elstat

EMS3000 *series*

PRODUCT MANUAL VERSION 1.7

Scope

EMD with Heater defrost - EMS3120

EMD - EMS3125

CONTENTS

1. OVERVIEW

The EMS3000 series is a set of intelligent devices that provide a range of features, enabling cost saving and sales optimisation for a connectivity programme.

The series includes models that utilize patented smart learning technology, with the potential to deliver optimal energy saving by adapting to the trading pattern of any outlet.

The device features sensors to provide tracking of key cooler metrics. Asset monitoring and management is made possible through the Nexo Discovery cloud portal, or via integration with business systems, providing directly actionable insights to improve bottom-line performance.

The intelligent thermostat model provides asset and service management, with a range of sensor options, for applications where perishable food and drinks are displayed.

The energy management device (EMD) model optimises energy use for each retail situation, while delivering a guaranteed brand temperature promise.

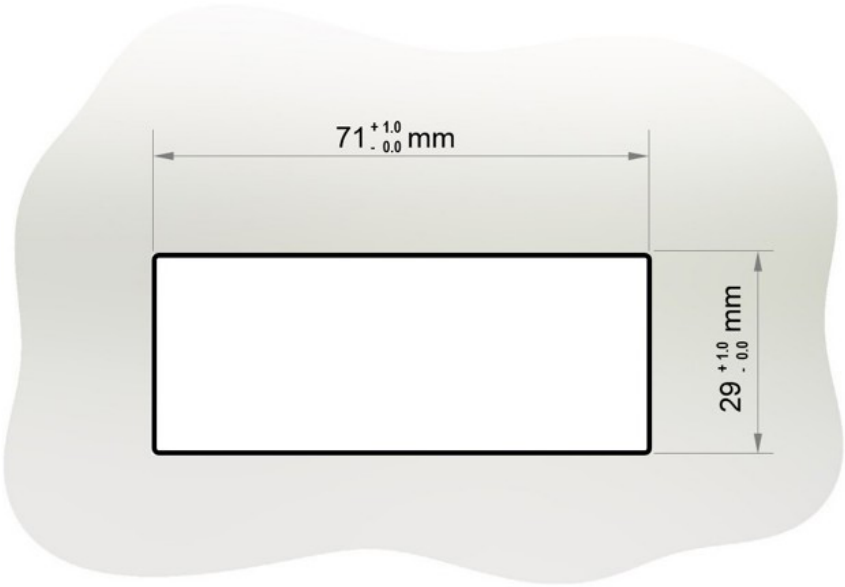
The EMD model, with heater defrost, includes a programmable defrosting maintenance capability.

The series uses the industry standard DIN panel aperture, for use with most popular cooler models.

2. INSTALLATION

2.1 Mounting

EMS3000 controllers are designed for panel mounting and are secured using two side-clips. The aperture dimensions are as shown below.



Note

Minimum depth required behind aperture is 100mm.

Refer to section 6.1 "Dimensions" for detailed product dimensions

Always fit the EMS3000 controller horizontally in the orientation shown.

Care should be taken in the installation of EMS3000 controllers incorporating a motion sensor.

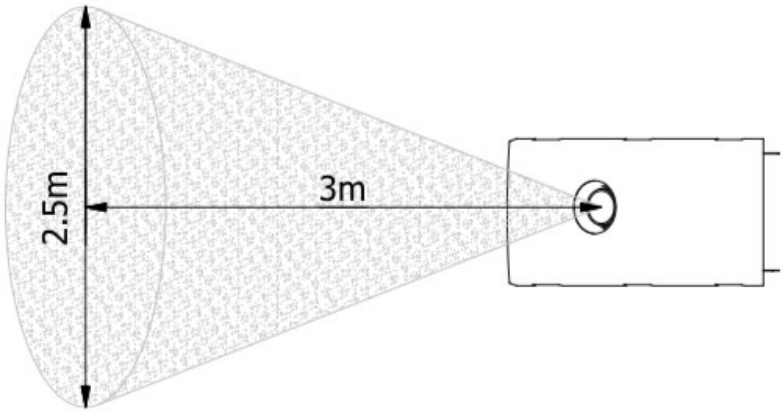
Motion sensors are passive infra-red (PIR) devices that detect activity in front of the cooler.

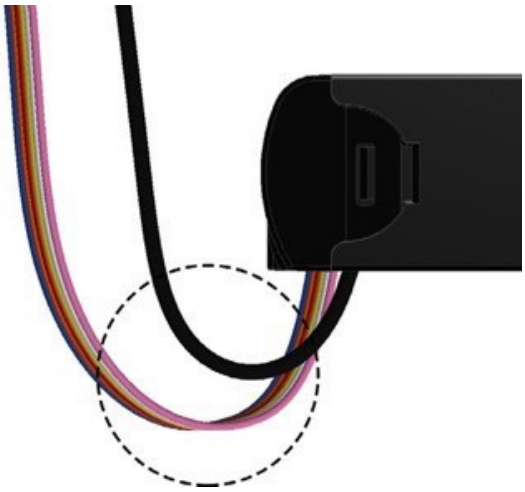
To ensure correct operation of the motion detector, we recommend fitting the controller at least 200mm above floor-level.

The motion sensor must have an uninterrupted view directly in front and to the sides.

The diagram, to the right, shows the typical detection pattern of the motion sensors.

For optimal performance, it is recommended that the motion sensor is fitted in the upper section/header panel of the cooler. This reduces the risk of the motion sensor being blocked by objects placed on the floor in front of the cooler.





To ensure water ingress protection is achieved a drip loop must be formed in all wiring connections of the controller.

We recommend securing cables with appropriate clips wherever possible.

Note

Cables should not be secured to hot pipes or vibrating components.

Ensure that the rear of the controller cannot be accessed except with the use of a tool.

Note

The water Ingress Protection ratings (IP ratings) are only valid when the product is installed according to this guide.

Failure to follow these instructions may result in a lower level of ingress protection being achieved and invalidate the products warranty.

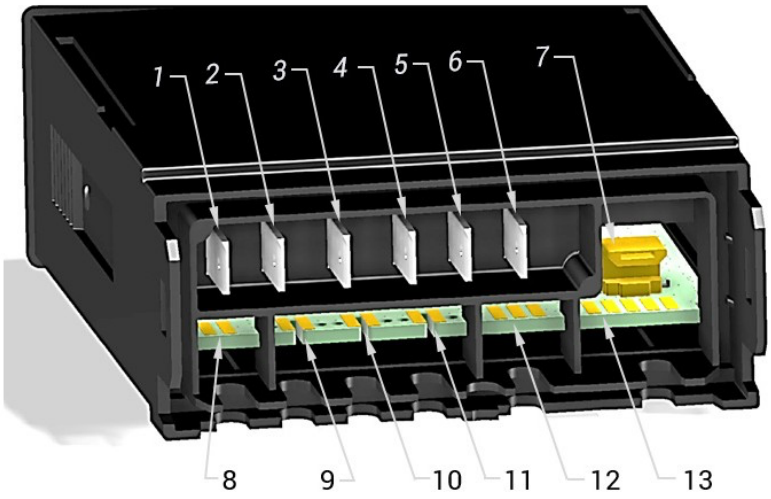
2.2 Electrical Connections

Note

The electrical supply to the EMS3000 must be protected by an overload device in accordance with local wiring regulations and with a current rating not exceeding 16 A

Note

Refer to section 6 “Technical Specification” of this guide for maximum ratings.

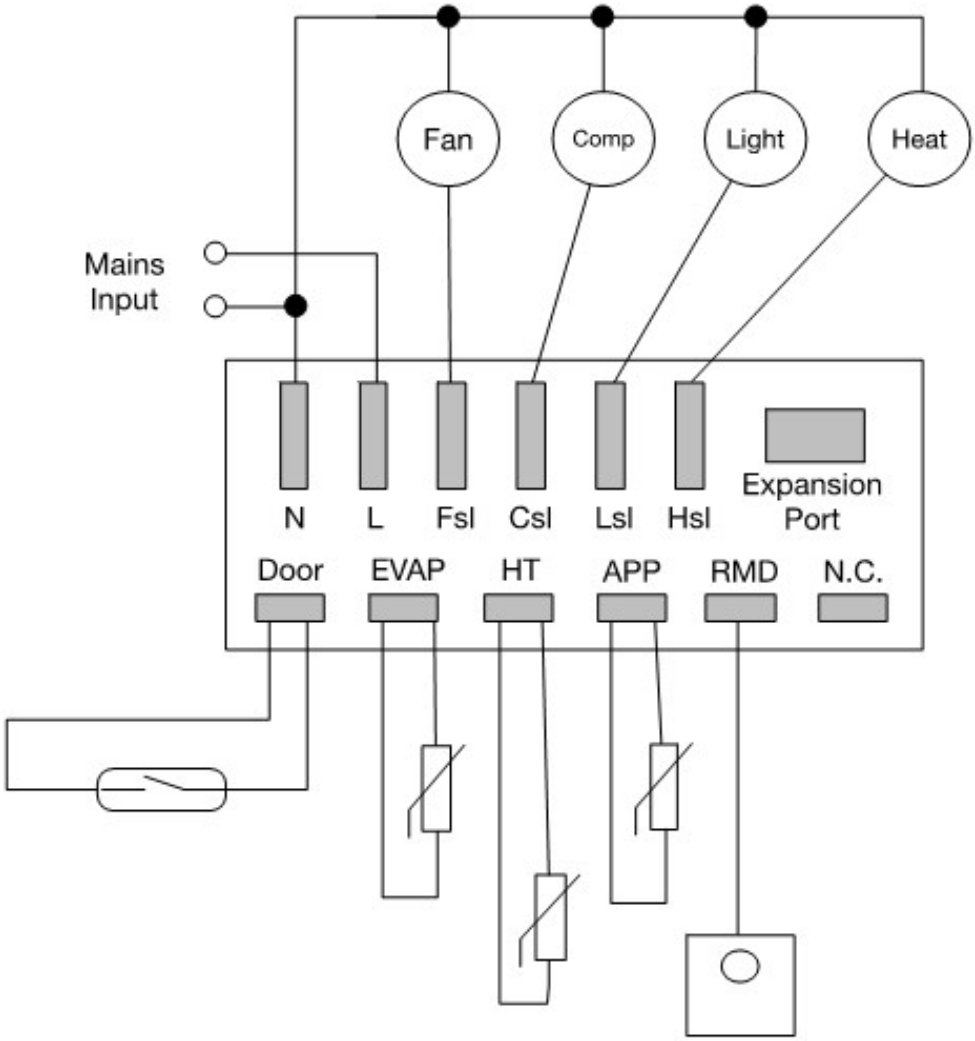


1. N - Mains Neutral (in)
2. L - Mains Live (in)
3. FSL - Fan switched live (out)
4. CSL - Compressor switched live (out)
5. LSL - Light switched live (out)
6. HSL - Heater switched live (out) *(EMS3120 only)*
7. Communications port
8. Door switch input
9. Evaporator sensor input
10. Condenser sensor input
11. Appliance sensor input
12. Remote motion detector input
13. (Future use only)

2.2.2 Wiring Diagram

Note

All mains voltage connections should be made with right angled, fully insulated 6.3mm female tab connectors, (also known as 90-degree ¼ inch female spade connectors).



N = Mains NEUTRAL	Hsl = Heater switched live *(EMS3120 only)*	Lsl = Light switched live
L = Mains LIVE	Expansion Port	HT = High temperature sensor
Fsl = FAN switched live	Door = Door switch	APP = Appliance sensor
Csl = Compressor switched live	EVAP = Evaporator sensor	RMD = Remote motion detector
		N.C = not connected / used

2.3 Sensor Installation - Standard

2.3.1 Appliance Temperature Sensor

Note

Temperature sensors are available from Elstat in a variety of standard cable lengths.

Please select the most appropriate to your particular application

Note

The sensor inputs are designed for connection safety extra low voltage (SELV) circuits only.

If the sensor cable needs to be joined during production or maintenance, only connectors normally used in SELV circuits may be used.

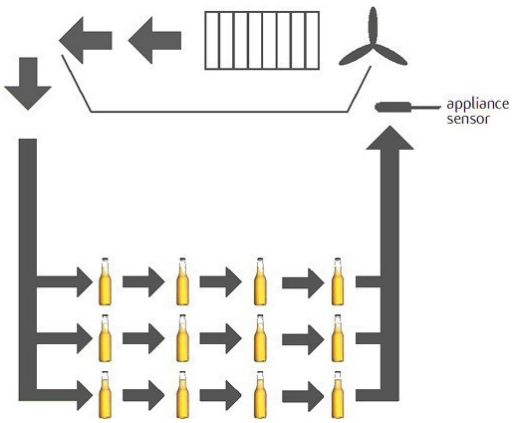
Note

Each make, model and type of temperature sensor has a specific resistance/temperature characteristic. To ensure reliable operation, only sensors supplied by Elstat should be used.

The appliance sensor measures air temperature of the refrigerated compartment by measuring the return air temperature after the air has been drawn over the products. It therefore provides a close approximation of the product temperature.

The diagram shows the recommended position of the appliance sensor.

The sensor head should be placed at a right-angle to the air flow and secured using a P-clip.



2.3.1.1 Appliance Sensor Calibration

In some coolers, the exact position of the appliance sensor has to be compromised such that the measured temperature is affected by external localised heating and / or cooling effects. To compensate in these situations, the EMS3000 controllers include a calibration factor that may be applied to the temperature measured by the sensor.

See parameter C1 in section 5.1.2 of this guide

2.3.2 Door switch

Note

Door switches are available from Elstat in various cable lengths. Please select a length appropriate to your particular application

Note

The Elstat supplied door switch and activator are over-moulded for increased physical protection and resistance to water ingress.

Door switches are usually mounted with the door switch including the cable on the cooler and the activator on the door.

Door switches must be used with the corresponding activator.

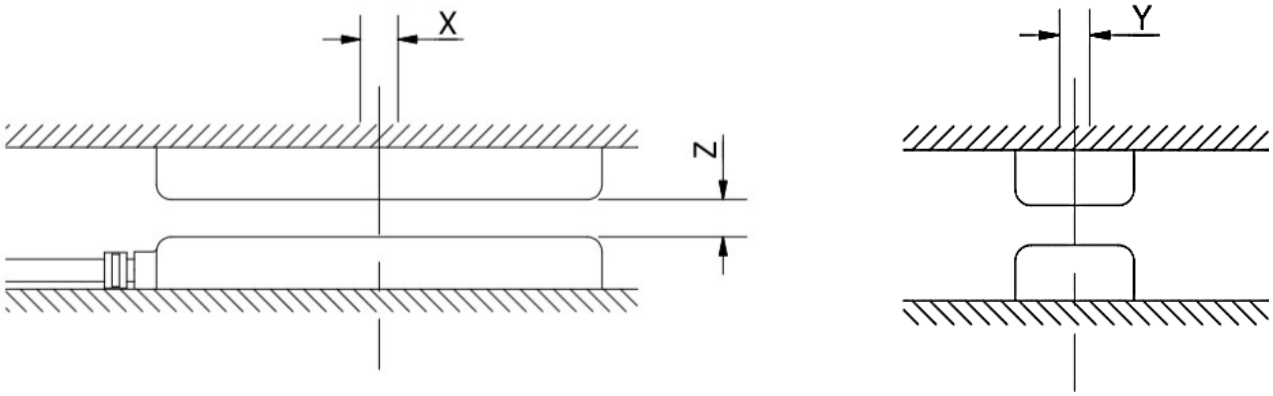
Both components should be fixed using counter sunk screws or bolts with the following characteristics:

- Head: countersunk, maximum diameter 5.0mm (0.24in)
- Thread: maximum diameter 3.0mm (0.16in)
- The screws should be tightened to a maximum torque of 0.5Nm (0.37lb ft) to avoid damage to the components

2.3.2.1 Door switch alignment

The alignment of the door switch and activator is critical for reliable operation.

The diagram below shows the horizontal, vertical, and gap alignment between the door switch and the activator.



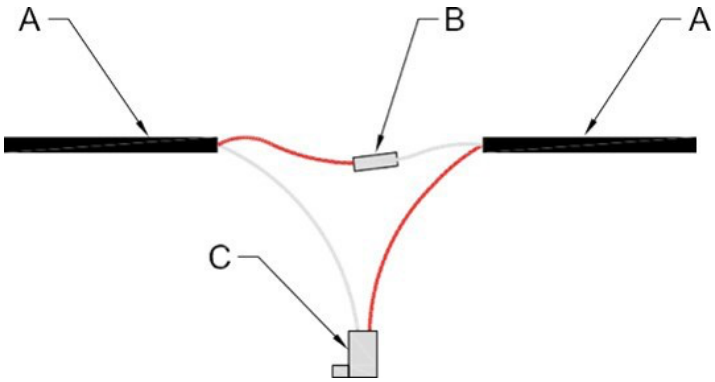
The following maximum tolerance apply:

ALIGNMENT	Abs Max. TOLERANCE	NOTES
X Horizontal	+/- 20mm (0.7in)	Measured when the door is closed and the gap (Z-dimension) is correct.
Y Vertical	+/- 10mm (0.4in)	Measured when the door is closed and the gap (Z-dimension) is correct.
Z Gap	5mm (0.2in)	

2.3.2.2 Multi-door Coolers

To mount door switches on multi-door coolers, two or more door switches should be connected in series, and one fitted to each of the cooler doors.

The image below shows two door switches connected in series.



A – Door switch cables A

B – Cable connector

C – Controller Connector

2.4 Sensor Installation – Optional accessories

Note

Sensors are available from Elstat with various cable lengths. Please select a length appropriate to your particular application

Note

To help identify sensors within an installation, Elstat can supply sensor cables with a blue, or white, identification sleeve.

For example, the high temperature sensor cable can be purchased with a blue, or white, identification sleeve to make it easily distinguishable from the appliance sensor.

Note

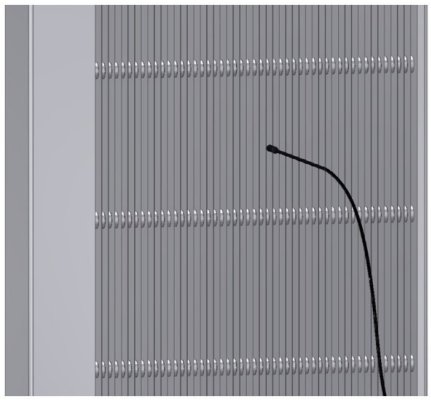
The sensor inputs are designed for connection safety extra low voltage (SELV) circuits only.

If the sensor cable needs to be joined during production or maintenance, only connectors normally used in SELV circuits can be used.

Note

Each make, model and type of temperature sensor has a specific resistance/temperature characteristic. To ensure reliable operation only sensors supplied by Elstat should be used.

2.4.1 Evaporator sensor



The evaporator sensor measures the temperature of the evaporator and can be used to activate and terminate defrost cycles.

The evaporator sensor should be placed in the immediate proximity of the evaporator.

Mount the sensor head inside the evaporator cooling fins, as shown. The sensor head must be mounted securely to prevent being dislodged by vibration.

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Note

In coolers fitted with a defrost heater, the evaporator sensor should be placed as far away from the heating element as possible – for example at the opposite end of the evaporator.

Failure to do so will result in defrost cycles terminating before the entire evaporator has defrosted.

2.4.1.1 Evaporator Sensor Calibration

In some coolers, the exact position of the evaporator sensor has to be compromised such that the measured temperature is slightly different to that of the evaporator. To compensate for such effects, the EMS3000 controllers include a calibration factor that may be applied to the temperature measured by the sensor.

See parameter C2 in section 5.1.2 of this guide

2.4.2 High Temperature Sensor

This sensor, and the associated high temperature alarm, can prevent the risk of damage due to over temperature in key components of the cooler, for example the compressor or condenser. .

Attach the sensor to the component being monitored and set the HT alarm threshold using the HT parameter. In the event of that threshold being exceeded the refrigeration system is shut down. A high temperature alarm will also be activated.

2.4.2.1 High temperature sensor options

Elstat can provide a temperature sensor with a maximum operating temperature of 105 °C or 125 °C.

Care must be taken to ensure the correct sensor is chosen according to the maximum temperature that the component being monitored is expected to achieve.

Note

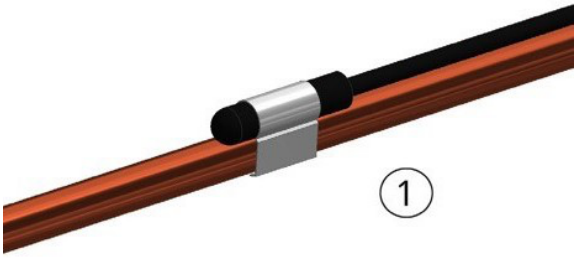
Ensure the fixing method used to attach the high temperature sensor to the cooler component is rated at least as high as the temperature sensor rating.

Plastic tie wraps should be avoided as these are likely to melt and cause damage

2.4.3 Fitting high temperature sensor

Note

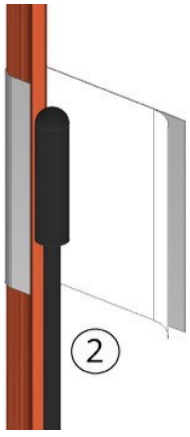
If fitting to condenser, the sensor should be mounted on the liquid pipe of the condenser.

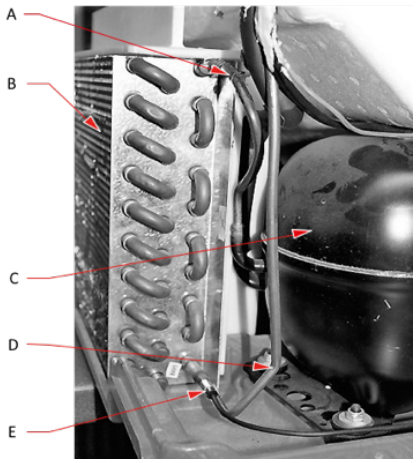


The temperature is then set as the value of the condenser high temperature (Ht) parameter.

Ensure the sensor is fixed using an appropriate fixing method. A metal pipe clip (1) or foil tape (2) may be used as shown.

Elstat can supply pipe clips for 6-8 mm and 8-10 mm pipes





A - Condenser hot gas pipe (Condenser inlet pipe)

B - Condenser

C - Compressor

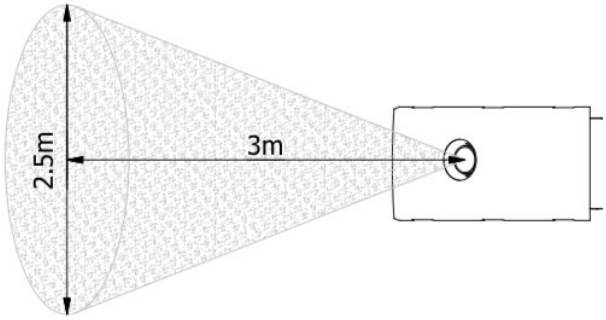
D - Liquid pipe (Condenser outlet pipe)

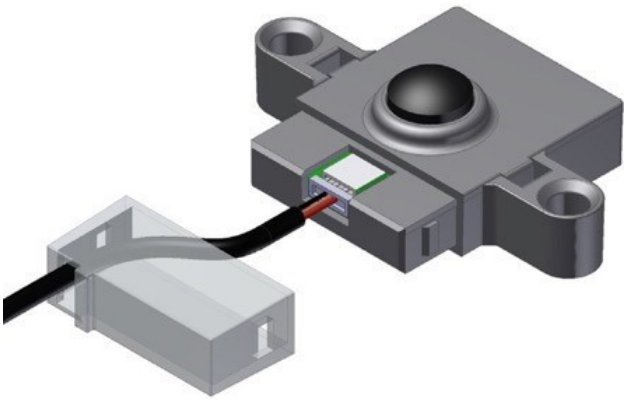
E - HT Sensor

2.4.4 Remote Motion Sensor

Motion sensors are passive infra-red (PIR) devices that detect activity in front of the cooler. The diagram shows the typical detection pattern of the motion sensors.

The motion sensor must have an uninterrupted view directly in front and to the sides.
For optimal performance it is recommended that the motion sensor is fitted in the upper section / header panel of the cooler. This reduces the risk of the motion sensor being blocked by objects placed on the floor in front of the cooler.



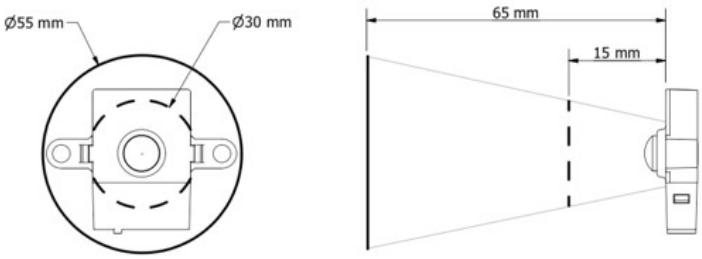


The remote motion sensor head is supplied detached from the cable, allowing the cable to be easily routed through holes or foamed into place as required by the OEM or installer.

For optimal performance, the motion sensor should be mounted vertically with the connector at the bottom. Mounting horizontally with the connector at the side will result in the motion sensor being less sensitive. Although, the motion sensor will still work correctly.

The motion sensor must not be located behind any material such as glass or polycarbonate.

For a motion sensor that is not mounted flush with the panel, the diagram, to the right, shows the minimum recommended clearances for ensuring motion detection. For example, if the motion sensor is mounted 15mm behind the panel, a 30mm diameter aperture is required.

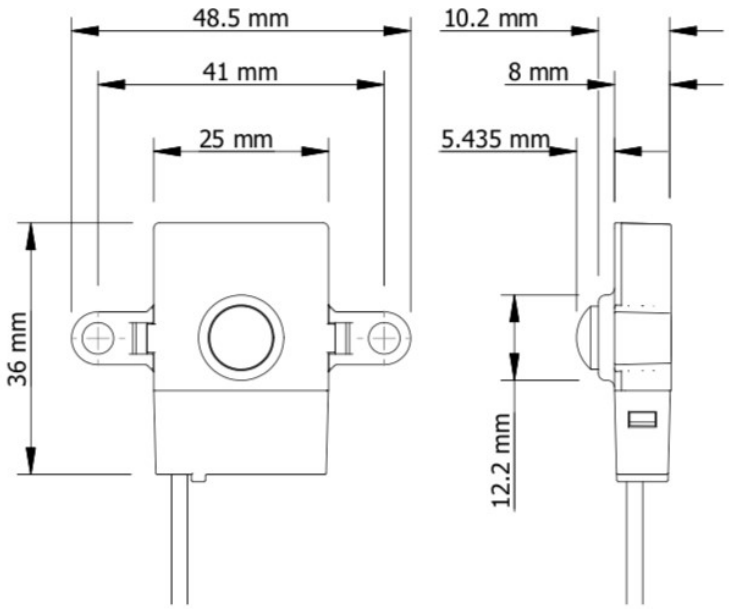


The motion sensor head must be fixed using counter sunk screws or bolts with the following characteristics:

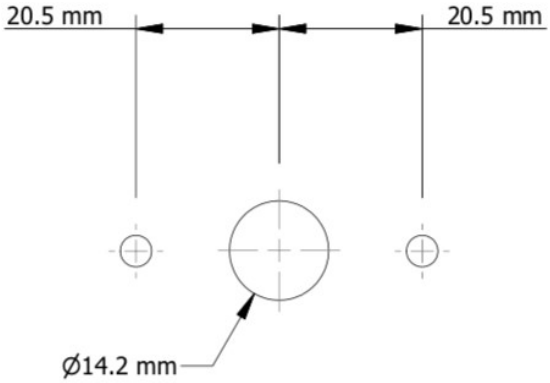
- Head: countersunk, maximum diameter 6.0mm (0.24in)
- Thread: maximum diameter 4.0mm (0.16in).

The screws must be tightened to a maximum torque of 0.5Nm (0.37lbft).

Overall dimensions of the motion sensor



Dimensions of the mounting holes



Sample of a mounted motion sensor

3. USER GUIDE

3.1 User Interface

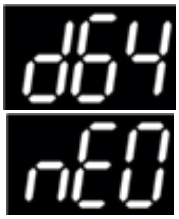
LED INDICATOR	NAME	FUNCTION
	Motion	Illuminated when footfall traffic movement is detected.
	Door	Illuminated when door opens.
	Compressor	Illuminated when the compressor is running.
	Evaporator fan	Illuminated when the evaporator fan is running.
	Bluetooth	Illuminated when connection via Bluetooth is established.

PUSH BUTTON	NAME	FUNCTION
	Up	Scrolls up menus, Increases parameter values.
	Set	Selects menu options and parameters Short press to accept Long press to return/go back
	Defrost	Activates a manual defrost (Only applicable if temp is below termination temp)
	Down	Scrolls down menus. Decreases parameter values.

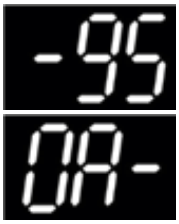
ITEM	NAME	FUNCTION
	Motion Sensor	Detects footfall traffic movement up to 3m in front of cooler
	LED Display	Displays cabinet temperature and current status of the controller.

3.2 Power-up sequence

8.8.8. to confirm that all segments of the display are functioning correctly



Platform type and firmware version. (example)



Checksum of the parameter set. (example)

The display then shows the appropriate display operational message.

Note

All controller outputs will remain OFF throughout the power on sequence and until the operational message is displayed.

3.3 Operational Messages

Cooler is in operational mode (exact display according to display mode, Dp parameter. See section 5.1.2 for details).

3.4 EMS3000 menu system

3.4.1 Access

Note

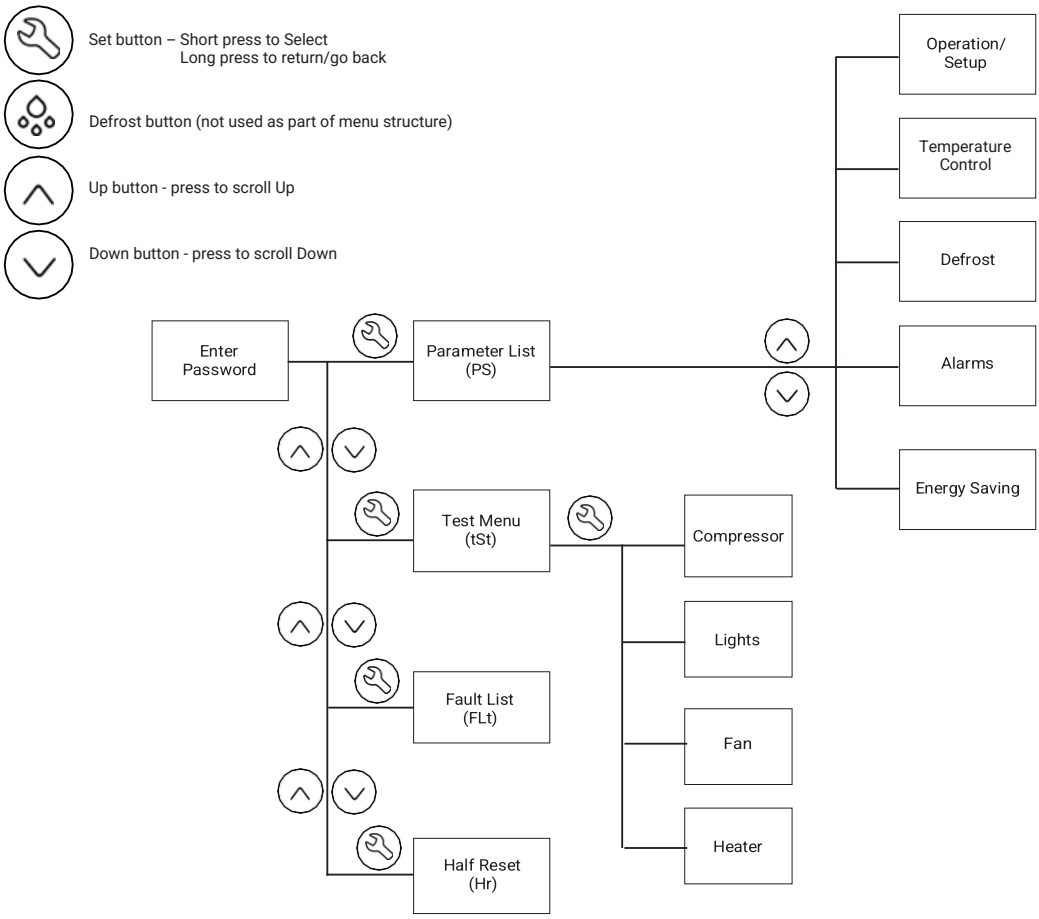
This feature as detailed below is only available from Firmware Version 3.6.5.

All previous versions must use the APP in order to access the menu as the front buttons are disabled

To enter the controller's menu, follow the steps below:

STEP	ACTION	BUTTON	DISPLAY
1	Press the Set button		
2	The display shows		
3	Press the Set button again to start the password entry Display shows: 0		
4	Use the up or down arrows to enter the first digit (4) and press to Set button Display will show -0		
5	Use the up or down arrows to enter the second digit (2) and press the Set button Display will show --0		
6	Use the up or down arrows to enter the third digit (1) and press the Set button Display will show ---		
7	Press the Set button again		
8	The display shows:		

3.4.2 Menu Structure



MENU	DISPLAY	DESCRIPTION
Parameter list		Displays the parameters and the parameter values.
Test routine		Enters the test routine that tests the relays, temperature sensors, door switch, and motion sensor.
Faults		Displays the last three faults (alarms).
Half reset		Resets controller including self-learning and self-optimising features. The self-learning and optimising features will adapt automatically if conditions in the store change (or the cooler is moved). However, you may choose to reset the controller as this will cause the controller to reset the learning process to factory condition

4. ALARM AND ERRORS

The following table shows the alarms that can be activated on an EMS3000 controller to indicate a fault with the cooler requiring attention.

ALARM	ERROR CODE	DESCRIPTION
Refrigeration system failure	E0	The RSF alarm is activated if the Set Point temperature has not been achieved during the time period set in parameter CT (default 72 hours)
Appliance sensor failure	E1	Temperature sensor failure alarms are activated if the measured temperature is outside the normal measurement range. This may be caused by a wiring fault (loose connection, short or open circuit) or the sensor itself may be faulty. Whilst this alarm will cause the compressor to shut down when active
High Temperature sensor failure	E2	Temperature sensor failure alarms are activated if the measured temperature is outside the normal measurement range. This may be caused by a wiring fault (loose connection, short or open circuit) or the sensor itself may be faulty.
Evaporator sensor failure	E3	Temperature sensor failure alarms are activated if the measured temperature is outside the normal measurement range. This may be caused by a wiring fault (loose connection, short or open circuit) or the sensor itself may be faulty Whilst this alarm is active only time based defrost functionality will be available.
High voltage alarm	E4	If there is an over voltage in the mains supply, according to the value set in parameter HI, the high voltage alarm is activated and controllers stops running the compressor.
Low voltage alarm	E5	If there is an under voltage in the mains supply, according to the value set in parameter LO, the low voltage alarm is activated and the controllers stops running the compressor.
Freeze up protect alarm	E6	If the temperature of the cooler falls below the temperature defined by parameter FU this alarm will activate.
Door broken alarm	EC	Indicates the door is not closing properly
Door switch broken alarm	ED	Indicates the door switch it not working correctly
High temperature alarm	EF	High Temperature alarm is activated if over-heating of a refrigeration system component is detected as measured by the HT sensor. Once activated the compressor will be turned OFF and remain OFF until the HT sensor temperature lowers to an acceptable level.

5. PARAMETERS

The behaviour of an EMS3000 controller is defined by setting parameters which can be easily programmed on the production line

The full set of parameters, with descriptions, ranges and default values are described in the following section.

5.1 Parameters by function

OPERATION / SETUP	Temperature scale(CF) Display mode (dP) Appliance temperature calibration (C1) Evaporator temperature calibration (C2) Motion sensor input select (Sn) Rest time (rt) Energy savings mode (ES) Marketing mode (Ar)
TEMPERATURE CONTROL	Set point (SP) Differential (dF) Saving set poin (SS) Saving differential (Sd) Condenser high temperature (Ht) Uninterrupted pull down (UP) Fan set point (FP) Fan cycle ON (Fn) Fan cycle OFF (FF)
DEFROST CONTROL	Defrost method (dr) Defrost interval (dE) Defrost duration (dd) Defrost activation temperature (dA) Defrost termination temperature (dt) Heating element defrost (dH)
ALARMS	Condenser high temperature (Ht) Alarm delay (Ad) Low voltage output (LO) High voltage output (HI) Refrigeration failure time (Ct) Freexe up protection temp (FU) HT alarm temperature differential (Hd) HT alarm timeout (tt)

ENERGY SAVING	**Mode:** Energy savings activation (EA) Saving set point (SS) Saving differential (Sd) **Self-Learning:** Learning period (LP) Activity frequency (AF) Store close time (St) **Saving Restart:** Saving restart mode (rE) - Timed: - Automatic: Saving restart period (Sr) Automatic restart time (At) Automatic restart time delta (rd) Saving restart stabilisation (rS) Fan driven temperature stabilisation (Ft) Super-chill set point (SC) Light delay (Ld) MEC test mode enable/disable (ME) Normal mode time(Mn) Energy saving mode time (MS)

5.1.1 Parameter validation

The EMS3000 controller validates the parameter values that have been manually set by the user by checking that the values do not clash with each other.

Below is the set of rules the controller validates the parameter values against:
SP value must be greater than FU
SS value must be greater than SP
UP value must be greater than (SS + SD)
UP value must be greater than DT
DT value must begreater than (SP + DF)

5.1.2 Installation / Setup Parameters

The parameters in this section are used to configure the controller according to the type of cooler and the intended application for that cooler.

TEMPERATURE SCALE	
DEFINITION	Determines whether the cooler's temperature is displayed in Celsius or Fahrenheit. Note: this parameter only affects the displayed temperature value. All parameter values are defined in Celsius. 0 = Temperature displayed in Celsius 1 = Temperature displayed in Fahrenheit
UNIT	Integer
RANGE	0 to 1
DEFAULT	0

DISPLAY MODE	
DEFINITION	This parameter defines the behaviour of the display during normal operation 0 = Display 'USE' during normal operation 1 = Display temperature during normal operation 2 = Display OFF
UNIT	Integer
RANGE	0 to 2
DEFAULT	1

APPLIANCE TEMPERATURE CALIBRATION	
DEFINITION	Appliance temperature calibration factor added to appliance temperature measurement. Note the calibration factor is applied at point of temperature measurement. The displayed temperature and all associated parameter values apply to the calibrated temperature value
UNIT	Celsius
RANGE	-10 to 10
DEFAULT	0

EVAPORATOR TEMPERATURE CALIBRATION	
DEFINITION	Evaporator temperature calibration factor added to evaporator temperature measurement. Note the calibration factor is applied at point of temperature measurement. All associated parameter values apply to the calibrated temperature value.
UNIT	Celsius
RANGE	-10 to 10
DEFAULT	0

MOTION SENSOR INPUT SELECT	
DEFINITION	Configures the controller to use the internal or external motion sensor. It can also be used to disable the motion sensor (not recommended). 0 = Motion sensor not fitted / disabled 1 = Internal (IMD) Motion Sensor enabled 2 = External (RMD) Motion Senor enabled
UNIT	Integer
RANGE	0 to 2
DEFAULT	1

REST TIME	
DEFINITION	Minimum time before compressor can be switched ON after being switched OFF
UNIT	Minute
RANGE	1 to 30
DEFAULT	3

ENERGY SAVING ENABLE	
DEFINITION	Used to enable and disable energy saving mode and determine behaviour during energy saving mode when enabled. Energy saving should be disabled when cooler is used to store perishable products. 0 = Disabled (run continuously in normal mode) 1 = Activate SSP during energy saving period 2 = Cooler OFF during energy saving period.
UNIT	Integer
RANGE	0 to 2
DEFAULT	0

MARKETING MODE	
DEFINITION	Marketing mode allows the coolers lights to remain on when the store is closed (whilst operating in energy savings mode). This is typically used as an advertising aid when the cooler is in a prominent position. 0 = Lights OFF 1 = Lights ON
UNIT	Integer
RANGE	0 a 1
DEFAULT	0

5.1.3 Temperature Control Parameters

SET POINT	
DEFINITION	Defines the temperature at which the compressor is switched OFF. This equates to the low temperature control point.
UNIT	Celsius
RANGE	-10 to 10
DEFAULT	3

DIFFERENTIAL	
DEFINITION	Temperature increase above SP parameter at which compressor is switched ON. Parameters SP + dF = high temperature control point.
UNIT	Celsius
RANGE	0 to 10
DEFAULT	4
UNINTERRUPTED PULL DOWN	
DEFINITION	An un-interrupted pull-down (IPD) lowers the temperature of the cooler as quickly as possible by over-riding defrost cycles that might otherwise occur. IPD is initiated when the cooler temperature exceeds the temperature defined by this parameter. 0 = Disabled (no uninterrupted pull-down) >0 = temperature above which an IPD is initiated Note: UP should not be set less than SP + DF or Dt, whichever is the greater. Failure to do so will result in defrost cycles being permanently disabled.
UNIT	Celsius
RANGE	Operational range 1 to 30, setting to 0 disables un-interruptable pull-down
DEFAULT	20
FAN SET POINT	
DEFINITION	Temperature above which the evaporator fan will run continuously regardless of whether door is open or closed.
UNIT	Celsius
RANGE	1 to 60
DEFAULT	15

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FAN CYCLE ON	
DEFINITION	Normally the evaporator fan remains ON to provide accurate measurement of the cooler's temperature by ensuring air passes over the app sensor. It can, however be switched off to save energy when the compressor is OFF. The length of time the evaporator fan remains ON after the compressor switches OFF or following FF (see below).
UNIT	Minute
RANGE	1 to 30
DEFAULT	30

FAN CYCLE OFF	
DEFINITION	Normally the evaporator fan remains ON to give accurate measurement of the cooler's temperature by ensuring air passes over the app sensor. It can, however, be switched off to save energy when the compressor is OFF. The length of time the evaporator fan is OFF when the compressor is OFF and following Fn time. This parameter should be set to 0 (fan OFF disabled) when used in open front cooler (OFC) and similar applications.
UNIT	Minute
RANGE	Operational range 1 to 30, setting to 0 prevents the fan from switching off
DEFAULT	1

5.1.4 Defrost Parameters

DEFROST METHOD	
DEFINITION	Defrost method: 0 = Controller starts defrost by time (parameter DE) and finishes by time (parameter DD) or temperature measured by the appliance sensor (parameter DT) 1 = Controller starts defrost by temperature measured by the evaporator sensor (parameter DA) and finishes by temperature measured by the evaporator sensor (parameter DT) 2 = Time based (EVAP sensor termination). Note EVAP sensor must be installed and enabled in order to use temperature based defrost (dr = 1, 2).
UNIT	Integer
RANGE	0 to 2
DEFAULT	0
NOTE	EVAP sensor must be installed and enabled in order to use the temperature based defrost (dr = 1,2)

DEFROST INTERVAL	
DEFINITION	Length of time cooler runs between automatic defrost cycles,
UNIT	Hours
RANGE	Operational range 1 to 199, setting to 0 disables defrost (not recommended)
DEFAULT	6

DEFROST DURATION	
DEFINITION	Duration of an automatic defrost cycle.
UNIT	Minute
RANGE	0 to 199
DEFAULT	15

DEFROST ACTIVATION TEMPERATURE	
DEFINITION	Using the temperature, as measured by the EVAP sensor, to control defrost cycles means a cycle is only initiated when required (as dictated by the value of DA) and terminates once the evaporator temperature returns to normal. The defrost cycle time can be reduced by using heater supplemented defrost (see parameter DH).
UNIT	Celsius
RANGE	-30 to 5
DEFAULT	-6

DEFROST TERMINATION TEMPERATURE	
DEFINITION	Defrost termination temperature (Dt) is used to abort a defrost cycle if the temperature of the cooler reaches a threshold (as determined by the value of dt) indicating the defrost cycle is no longer required.
UNIT	Celsius
RANGE	-5 to 30
DEFAULT	10

NOTE: The following parameter applies to models with Heater Defrost only (EMS3120)

HEATING ELEMENT DEFROST	
DEFINITION	Controls the behaviour of the fan during heating element supplemented defrost
UNIT	Integer
RANGE	0 = Heater supplemented defrost disabled 1 = Heater and Fan shall be ON during active defrost cycle 2 = Heater shall be switched ON during the active defrost cycle, fan shall be switched off 3 = Heater shall be switched ON during the active defrost cycle, fan shall be switched off. The evaporator fan then remains off for one minute after the end of the defrost cycle 4 = Heater shall be switched ON during the active defrost cycle, fan shall be switched off. The evaporator fan then remains off for two minutes after the end of the defrost cycle 5 = Heater shall be switched ON during the active defrost cycle, fan shall be switched off. The evaporator fan then remains off for three minutes after the end of the defrost cycle 6 = Hot gas defrost. The relay switches a solenoid valve
DEFAULT	0

5.1.5 Energy Saving Parameters

ENERGY SAVINGS ACTIVATION	
DEFINITION	Energy saving mode activation method used to switch the controller between energy saving and normal modes of operation. Options are to use the self-learning algorithm, OR a door switch fitted on a night curtain – these are typically used on open front coolers to reduce energy consumption overnight. 0 = Store open / closed times (based on self-learning algorithm) 1 = door switch input (night curtain for use with OFC coolers)
UNIT	Integer
RANGE	0 to 1
DEFAULT	0

SAVING SET POINT	
DEFINITION	Defines the temperature at which the compressor is switched OFF when operating in energy savings mode. This equates to the low temperature saving control point.
UNIT	Celsius
RANGE	-9.9 to 9.9
DEFAULT	8

SAVING DIFFERENTIAL	
DEFINITION	Temperature increase above SS parameter at which compressor is switched ON when operating in energy saving mode Parameters SS + Sd = high temperature saving control point.
UNIT	Celsius
RANGE	0 to 9.9
DEFAULT	4

LEARNING PERIOD	
DEFINITION	Specifies duration of the automatic learning period prior to energy savings being achieved. 7-day learning is the recommended option, as it learns individual store open and close times for every day of the week, including weekends. However, 24hrs learning means energy savings can be adopted quicker and is appropriate for stores having regular opening and close times every day of the week. 0 = 24hrs 1= 7 days
UNIT	Integer
RANGE	0 a 1
DEFAULT	1

ACTIVITY FREQUENCY	
DEFINITION	The learning of store open/closed times is dependent on the amount of motion detections and door openings that occur in a 30-minute interval (activity frequency). The higher the number, the more activity required to define the store as open. Elstat recommend setting this value to 3 so that occasional motion detections overnight (for example security sweeps of store) can be distinguished from customer activity. Lower values may be required in quieter stores, with less regular customer activity.
UNIT	Integer
RANGE	0 to 3
DEFAULT	0

STORE CLOSE TIME	
DEFINITION	An algorithm is applied to the learned store activity in order to identify the store opening and close times. The St parameter sets the minimum time in any 24hrs where no activity identifies the store close time. Setting this parameter to 0 disables the algorithm.
UNIT	Hour
RANGE	Operational range 6 to 24, setting to 0 disables this function
DEFAULT	0

SAVING RESTART MODE	
DEFINITION	At the end of an energy saving period, and prior to the store opening time, the product must be chilled to the optimal serving temperature. The time this takes is called the 'saving restart time'. This parameter allows the restart time to be set according to a simple time duration (see parameter Sr) OR using an automatic, self-optimising algorithm. Saving restart operation mode: 0 = Timed 1 = Automatic
UNIT	Integer
RANGE	0 to 1
DEFAULT	0

SAVING RESTART PERIOD	
DEFINITION	Fixed time before store opening time that the cooler switches on, in order to ensure products are at the optimal serving temperature when the store opens. See also parameter SC
UNIT	Integer
RANGE	0 to 240
DEFAULT	120

AUTOMATIC RESTART TIME	
DEFINITION	Automatic restart time. Defines the initial time a cooler is given to cooler product during energy saving restart time. Note this time will automatically adjust if saving restart mode is set to 1 (automatic)
UNIT	Minute
RANGE	0 to 240
DEFAULT	120

AUTOMATIC RESTARTTIME DELTA	
DEFINITION	Automatic restart time delta (applied to AT depending on whether drinks temperature achieve too late or too early).
UNIT	Minute
RANGE	0 to 30
DEFAULT	15

SAVING RESTART STABILISATION	
DEFINITION	The value of the saving restart stabilisation time (rS) parameter defines the length of time the cooler run in stable conditions following energy saving restart and prior to store opening, in order for the temperature of all the products in the cooler to stabilise.
UNIT	Minute
RANGE	0 to 120
DEFAULT	0

FAN DRIVEN TEMPERATURE STABILISATION	
DEFINITION	Length of time fan is switched ON when in 'cooler OFF' energy saving mode, prior to saving restart period in order to ensure all the product in the cooler is at the approximately same temperature.
UNIT	Minute
RANGE	0 to 60
DEFAULT	0

DRINK TEMPERATURE SAMPLING INTERVAL	
DEFINITION	The frequency of fan ON events during 'cooler OFF' energy saving mode in order to determine the approximate drinks temperature
UNIT	Minute
RANGE	0 to 240
DEFAULT	60

SUPER-CHILL SET POINT	
DEFINITION	Offset applied to SP during energy saving restart period that reduces the time it takes for products in the cooler to reach optimal serving temperature. Note this is effectively a negative number, e.g. defines degrees BELOW SP that cooler must achieve before the compressor switches OFF.
UNIT	Celsius
RANGE	0 to 5
DEFAULT	0

LIGHTS DELAY	
DEFINITION	The length of time the lights stay on when entering 'Energy Savings Mode' from 'Normal Mode'. Use this parameter to keep the lights on for a period of time determined by the value of Ld after the store has closed
UNIT	Minute
RANGE	0 to 120
DEFAULT	0

5.2 Alarm Parameters

CONDENSER HIGH TEMPERATURE	
DEFINITION	High temperature alarm threshold. If exceed HT alarm is activated. If set to any value less than 50 the HT sensor is disabled.
UNIT	Celsius
RANGE	Operational range 50 to 125, setting to 0 disables the high temperature alarm function
DEFAULT	0

ALARM DELAY	
DEFINITION	Delay before door alarms are triggered. 0 means door alarms are disabled.
UNIT	Minute
RANGE	Operational range 2 to 30. Setting to 0 disables the door switch function
DEFAULT	2

LOW VOLTAGE	
DEFINITION	Threshold below which supply voltage low alarm is activated. Parameter value is (actual voltage / 10). 0 means VMS Low alarm disabled.
UNIT	Volts
RANGE	Operational range 1 to 21, setting to 0 disables the voltage alarm function
DEFAULT	9

Note: Voltage measurement is accurate to ± 10%

Note

The voltage measurement used is not calibrated and therefore subject to a tolerance of approximately 10%.

Actual performance can be influenced by several factors and total protection cannot be guaranteed.

HIGH VOLTAGE	
DEFINITION	Threshold above which supply voltage High alarm is activated. Parameter value is (actual voltage / 10). 0 means VMS High alarm disabled.
UNIT	Volts
RANGE	Operational range 1 to 27, setting to 0 disables the voltage alarm function
DEFAULT	25
Note: Voltage measurement is accurate to ± 10%	

REFRIGERATION SYSTEM FAILURE	
DEFINITION	Defines the maximum length of time, after the compressor switches on, to achieve temperature SP. Exceeding this time causes the refrigeration system failure (RSF) alarm to be activated.
UNIT	Hour
RANGE	Operational range 1 to 100. Setting to 0 disables the RSF alarm function
DEFAULT	72

FREEZE-UP PROTECTION	
DEFINITION	Temperature at which freeze up protection alarm is activated.
UNIT	Celsius
RANGE	-15 to 10
DEFAULT	0

HT ALARM TEMPERATURE DIFFERENTIAL	
DEFINITION	The temperature drop that must occur, as measured by the HT sensor, in order for the HT alarm to clear.
UNIT	Celsius
RANGE	0 to 100
DEFAULT	30

HT ALARM TIMEOUT	
DEFINITION	The minimum time the HT alarm is active before being cleared regardless of Hd/HT temperatures
UNIT	Minute
RANGE	0 to 240
DEFAULT	30

5.2.1 Cooler Test Parameters

These parameters can be used to set the controller into a test mode whereby it operates in normal mode for Mn duration followed by energy saving mode for MS duration.

This can, for example, simplify energy consumption testing of a cooler.

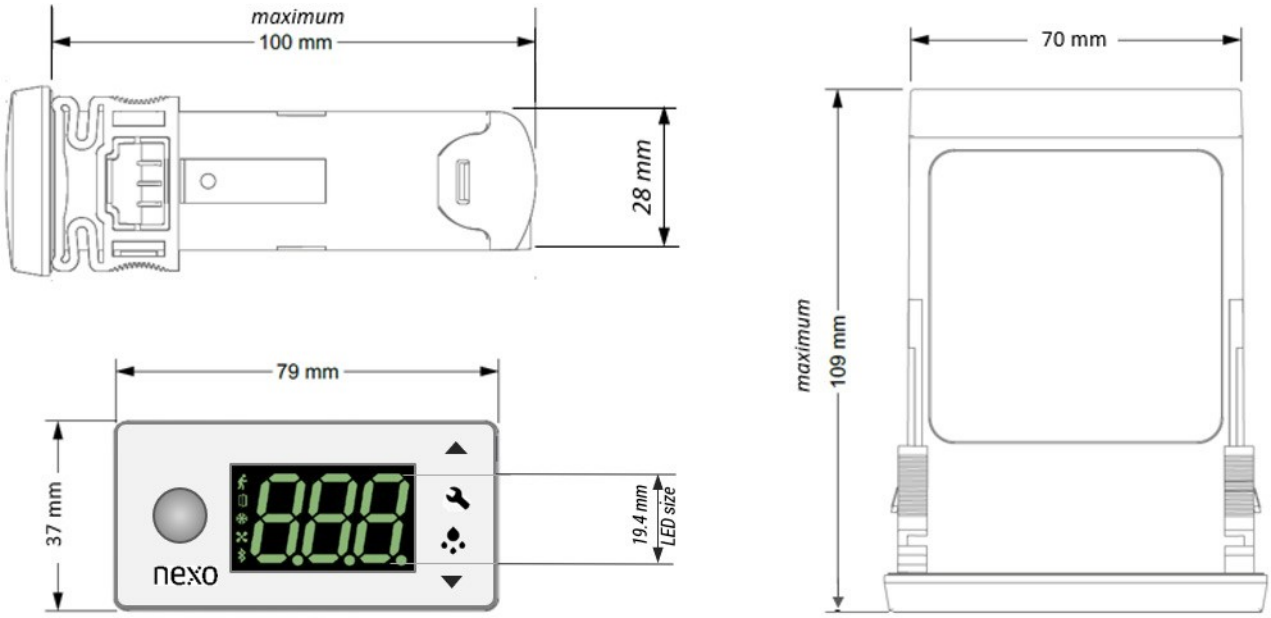
MEC TEST MODE ENABLE / DISABLE	
DEFINITION	Test mode. 0 = Disabled 1 = Enabled See also parameters Mn and MS below.
UNIT	Integer
RANGE	0 to 1
DEFAULT	0

NORMAL MODE TIME	
DEFINITION	Normal mode time.
UNIT	Hour
RANGE	0 to 48
DEFAULT	12

ENERGY SAVING MODE TIME	
DEFINITION	Energy save mode time. Operates cooler in energy save mode as determined by parameter ES
UNIT	Hour
RANGE	0 to 48
DEFAULT	12

6. TECHNICAL SPECIFICATIONS

6.1 Dimensions



6.2 Environmental Ratings

CHARACTERISTIC	VALUE
IP (Ingress Protection) Rating	IP65 Front Fascia, IP25 All Over
Maximum operating temperature	50°C (131°F)
Minimum operating temperature	0ºC (32ºF)
Housing material	Black polycarbonate, Food grade (non-contact)
Operating control	Electronic Thermostat
Construction	Class II (SELV electronic control)
Software Class	Class A
Limitation of operating control	Continuous
Action	Type 1B
Control pollution degree	Degree 2
Rated impulse voltage	Loads 2.5KV Control 330V (SELV)
Temperature ball pressure test	160ºC (PCB) 125ºC (Enclosure) 75ºC (Front face only)

6.3 Absolute Maximum Ratings

		MAXIMUM IEC RATING @100-240VAC	MAXIMUM UL RATING @110VAC
EMS 3125 (3 outputs)	Compressor	9(9) A, p.f. 0.6	11FLA, 66LRA
	Lights (250Wballast)	1(1) A, p.f. 0.6	1FLA, 6LRA
	Evaporator Fan	1(1) A, p.f. 0.6	1FLA, 6LRA
EMS 3120 (4 outputs)	Compressor	9(9) A, p.f. 0.6	11FLA, 66LRA*
	Heater Auxiliary	4(4)A, p.f. 0.6^	4FLA, 24LRA^
	Lights (250Wballast)	1(1) A, p.f. 0.6	1FLA, 6LRA*
	Evaporator Fan	1(1) A, p.f. 0.6	1FLA, 6LRA*

*Total load must not exceed 13A
^Heater Auxilary Load is mutually exclusive with the Compressor, i.e. when Compressor is ON Heater is forced OFF

Note

The electrical supply to the EMS3000 must be protected by an overload device in accordance with local wiring regulations and with a current rating not exceeding 16 A

Note

This controller is designed for integration into 3rd party equipment only and should be installed according to these instructions and all relevant local electrical and safety standards.

6.4 Temperature sensor accuracy

TEMPERATURE RANGE (°C)	ACCURACY
-35°C to 15°C	**+/- 0.5°C**
-16°C to 70°C	**+/- 2.0°C**
71°C to 125°C	**+/- 5.0°C**

Note

The standard NTC (negative temperature coefficient) thermistor from Elstat is rated at -35°C to 105°C.

An extended temperature range sensor rated to 125°C is available, if required.

7. APPROVALS

7.1 Product Approvals

CE	**CONFORMITÉ EUROPÉENE / EUROPEAN CONFORMITY (CE)** EN60730-1 EN60730-2-9
IEC	**INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)** IEC60730-1 IEC60730-2-9 Glow wire: IEC60335-1
c UL us	**NORTH AMERICA (INCLUDING CANADA) - UL MARK (COMPONENT RECOGNITION)** UL60730-1 / CSA E 60730-1 UL60730-2-9 / CSA E60730-2-9
FC	**FEDERAL COMMUNICATIONS COMMISSION (FCC)** FCC Part 15.107 & 15.109
EMC	**ELECTROMAGNETIC COMPATIBILITY (EMC)** EN55014-1, EN55014-2, EN61000-6-1, EN61000-6-3, EN61000-3-2, EN61000-3-3
ETSI	**EUROPEAN TELECOMMUNICATIONS STANDARDS INSTITUTE (ETSI)** EN301 489-1

7.2 Bluetooth Approvals

	**AGÊNCIA NACIONAL DE TELECOMUNICAÇÕES (ANATEL)** Esse produto contém o modulo BlueMod + S42 código de homologação 00573-17-02618 Resolução Anatel nº 242
	**EUROPEAN TELECOMMUNICATIONS STANDARDS INSTITUTE (ETSI)** EN300 328 V1.8.1
	**FEDERAL COMMUNICATIONS COMMISSION (FCC)** Part 15C
	**INSTITUTO FEDERAL DE TELECOMUNICACIONES (IFETEL)** NOM-121-SCT1-2009

EMS3000 *series* Product Manual

Overview

Installation

Parameters

Technical Specifications

Approvals

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