = Sensor temperature indication 1 = Display locked - last temperature before defrost (set to L1) 2 = Display "dF" This function is intended to prevent the display of room temperature rise due to defrost.	0	2	-	1
L3	Maximum time of locked indication during defrost process if L2 = 1 or 2	During the defrosting process, the last temperature measured in the refrigeration cycle or the message dF will be frozen on the display. The indication will be restored when this temperature is reached again or exceeds the time set in this function after the start of the refrigeration cycle (whichever comes first). If set to 0F, the temperature indication will be frozen only in the defrost stage.	0[of]	99	minutes	15
L4	Function Lock	0 = Does not allow blocking of functions 1 = Enables partial blocking, where the control functions will be blocked but changing the presets and adjusting the setpoint using the Set key remain enabled. 2 = Enables total blocking, providing only access to functions. *Note: With this functionality active, the parameters are protected against undue changes, making them available only for viewing. In this condition, when trying to change these values, the message LC will appear on the display.*	0 [of]	2	-	2
L5	Time to lock functions	It defines the time that keys 2 and 4 must be pressed to lock or unlock the editing of functions, if L4 = 1 or 2 on the display.	15	60	seconds	15
L6	Maintenance mode (Turns off the control functions)	When turning off the control functions, the controller will only operate as a temperature indicator with all outputs disabled. This function can operate in the following ways: 0 - Does not allow control functions to be turned off; 1 - It allows you to turn control functions on and off only if the functions are unlocked; 2 - Allows you to turn control functions on and off even if the functions are locked.	0 [of]	2	-	0 [of]
U1	Minimum working voltage limit	If the voltage value exceeds the limits configured in these functions, the compressor immediately disconnects after the time configured in function U4 has elapsed. To disable voltage monitoring, set U1 greater than U2. ●CORE	9	26	x 10Vca	10
U2	Maximum working voltage limit		9	26	x 10Vca	24
U3	Stress measurement offset	It allows compensation for any deviations in the reating of the mains voltage. *Note: Parameters available on product only ●CORE*	-10	10	Vca	0
U4	Time for voltage validation	This time prevents small voltage variations from prematurely disconnecting the compressor. *Note: Parameters available on product only ●CORE*	2	30	seg	4

6.6 Variable compressor control

The control settings of the variable compressor differ depending on the brand and model of the variable compressor used. Consult the compressor's technical manual.

In traditional cooling applications, the demand for using the compressor at full load is rare and restricted to a few days a year. The control of the operating frequency of a variable capacity compressor adapts its use to the real demand. This way, the compressor runs at a low speed most of the time, minimizing energy consumption.
The operating frequency is proportional to the cooling capacity defined in parameters $i5$ and $i6$. The parameter $i7$ defines the maximum operating frequency of the compressor and is used in situations where it is needed to quickly lower the temperature of the controlled enviroment.
It is possible to keep the compressor operating continuously, keeping the temperature of the controlled environment stable and reducing the number of compressor starts, thereby resulting in energy savings. To use this characteristic, parameter $J4$ - Variable compressor time on after reaching the setpoint must be programmed.

7. SIGNALS

Lt
Reason: Low temperature or cabinet sensor (S1).
Provisions: Check sensor S1 connection and functioning (room);
Check refrigeration system;
Check function $A2$.

Ht
Reason: High temperature or cabinet sensor (S1).
Provisions: Check sensor S1 connection and functioning (room);
Check refrigeration system and/or door seal;
Check function $A3$.

Lu
Reason: Low voltage alarm.
Provisions: Bad power grid quality and voltage below the one configured in $U1$. **CORE**

Hu
Reason: High voltage alarm in the mains.
Provisions: Bad power grid quality and voltage above the that configured in $U2$. **CORE**

Eu
Reason: Invalid voltage reading.
Provisions: Check the supply voltage of the instrument. **CORE**

A1
Reason: Exceeded maximum compressor on time without reaching control temperature (setpoint).
Provisions: Check compressor and refrigeration system;
Check door seal;
Check function $A7$.

Ad
Reason: External alarm (digital input).
Provisions: Check the control accessory connected to the digital input;
Check the connection on the controller;
Check function $P1$.

E1
Reason: Cabinet temperature sensor disconnected or short-circuited.
Provisions: Check the connection on the controller. If necessary, replace the sensor.

E2
Reason: Cabinet temperature sensor disconnected or short-circuited.
Provisions: Check the connection on the controller. If necessary, replace the sensor.

OP
Reason: Open door alert.
Provisions: Make sure the door is properly closed;
Check limit switch micro or magnetic sensor (reed switch) of the closed-door detection (if applicable), plus the connection to the controller.

LC
Reason: Function lock on.
Provisions: See item 6.3.

Ct OF
Reason: Turning off the control functions.
Provisions: See item 6.4.

EP
Reason: Easyprog connected by sending data to the controller.

.
Reason: Defrost alert terminated by time rather than temperature. The dot in the lower right corner of the display will flash until the next defrost (if enabled in the function $A8$).
Provisions: Check that there are no burnt heating elements;
Check if hot gas is circulating;
Check that the fan is not inoperative or shorted;
Check that the maximum time for defrost duration is not too short $b6$.

Pu
Provisions: Contact Full Gauge Controls.

PP
Provisions: Reset the values of the functions.

FC
Reason: Communication failure between the front module and the base.
**Measures:** Check the interconnection cable.

8. PROGRAMMING KEY - EasyProg ver.02 or higher

The main function of this accessory is to store the parameters of the controllers. You can load new parameters from a controller and download to a production line at any time (from the same controller).
The controller has a USB connection to upload or download the parameters:
- USB: it can be connected to the computer with the USB port, using the Sitrad Recipe Editor the parameters can be copied, edited and saved in **EasyProg ver. 02**. The USB port can also have the function to supply power to **EasyProg ver. 02** and the controller (when used in USB and Serial TTL set).
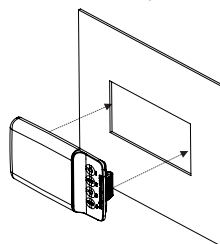
*Sold separately
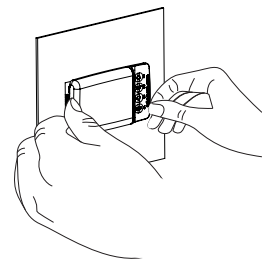

EasyProg*

Base module
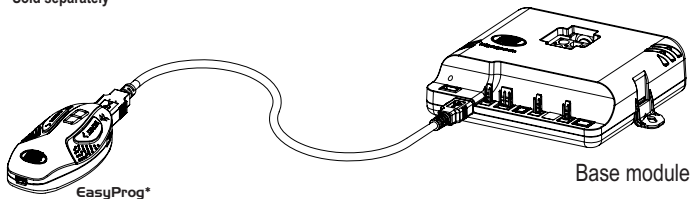
9. INSTALLATION

9.1 Attaching the base and front modules
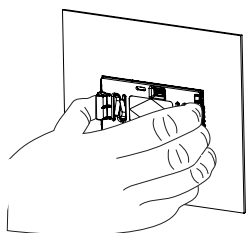
- Front module

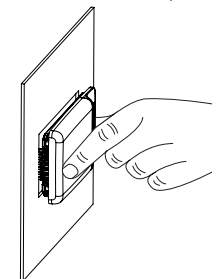1 Cut out the panel with the measurements indicated. See item 3;

2 To place the front module in the panel, press until it clicks;
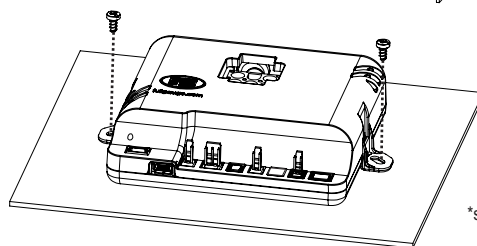

3 To remove it, simply press the side locks;

- Base module
Attach the base module with screws*;

4 Remove the controller from the front of the panel;

*screws not included;

9.2 Compressor connection diagram type ON - OFF

- Front module

- Base module

Interconnection cable

Digital input
(Door switch)

Sensor S2**

Sensor S1*

* O **sensor S1** must be in the room.

** O **sensor S2** must be attached to the evaporator using a metal clamp.

(Supply and common relays)

Fan
(FANS)

Compressor
(COMP)

Power supply
85~240Vac

Lamp
(LIGHT)

Defrost
(DEFR)
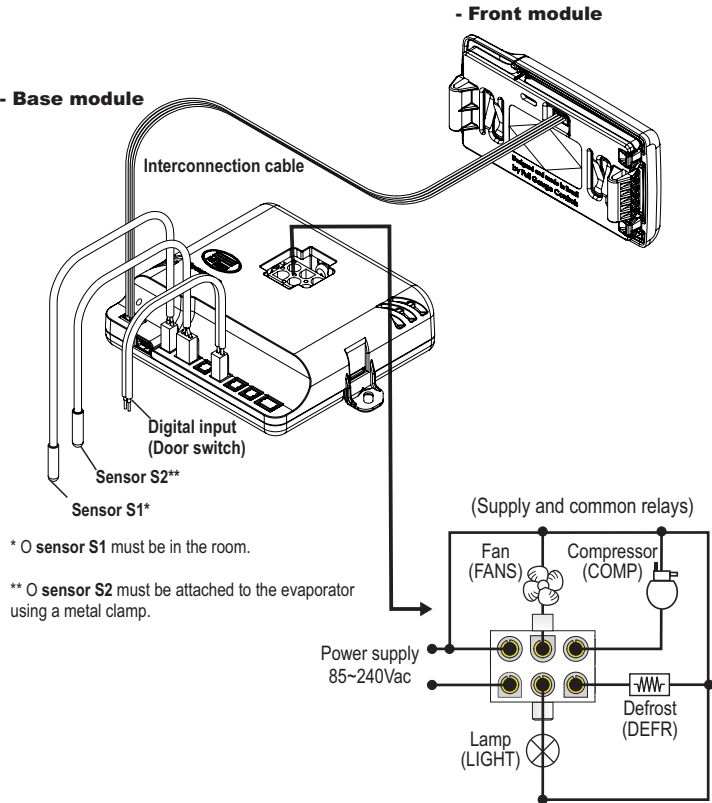
9.3 VCC type compressor connection diagram

- Front module

- Base module

Interconnection cable

Frequency output
(VCC)

Digital input
(Door switch)

Sensor S2**

Sensor S1*

* O **sensor S1** must be in the room.

** O **sensor S2** must be attached to the evaporator using a metal clamp.

(Supply and common relays)

Fan
(FANS)

Power supply
85~240Vac

Lamp
(LIGHT)

Defrost
(DEFR)
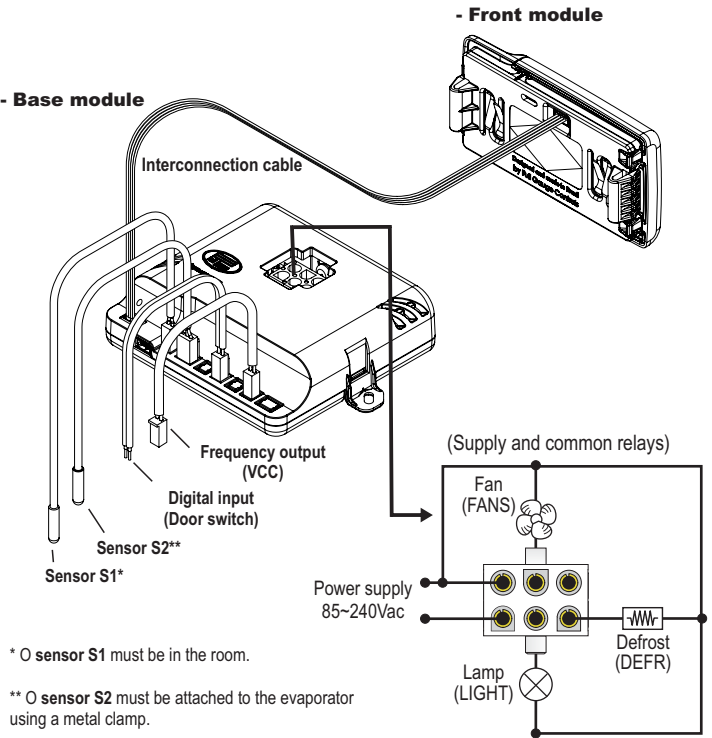
10. IMPORTANT

According to the chapters of the NBR 5410 standards:
1: Install surge protectors against supply surges
2: Sensor and serial communication cables may be together, but not in the same conduit through which power supply and load actuators pass
3: Install transient suppressors (RC filter) parallel to loads as a way to extend relay life.

Contactor suppressor wiring diagram

A1

Supressor

A2

A1 and A2 are the contactor coil terminals.
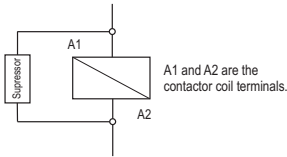
Wiring diagram for direct actuator load suppressors

Supressor

Load

For direct actuator, take into account the specified maximum current.
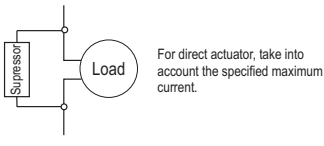
Full Gauge Controls available suppressors for sale

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

Product:
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 service life. Observe the legislation in your area regarding the disposal of electronic waste. If you have any questions, please contact Full Gauge Controls.