CMS100

PRODUCT MANUAL

Issue 8

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1. CONTROLLER WITH INTELLIGENCE

The Nexo controllers are the first truly intelligent refrigeration solution for the beverage industry that delivers consumer insights from field data to optimize and take complete control of cold drink marketing.

Elstat's game-changing Nexo platform is a powerful tool that connects drink brands directly to consumers at the point of sale, wherever they are in the world, to create sustainable and profitable relationships.

The energy management system (ems) controllers from Elstat are used in a variety of drinks coolers, optimising energy savings, without compromising on drinks serving temperature.

The CMS100 Nexo controller is designed for applications such as single door coolers, double door coolers and vending machines.

1.1 Functionality

Feature	Description
User and diagnostic information	3-digit, 7-segment display that displays the product temperature and other information such as defrost or teach and alarm conditions. Also push buttons, that enable the end-users to cancel alarms and service technicians to run test routines.
Product temperature	An appliance sensor measures temperature of the refrigeration compartment. EMS controllers use the refrigeration temperature to manage the product temperature.
Refrigeration system high temperature alarm	An optional condenser sensor measures the temperature of the refrigeration system. EMS controllers use the temperature to alert to problems such as blocked condensers.
Motion detection	A remote or integrated motion sensor enables EMS controllers to detect activity when someone moves in front of the cooler.
Door open detection	A door switch enables EMS controllers to detect cooler activity when someone opens the cooler doors.

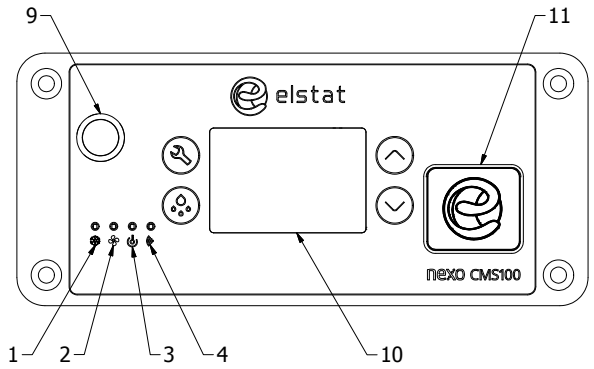
The controllers switch the following cooler components:

Feature	Description
Compressor	EMS controllers switch the compressor to manage the temperature of the refrigeration compartment.
Evaporator fan	EMS controllers can control the evaporator fan.
Lights	EMS controllers can control the cooler lights to save energy.

1.2 User interface

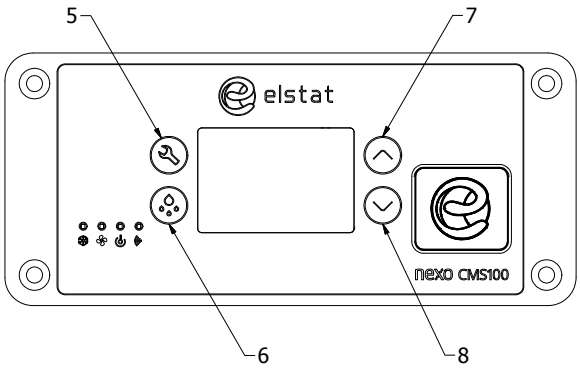
All Elstat controllers are made from food grade materials and are safe for internal installation. The CMS100 controllers are available with either an integrated or a remote motion sensor.

Controller with integrated motion detection (IMD)



This variant should always be installed where the sensor can 'see' activity. It is recommended that the controller is installed externally on the cooler.

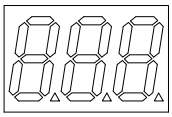
Controller with remote motion detection (RMD)



This variant of the controller can be installed internally on the cooler but the remote motion sensor must be installed where it can 'see' activity.

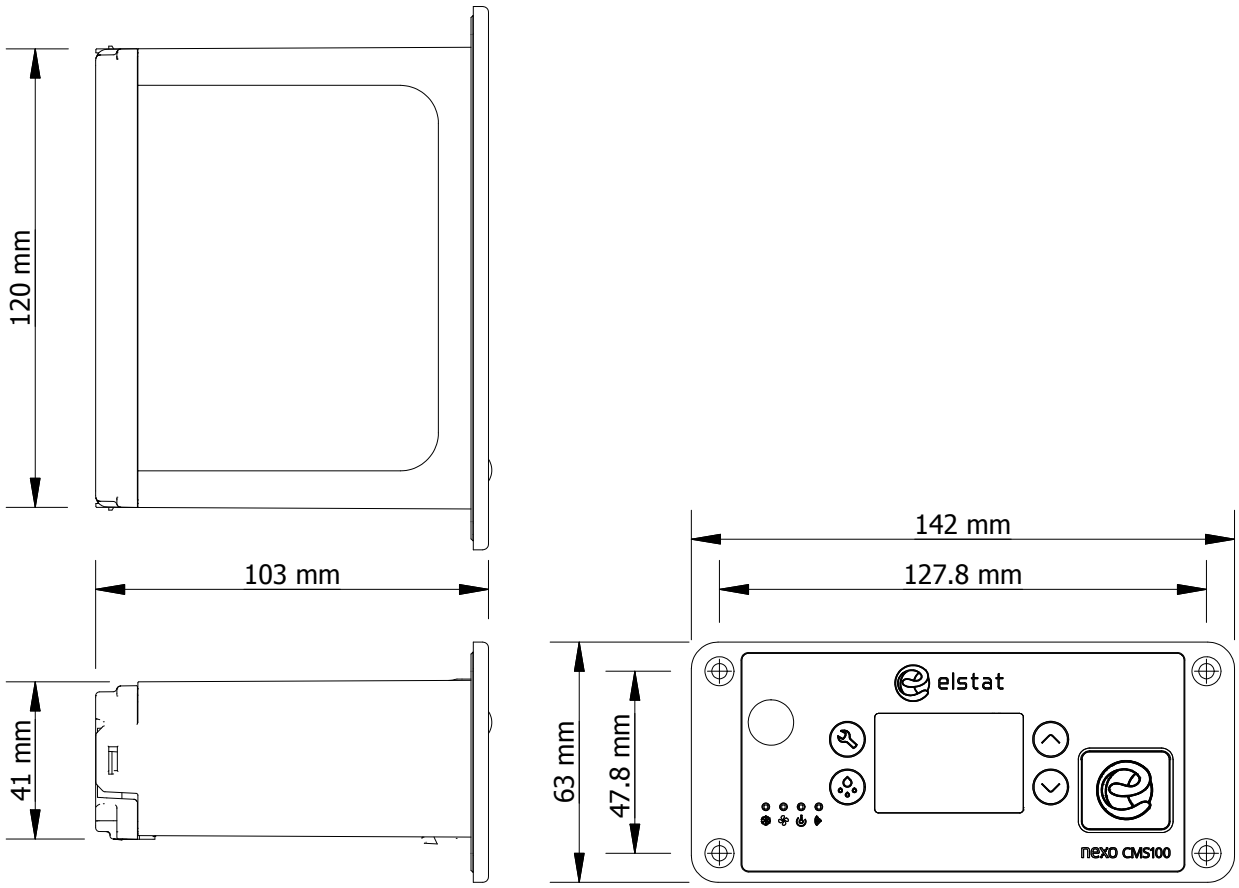
Item	LED Indicator	Name	Function	Colour
1		Compressor	On when the compressor is running.	Green
2		Evaporator fan	On when the evaporator fan is running.	Green
3		Saving temperature disable	On if the saving temperature is disabled. The controller maintains the Ready mode temperatures at all times.	Red
4		Motion	On when motion sensor detects motion from passing shoppers.	Red

Item	Push Button	Name	Function
5		Set	Accept/forward - selects menu options and parameters.
6		Defrost	Return/backward - De-selects menu options and parameters. Activates a manual defrost (only applicable if temp is below termination temp).
7		Up	Scrolls up menus. Increases parameter values.
8		Down	Scrolls down menus. Decreases parameter values. Cancels the rSF, d0 and Ht alarms.

Item	On display	Name	Function
9		Motion Sensor	Detects motion
10		LED Display	Displays the current status of the controller
11		Programmable Port	Enables upload of parameters using a dongle

1.3 Overall dimensions

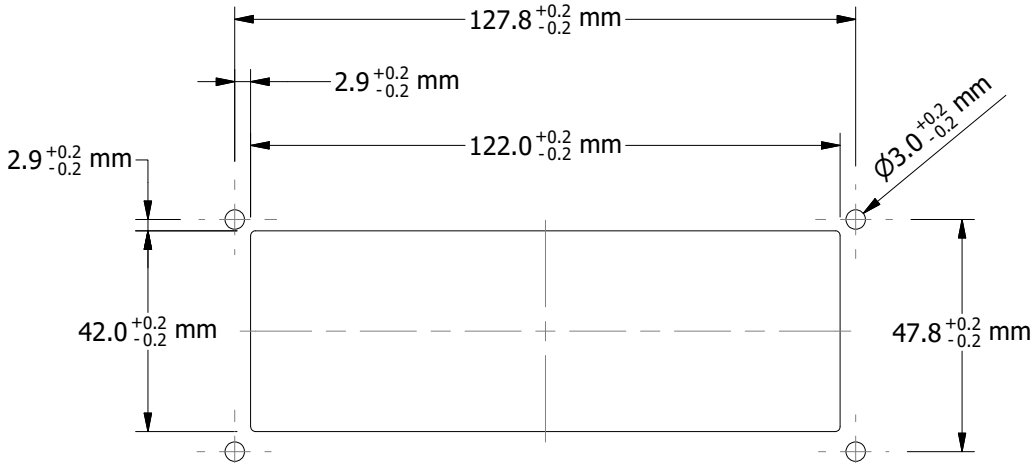
The overall dimensions of the controller are shown in the following diagram.



1.4 Mounting

CMS100 Nexo controllers are designed for panel mounting and are secured using four countersunk self-tapping screws.

The aperture and screw pitch dimensions are as shown.

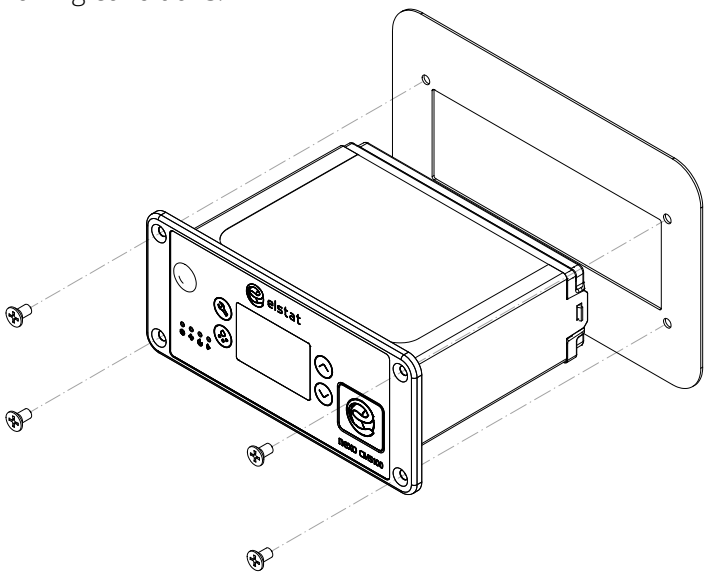


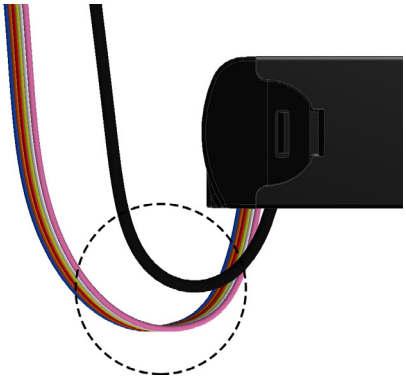
Note

The Water Ingress Protection ratings (IP ratings) are only valid when the product is mounted in the recommended orientation shown below.
Failure to follow these guidelines will invalidate the designed levels of Ingress Protection and any subsequent damage incurred will not be covered under the warranty terms.

In addition, incorrect installation may result in the following conditions:

- If mounted vertically with the integrated motion sensor close to the floor, the motion sensor may not be able to detect motion effectively.
- If mounted vertically with [parameter programming port] close to the floor, water ingress may occur.
- If mounted too close the floor, water ingress may occur at the mains or line voltage terminals.





Cable routing to the CMS100 controller is critical as water can trace or follow the cable downwards.

Therefore, immediately prior to the connection to the controller, a drip loop must be formed in all wiring as shown.

An appropriate level of protection must be given for the effects of water ingress due to condensation, product spillage, and so on.

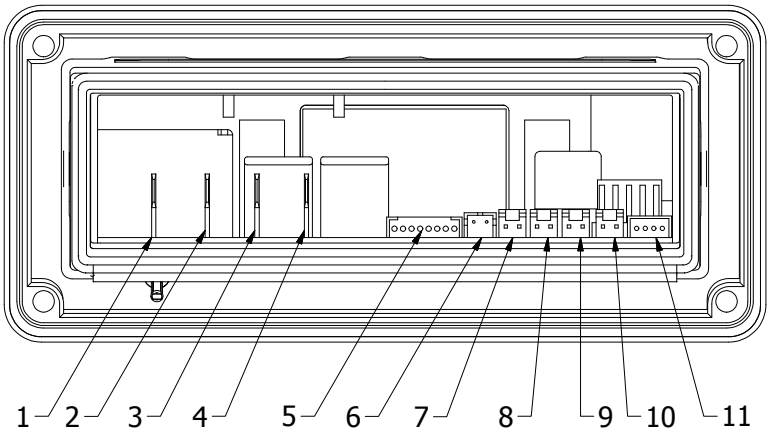
Note

Cable routing looms must not be secured to hot pipes or vibrating components. Secure cable routing looms with clips where ever possible.

Ensure that the back of the controller is protected from the possibility of unauthorized tooled access with an appropriate strain relief on cables.

1.5 Electrical connections

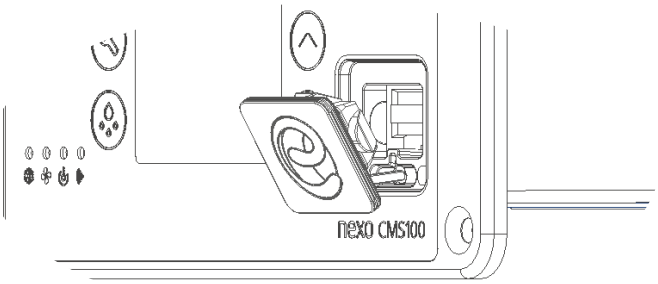
Item	Description	Connectors
1	Compressor	
2	Line in	
3	Fan(s)	
4	Light(s)	
5	Product Sensor	
6	12VAC	
7	Evaporator Sensor	
8	Door	
9	Condenser Sensor	
10	Appliance Sensor	
11	Remote Motion Detector (If applicable)	



1.6 Programming port cover

When accessing the programming port on the controller fascia, remove the rubber cover and let it hang on the attaching strap.

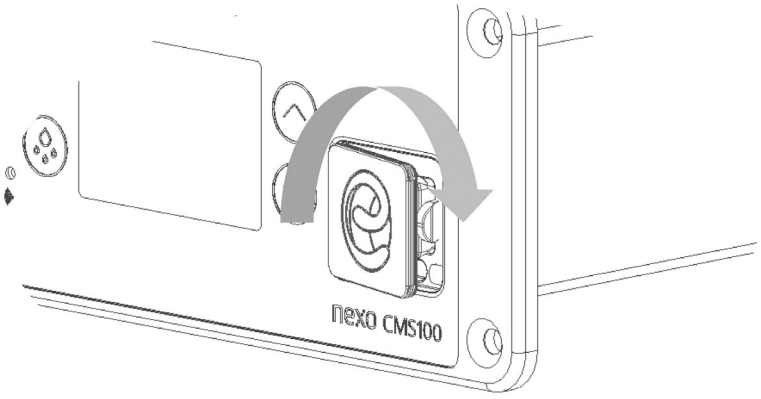
This will prevent misplacing the port cover.



Note

Do not remove programming port cover fully. Detaching the cover from the controller fascia can damage the attaching strap.

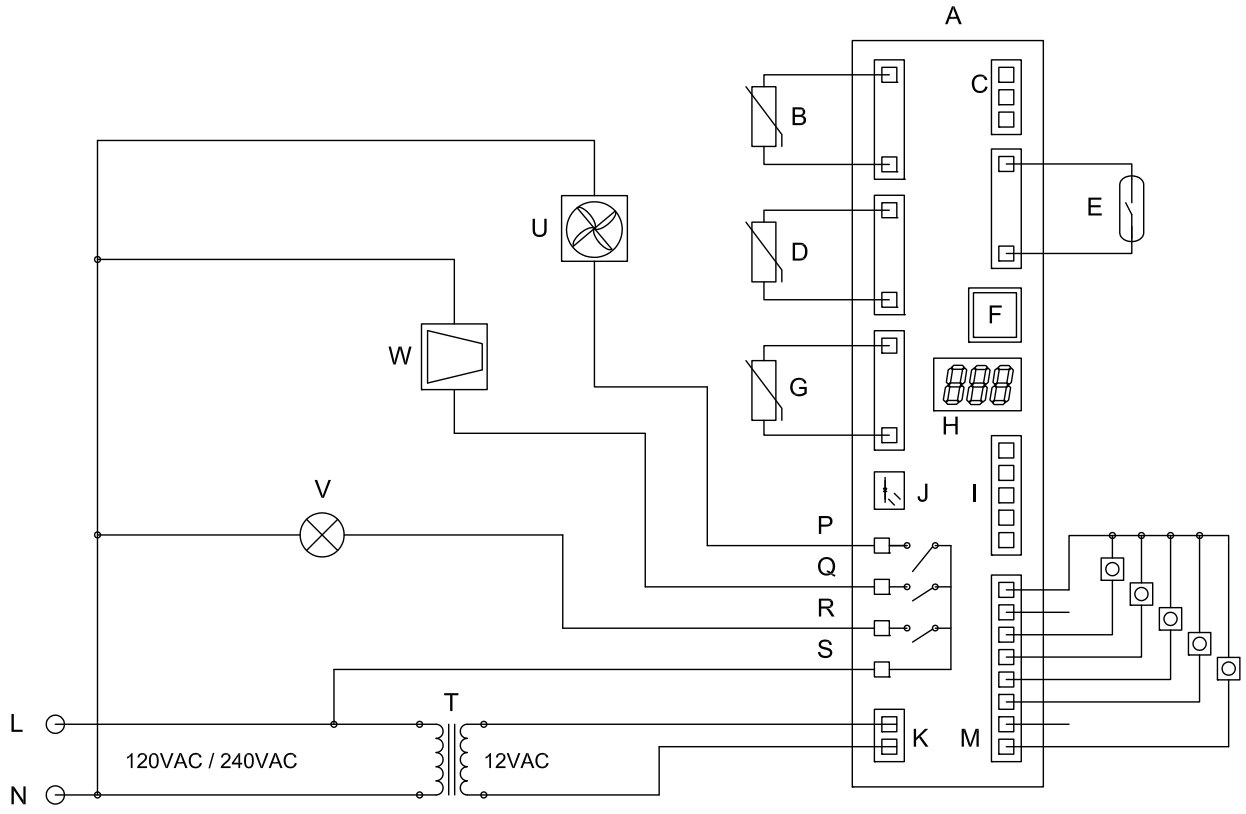
On completion of controller programming, ensure that the programming port cover is replaced inserting the left edge first then securing the other edges in place moving in clockwise direction.



1.7 Wiring diagram

Note

To remove the potential for damage occurring to, and the potential for failure of, the crimped connection on the mating half of terminals 1 to 4 of the CMS100 Nexo controller it is recommended that only right angle insulated 6.3mm tab connectors, complete with strain relief, are used to terminate these cables. Use of straight connectors may exert excessive pressure on to that connector.



A - Controller
B - Appliance sensor
C - RMD
D - Evaporator sensor
E - Door switch
F - RJ45 Port
G - Condenser sensor
H - Display
I - Modem interface
J - Motion sensor
K - 12VAC
L - Live
N - Neutral
M - Stock / product sensor
P - Fan out
Q - Compressor out
R - Lights out
S - Line in
T - Transformer
U - Evaporator fan
V - Lights
W - Compressor

Note

An additional input has been inserted between 12AV and Auxiliary inputs. The order does vary to Elstat's ems55adv models.

1.8 Relay ratings

Relay	Maximum IEC rating @100-240VAC	Maximum UL ratings @ 120VAC
Compressor	10 (10) A, p.f. 0.6	16 FLA, 96 LRA
Lights	4 (4) A, p.f. 0.6	250W ballast
Evaporator fan	4 (4) A, p.f. 0.6	4.4 FLA, 13.1 LRA

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.

1.9 Temperature input ranges

Sensor	Input range (°C)	Input range (°F)
Appliance sensor	-15°C to 50°C +/- 0.5°C	5°F to 122°F +/- 1°F
Condenser sensor	50°C to 125°C +/- 5.0°C	122°F to 257°F +/- 10°F
Evaporator sensor	-15°C to 50°C +/- 0.5°C	5°F to 122°F +/- 1°F

Note

The NTC (negative temperature coefficient) thermistor from Elstat is rated at: -35°C to 125°C (-31°F to 257°F).

1.10 Environmental ratings

Characteristic	Value
IP (Ingress Protection) Rating	IP45 Front Fascia, IP24 All Over
Maximum operating temperature	55°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)

2. ACCESSORIES

2.1 Temperature sensors

Temperature sensors are available from Elstat with various cable lengths. To help identify sensor cables during the installation, Elstat can supply sensor cables with blue identification sleeves. For example, if the appliance sensor cable is plain black; the condenser sensor cable can be purchased with a blue identification sleeve.

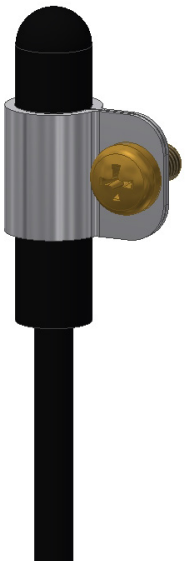
The sensor circuit is designed for safety extra low voltage (SELV). Therefore, if the sensor cable needs to be joined during production or maintenance, only connectors normally used in SELV circuits can be used.

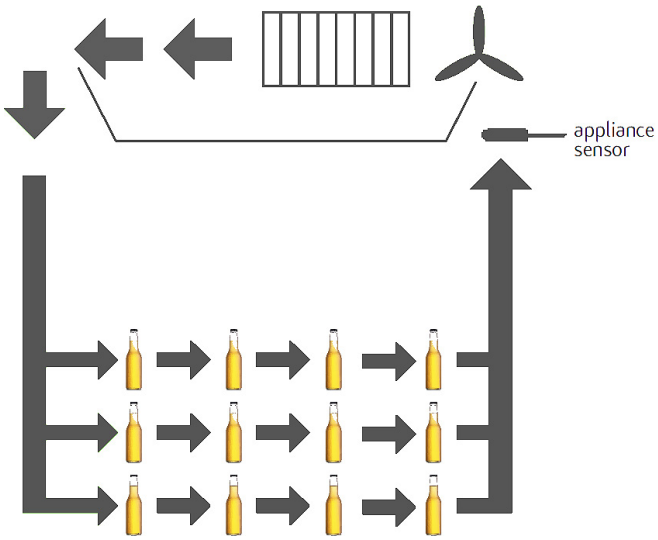
Note
Connectors designed to carry mains voltages must not be used to join cables to the sensor circuit.

The temperature sensors have a negative temperature coefficient (NTC). Each make and type of sensor has a specific resistance versus temperature curve. Therefore, only sensors supplied by Elstat should be used. The NTC thermistor is rated from -35ºC to 125ºC (-31ºF to 257ºF).

2.1.1 Appliance sensor

The appliance sensor measures air temperature of the refrigerated compartment by measuring the return air temperature.





The diagram shows the recommended position of the appliance sensor.

The appliance sensor measures the air temperature after the air has been drawn over the products. The return air provides a close approximation of the product temperature.

To measure the return air temperature, secure the sensor to allow air to flow over the sensor head.

The sensor head should be placed at a right-angle to the air flow and secured using a P-clip. The sensor head should not be completely covered by the P-clip or the sensor will not function correctly.

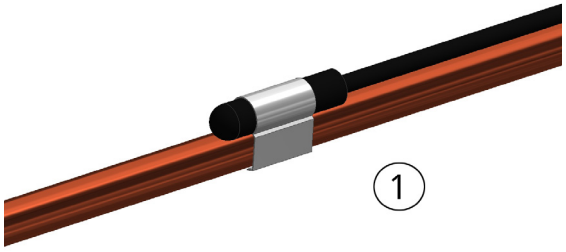
Note
The sensor head is fragile and can easily be damaged. Do not use cable ties to secure the sensor head or sensor cable as this invalidates the warranty.

To help place the appliance sensor, the parameter calibration 1 (CA1) defines an offset temperature. For more information refer to Parameters section.

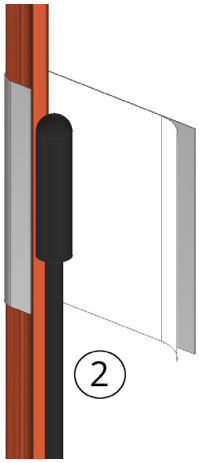
2.1.2 Condenser sensor

This sensor measures the temperature of the refrigeration system. Excessive condenser temperature is usually due to poor preventive maintenance, such as poorly cleaned condenser, or condenser fan failure. EMS controllers can generate alarms if the refrigeration system temperature rises too high.

Note
Condenser sensor needs to be mounted on the liquid pipe of the condenser.

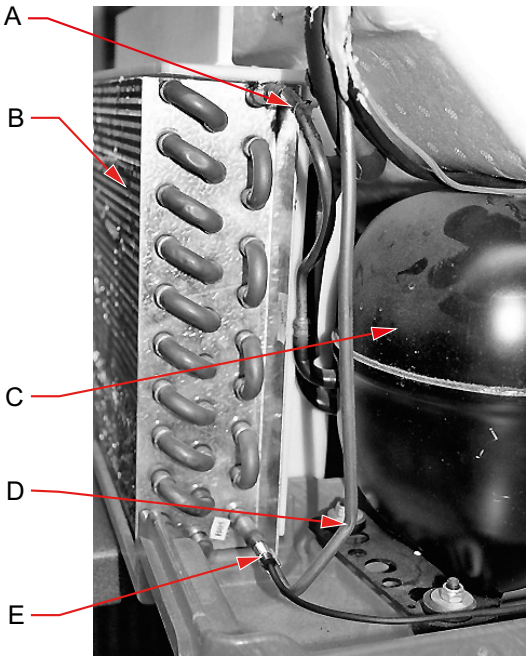


The value of the high temperature is set by measuring the refrigeration system temperature, when the condenser is approximately 75% blocked.



The temperature is then set as the value of the condenser high temperature (Ht) parameter. Ensure that the condenser sensor is fixed using a metal pipe clip (1) or foil tape (2) 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 (Dual temperature sensor)

Caution
Do not use cable ties. The head of the sensor is fragile and can be easily damaged. Using cable ties to secure the sensor head or sensor cable invalidates the warranty.
Do not attach sensor cables to hot pipes or allow the sensor cables to come into contact with hot pipes.

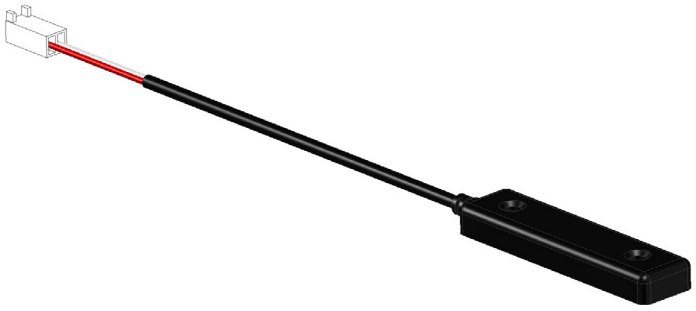
2.1.3 Evaporator sensor

The evaporator sensor measures the temperature of the evaporator.

2.2 Door switch

Door switches are used to detect door openings. They are SELV components that are able to create an open and closed circuit. The Elstat enhanced door switch, and activator, are over-moulded for increased physical protection and resistance to water ingress.

Door switch cables are available with various cable lengths.



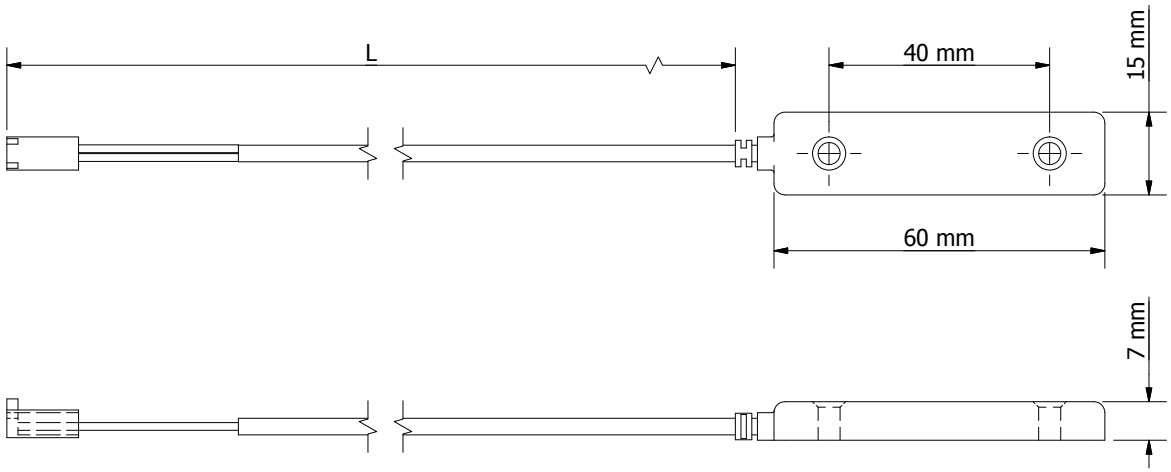
Door switches must be used with the corresponding activator.

Door switches are usually mounted with the door switch on the cooler and the activator on the door. Both components must 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 must be tightened to a maximum torque of 0.5Nm (0.37lb ft)

Note
If using non-Elstat door switches, ensure that they are double insulated.

Overall dimensions for the door switches are as shown.

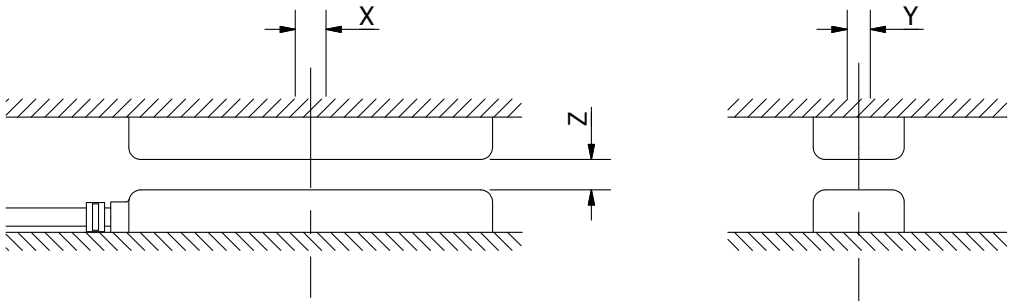


Note
Door switches and activators supplied by Elstat must not be installed using rivets. Using rivets invalidates the warranty.

The alignment of the door switch and activator is critical for the correct operation of the door switch. The table details alignment tolerances.

	Alignment	Dimensions	Notes
X	Horizontal	0mm (0in) +/- 20mm (0.7in)	Measured when the door is closed and the gap (z-dimension) is correct.
Y	Vertical	0mm (0in) +/- 10mm (0.4in)	Measured when the door is closed and the gap (z-dimension) is correct.
Z	Gap	0mm (0in) to 5mm (0.2in) +/- 2mm (0.07in)	

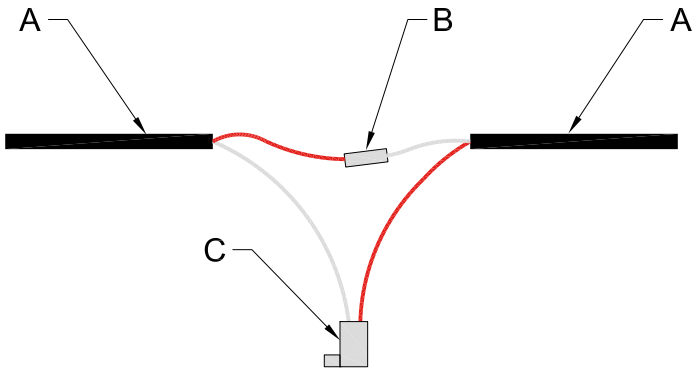
The diagram below shows the horizontal, vertical, and gap alignment between the door switch and the activator for open and closed doors.



To mount door switches on double-door coolers, two door switches must be connected in series. Connect two door switches in series as follows:

- Remove the two wires from one of the connectors. Be careful not to damage the terminals.
- Remove the white wire from the second connector. Again, be careful not to damage the terminal.
- Insert the white wire of the first cable into the connector of the second cable ensuring that the terminal is in the correct orientation.
- Connect the red wire from the first cable and the white wire from the second cable together using a butt splice or similar.

The image below shows two door switches connected in series.



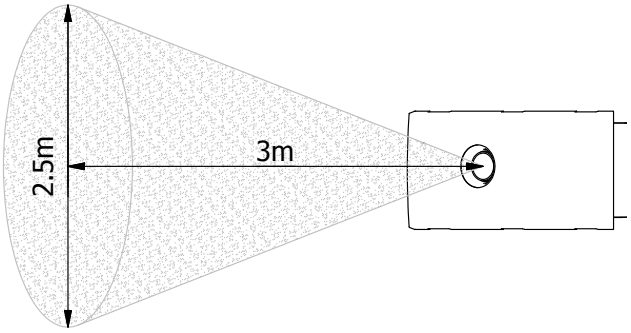
A - Door switch cables

B - Cable connector

C - Molex connector

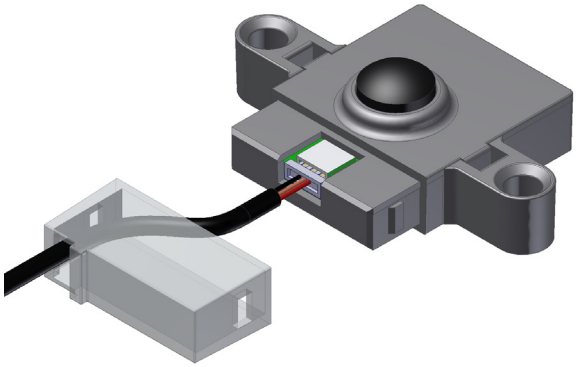
2.3 Motion sensor

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



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

The preferred location of the motion sensor is in the upper section or in header panel of the cooler to ensure the best motion detection and to lower the risk of the motion sensor being blocked by objects such as packages.



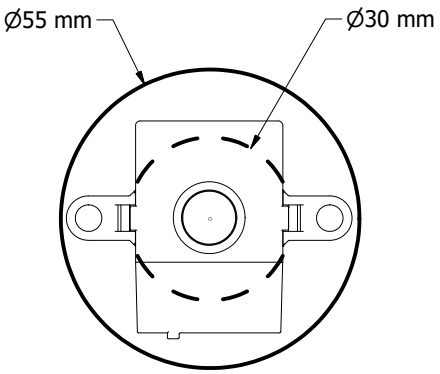
For the controllers without integrated motion sensor, a remote motion sensor can be used.

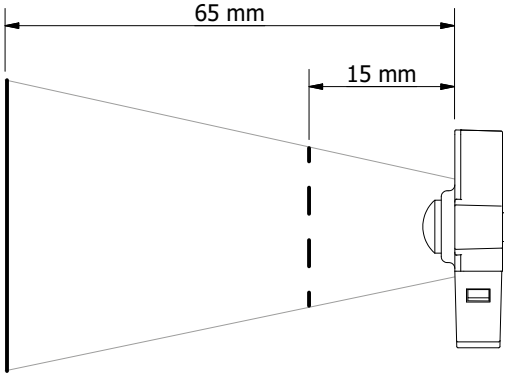
The remote motion sensor head is supplied detached from the cable to allow the cable to be easily routed through holes or foamed into place as required by the OEM or installer.

The motion sensor should be mounted vertically with the connector at the bottom for optimal performance. Mounting horizontally with the connector at the side results in the motion sensor being less sensitive. However, the motion sensor still works 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 shows the minimum recommended clearances to ensure motion detection. For example, if the motion sensor is mounted 15mm behind the panel, a 30mm diameter aperture is required.



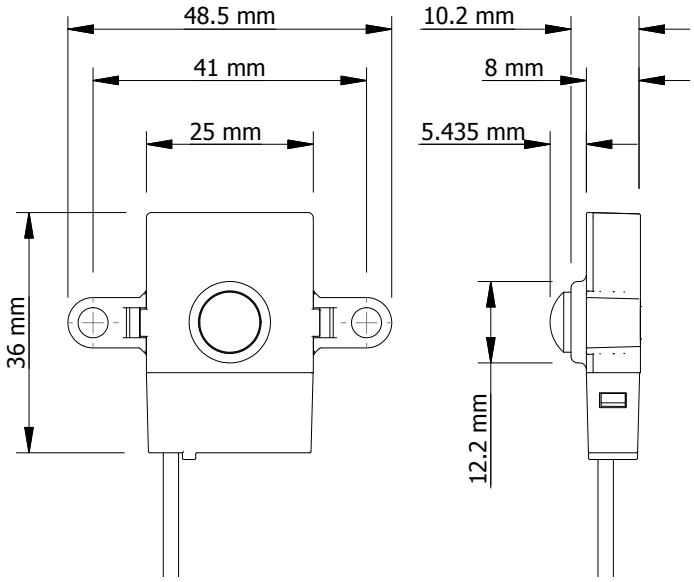


The motion sensor head must be fixed using counter sunk screws or bolts with the following characteristics:

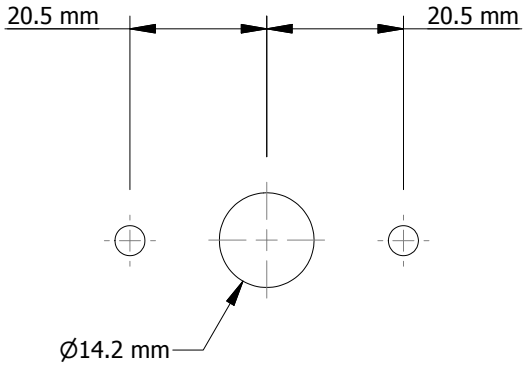
- Head: countersunk, maximum diameter 6.0mm (0.24in)
- Thread: maximum diameter 4.0mm (0.16in).

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

Note
Using rivets invalidates the warranty.



Overall dimensions of the motion sensor



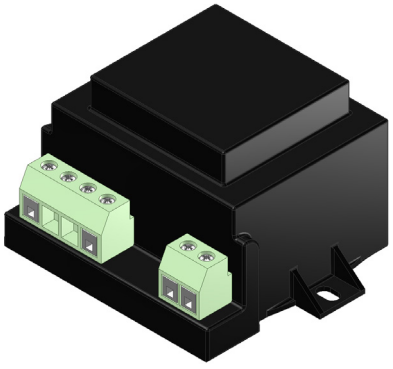
Dimensions of the mounting holes

Sample of a mounted motion sensor

2.4 Transformer

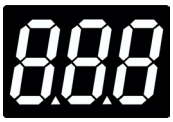
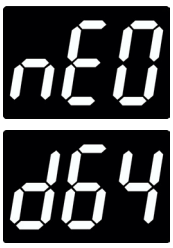
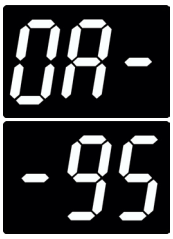
The CMS100 Nexo controller is powered up via the transformer that is available in two options:

- 120VAC/50-60Hz - 12VAC Transformer
- 230VAC/50-60Hz - 12VAC Transformer



3. USER GUIDE

3.1 Power-up sequence

1		8. 8. 8. to confirm that all segments of the display are functioning correctly
2		Platform type and firmware version. (example)
3		Checksum of the parameter set. (example)

The display then shows the appropriate display code. For example, the temperature or USE.

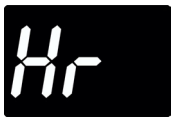
3.2 Function buttons

The controller buttons access the menus to view parameter values, reset the controller, and to run test routines.

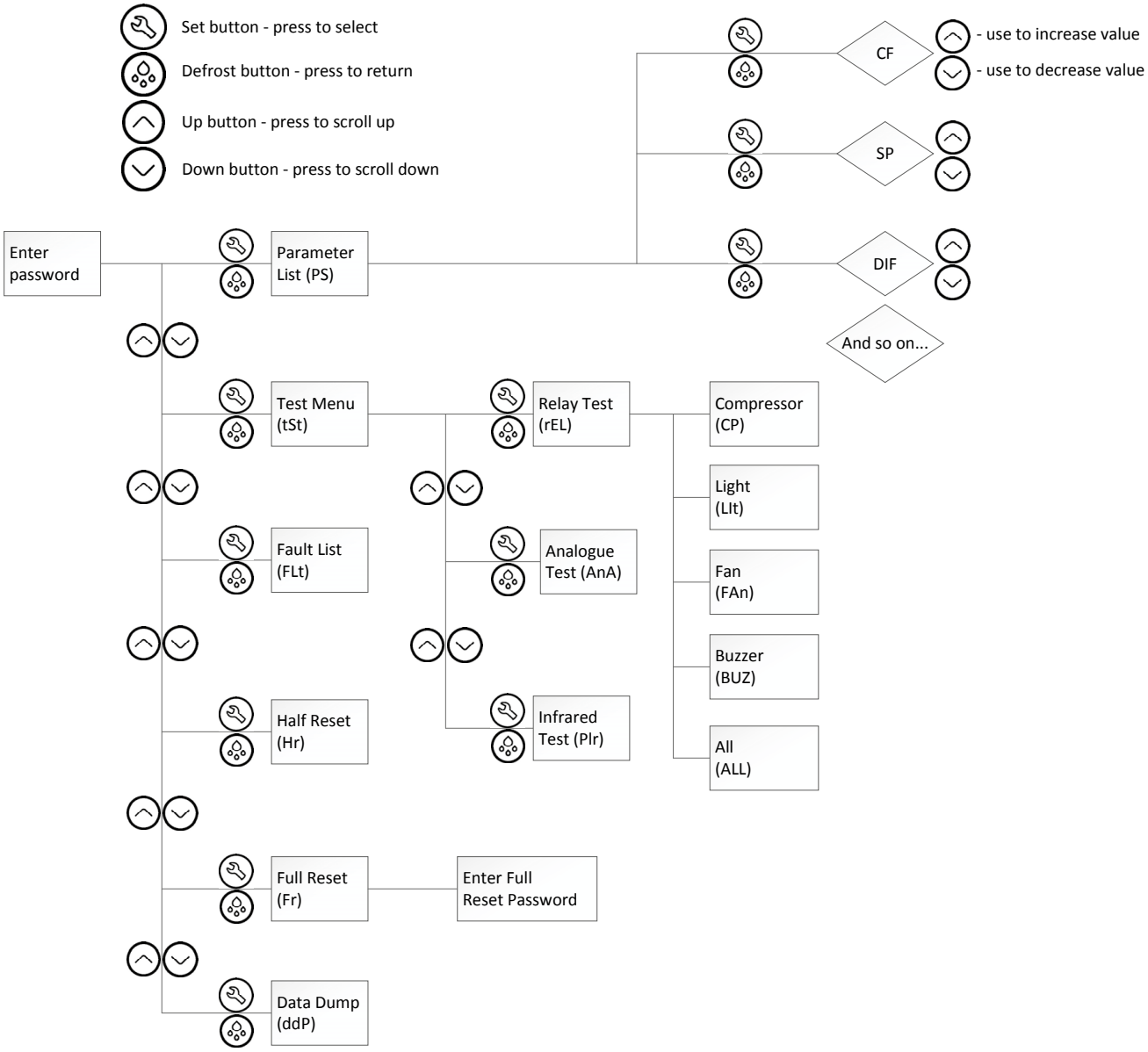
Button	Name	Function - end user	Function - service engineer
	Set	Accept/forward - selects menu options and parameters.	• Use as part of the controller password. • Selects menu options. • Selects parameters for change. • Use in the test routine.
	Defrost	Activates a manual defrost (only applicable if temp is below termination temp).	• Use as part of the controller password. • Use to de-select menu options (return). • Use in the test routine.
	Up	Scrolls up menus. Increases parameter values.	• Use as part of the controller password. • Increases the parameter values. • Scrolls up through parameters • Use in the test routine.
	Down	Scrolls down menus. Decreases parameter values. Cancels the rSF, d0 and Ht alarms.	• Use as part of the controller password. • Scrolls down menus. • Decreases parameter values. • Scrolls down through parameters • Use in the test routine.

3.3 (GDC) Firmware menus

The table below describes the controller GDC firmware Sub-menu. Use the Up or Down buttons to scroll through the menu and the Set button to select.

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		Clears the self-learning matrix.
Full reset		Resets the parameters settings to the global default values and clears the self-learning matrix and statistics. Elstat use only.
Data dump		Downloads data from the controller to a computer for analysis. Elstat use only.

3.4 The menu arrangement



Behind each of the sub-menu headings there is a list for further options:

- Selecting PS enters the parameter list, and from here parameters and their values can be viewed, checked and amended as required.
- Selecting t St - the test menu - allows the three test routines to be carried out. Unlike previous versions of the ems; it is now possible to simply carry out the test required - without having to perform all three.
- Selecting Hr - half re-set - will allow a half reset to be performed which will wipe the learning matrix, allowing the controller to re-learn outlet opening and closing times.

Note

The full reset is to be performed by Elstat personnel.
The data dump is for Elstat use only for testing and development purposes.

3.5 Menu access

To enter the controller's menus follow the routine below.

Step	Action		Display
1	Press the Set button		
2	The display shows:		
3	Enter the button sequence of the Main menu entry password		
4	Press the Set button four times (x 4)		
5	Press the Down button twice (x 2)		
6	Press the Up button once (x 1)		
7	Press the Defrost button twice (x 2)		
8	The display shows:		

3.6 Test routines (tSt)

The test routine tests the following:

- All load relays
- Analogue inputs (temperature sensors and door switch)
- Motion sensor

Should a problem be suspected with CMS100 Nexo controller it is recommended that the test routine is carried out before disconnecting or replacing the controller.

The test routine can detect any loose or disconnected cables and check that the controller is connected properly to the lights, fan and compressor.

3.6.1 Entering the test routine menu

Step	Action		Display
1	Press the Set button		
2	The display shows:		
3	Enter the appropriate password to access the menu.		
4	The display shows:		
5	Press the Down button to scroll to the test (tSt) menu		
6	The display shows:		
7	Press the Set button to enter the test routine		

Once in the test menu it is possible to select which test to use. Using the Up and Down buttons to scroll between tests, Set to select the test required and Defrost to return to the test menu.

3.6.2 The relay (rEL) test

The relay test is used to test the function of the relays within the controller and can also be used to diagnose problems with the cooler components - such as compressor and lights - before beginning work on the cooler.

Step	Action		Display
1	From the test section (tSt) of the main menu: Press the Set button to enter the test menu.		
2	The display shows:		
3	Press the Set button to select the relay test menu.		

Follow the routine below for Compressor:

Action	Button	Display	Test	Check
Press			Select compressor	
Press			Compressor relay engaged	Compressor is running and compressor LED is on
Press			Compressor relay disengaged	Compressor stopped running and compressor LED is off
Press		Press Defrost to return to the relay test menu.		

Follow the routine below for Light:

Action	Button	Display	Test	Check
Press			Light	
Press			Select light	
Press			Light relay engaged	Cooler lights are on
Press			Light relay disengaged	Cooler lights are off
Press		Press Defrost to return to the relay test menu.		

Follow the routine below for Fan:

Action	Button	Display	Test	Check
Press			Fan	
Press			Select fan	
Press			Fan relay engaged	Evaporator fan and the fan LED is on
Press			Fan relay disengaged	Evaporator fan and the fan LED is off
Press		Press Defrost to return to the relay test menu.		

Follow the routine below for Buzzer:

Action	Button	Display	Test	Check
Press			Buzzer	
Press			Select buzzer	
Press			Buzzer engaged	Buzzer sound is on
Press			Buzzer disengaged	Buzzer sound is off
Press		Press Defrost to return to the relay test menu.		

Follow the routine below for All outputs:

Action	Button	Display	Test	Check
Press			All outputs	
Press			Select all outputs	
Press			All outputs engaged	All outputs are on
Press			All outputs disengaged	All outputs are off
Press		Press Defrost to return to the relay test menu.		

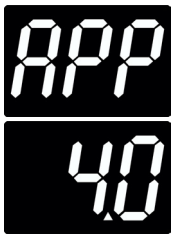
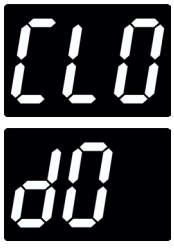
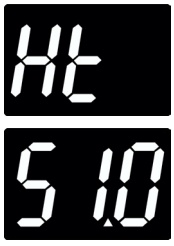
Note
All outputs should only be engaged by experienced service personnel and repeated switching should be avoided due to inrush currents.

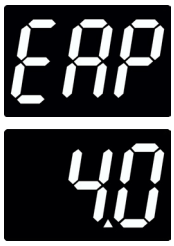
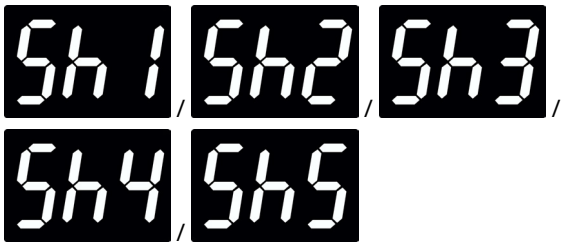
3.6.3 The analogue input (AnA) test

The analogue input test checks the connection between sensors and the controller are sound. Performing this test before starting work on the cooler can diagnose any loose connections or sensor probe faults.

Step	Action		Display
1	Press Defrost to return to the test menu		
2	From the test (tSt) menu: Press the Down button to scroll to the analogue input test.		
3	The display shows:		
4	Press the Set button to enter the analogue input test menu.		

Then follow the routine:

Action	Button	Display	Test	Check
			Appliance sensor input	
Press			Appliance sensor temperature	Displayed temperature is as expected
Press			Press Defrost to return to the analogue input test menu	
Press			Door switch	
Press			Door is open (dO) or closed (CLO) Opening and closing the door should make the display alternate between the two messages.	
Press			Press Defrost to return to the analogue input test menu	
Press			Condenser sensor input	
Press			Condenser sensor temperature	Displayed temperature is as expected
Press			Press Defrost to return to the analogue input test menu	

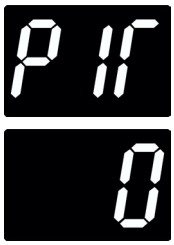
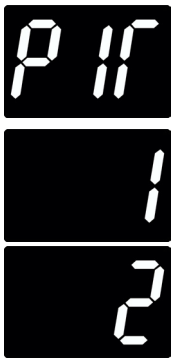
Action	Button	Display	Test	Check
Press			Evaporator sensor input	
Press			Evaporator sensor temperature	Displayed temperature is as expected
Press			Press Defrost to return to the analogue input test menu	
Press				For future use - Stock sensing hardware currently unavailable.

3.6.4 The motion sensor (PIr) test

The motion sensor test checks that the PIR (Passive Infra-red) sensor is picking up activity.

Step	Action		Display
1	Press Defrost to return to the analogue input test menu		
2	Press Defrost to return to the test menu		
3	From the test menu: Press the Down button to scroll to the PIR input test.		

Then follow the routine:

Action	Button	Display	Test	Check
Press			Press the Set button to enter the motion sensor test.	
			Place your hand about 300mm from the motion sensor	
			Move your hand from left to right. Check for the following:	
			The display count increments for each detected movement. The motion LED flashes for each detected movement.	
Press			Press the Defrost button to exit the test.	
Press			Press the Defrost button to return to the test menu.	

3.7 Viewing the last three cooler faults witnessed by the controller (FLt)

It is possible to view the last three faults and understand problems that have occurred with the cooler.

Step	Action		Display
1	Press the Set button		
2	The display shows:		
3	Enter the appropriate password to access the menu		
4	The display shows:		
5	Press the Down button and scroll to FLt		
6	The display shows:		
7	Press the Set button to select		
	The last three faults, or alarms, to occur are displayed. For example:		
	A condenser high temperature alarm has occurred		
	An appliance sensor alarm has occurred		
	A Condenser Sensor alarm has occurred		

Note

The alarms may have been cleared, or cancelled, by the retail outlet operators pressing the Down button.

3.8 Half reset (Hr)

Half resets are used to clear controller's self learning matrix in the event that the controller has learned incorrect opening times due to being unable to detect activity correctly.

The matrix may require clearing for reasons such as:

- The cooler has been moved from one store, to another - with different opening times
- The cooler has been prevented from learning due to an obstruction in front of the motion sensor
- The cooler is in saving mode when it is expected to be in ready mode
- The cooler does not appear to be going into the saving mode when expected

A half reset will not:

- Adjust, change or alter any of the parameters, or their values, as set by the OEMs or Brands.
- Fix any issues with cable connection

Step	Action		Display
1	Press the Set button.		
2	The displays shows:		
3	Enter the button sequence of the main menu entry password		
4	Press the Set button four times (x 4)		
5	Press the Down button twice (x 2)		
6	Press the Up button once (x 1)		
7	Press the Defrost button twice (x 2)		
8	The display shows:		
9	Press the Down button to scroll to the half re-set option:		
10	Press the set button to select the half reset option. The display will alternate between 'Hr' and 'nO'		 / 

Step	Action		Display
11	Press the Up button to change ‘nO’ to ‘yES’		
12	Press the set button to perform half reset		
	The controller should reset and begin the power-up sequence.		

3.9 Viewing statistics

Depending on the model, the controllers start gathering a variety of statistics when first powered up. Statistics provide information on the following, dependent on firmware:

- Activity: Number of motion counts and door openings.
- Compressor: Number of compressor cycles and total compressor runtime.
- Operation: Settings of the activity frequency (AF) parameter and the saving temperature disable (PEr) parameter.
- Temperature: Lowest and highest temperature measured on the appliance sensor in the past 24 hours.

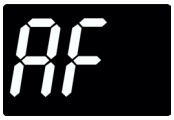
Note

A full reset clears all the gathered statistics.
Please see the following list which describes the statics available to view on your controller model.

To view the statistics, press the Up and Down buttons simultaneously. Statistics include door opening, compressor cycles and activity counts.

The controller then scrolls through the statistics pausing for 20 seconds at each statistic before returning to normal operation. The 3-digit display can show values from '0' to '999.'

For values of 1000 and above, the display shows the value as a rounded decimal number. For example, 1.1 represents 1100, 1.2 represents 1200, and so on.

Display	Statistic	Description
	Activity frequency	Value of the activity frequency AF parameter. Possible values are: 0, 1, 2 or 3. (0 = low, 2= high and 3 = automatic)
	Compressor cycles	Total number of compressor cycles since first powered up or last full reset
	Compressor runtime	Total number of hours that the compressor has run since the controller was first powered up or since the last full reset.
	Door openings	Total number of door openings since first powered up or last full reset
	Highest temperature	Highest temperature measured by the appliance sensor during the past 24 hours.

Display	Statistic	Description
	Lowest temperature	Lowest temperature measured by the appliance sensor during the last 24 hours.
	Motion counts	Total number of motion counts since first powered up or last full reset
	Saving temperature disable	Value of the standby temperature disable PEr parameter. Possible values are: OFF or ON. OFF = Saving temperature disable is switched off. ON = Saving temperature disable is switched on.

4. CONTROLLER ALARM OPERATIONS

The CMS100 Nexo controllers can be set to sound a buzzer with alarm conditions. The following table shows examples of alarms that could be displayed on an CMS100 Nexo controller.

Problem or Alarm	Meaning	Action
	Refrigeration system failure	Refer to Cooler & Controller Trouble Shooting Tips - Refrigeration system failure (rSF) alarms
	Condenser high temperature	Refer to Cooler & Controller Trouble Shooting Tips - Condenser high temperature (Ht) alarms
 	Sensor failures	Appliance sensor (PF1): Refer to Cooler & Controller Trouble Shooting Tips - Appliance Sensor Alarms. Condenser sensor (PF2): Refer to Cooler & Controller Trouble Shooting Tips – Condenser Sensor Alarms
Cooler lights do not switch on		Refer to Cooler & Controller Trouble Shooting Tips - Other Problems. Note: Controllers normally switch the cooler lights off in the Saving mode.

4.1 'Limp home' functionality

As the CMS100 Nexo acts as a diagnostic device, and manages various operational functions of the cooler it serves to prevent faults from becoming critical to the cooler, for example over working of the compressor.

The limp home functionality has been added to the CMS100 Nexo controller in order to allow time for the end user to contact a service engineer in the event of any such problems occurring, while preventing damage to major cooler components.

4.2 Door open alarms

The CMS100 Nexo controllers display d0 to show that the cooler door is open. However, if the cooler door remains open for the duration defined by alarm delay (Ad) parameter, an alarm buzzer sounds.

Then, if the cooler door is still open after the time defined by the buzzer duration (b1) parameter, the controller switches off the compressor and displays three horizontal bars, for the duration of RT.

Once RT has expired and SP+Dif have been exceeded the controller will enter door open limp home mode.

Door open alarms are triggered if the cooler door is left open for longer than the time defined by the alarm delay (Ad) parameter. If the door is closed, and a door open alarm is registered, this may indicate problems with the cooler door or the door switch.

4.3 Door alarms 'Limp home' mode

The limp home aspect of this alarm ensures that the cooler continues to operate with limited disruption to the end user while determining if the door switch or the door itself is at fault. The cooler will operate during this period, cooling the products, while a service engineer visit is scheduled.

The table below describes how the CMS100 Nexo controls the cooler during this time and what the end user will see:

The controller manages		Display	
1	Audio alarm sounds for the duration of the b1 (buzzer duration) parameter.		d0 is displayed for the duration of Ad (alarm delay) and b1 (buzzer duration) parameters
2	The compressor switches off.		
3	The RT compressor rest time parameter begins.		
4	In normal operation, if DIS parameter is set to 1, the controller display will alternate between		
	In normal operation, if DIS parameter is set to 0, the controller display will alternate between		
5	In saving mode the controller display will alternate between		
6	The compressor switches on when the SP (set point) and dIF (differential) are exceeded.		
7	The compressor runs for a maximum of twenty (20) minutes.		
8	The compressor switches off either; after twenty (20) minutes or when the appliance sensor temperature has dropped to SP (set point) - whichever happens first.		
9	The controller will repeat 3, 4, 5, 6, 7 and 8 for twenty (20) cycles or until a short circuit is seen on the door input.		

If set point is achieved within twenty (20) cycles the controller reverts to normal operation. If DIS parameter is set to 1 the controller alternately displays: d0/Temp. An audio alarm sounds for ten (10) seconds, every ten (10) minutes.	

If set point is achieved within twenty (20) cycles the controller reverts to normal operation. If DIS parameter is set to 0 the controller alternately displays: d0/USE. An audio alarm sounds for ten (10) seconds, every ten (10) minutes.	
If in Saving mode and set point is achieved within twenty (20) cycles the controller reverts to normal operation and alternately displays: d0/3Bars. An audio alarm sounds for ten (10) seconds, every ten (10) minutes.	

If set point is not achieved within twenty (20) cycles the compressor switches off and the controller displays 3BarStack: An audio alarm sounds continuously.	

4.4 Temperature sensor alarms

Elstat controllers manage sensor failures as follows:

- PF1 alarms: The controller will enter PF1 limp home mode.
- PF2 alarms: The controller will continue running the compressor. The display alternates between PF2 and the appliance sensor temperature indicating a fault.

Note: Sensor faults may also be identified by using the input test within the test routines (tSt).

4.5 Appliance sensor alarms

The limp home aspect of this alarm ensures that the cooler continues to operate with limited disruption to the end user. The cooler will operate, cooling the products, while a service engineer visit is scheduled. The table below describes how the CMS100 Nexo controls the cooler during this time and what the end user will see:

Audio alarm	Display
Audible alarm sounds five times every compressor cycle (compressor switches ON or OFF) - if the buzzer is enabled.	

While the controller displays the above, the controller is managing the compressor and the fans:

- The compressor cycles fifteen (15) minutes off, then five (5) minutes on.
- The fan switches on with the compressor on cycle, then cycles when the compressor is in the off cycle as set by the FCO (fan cycle on) and FCF (fan cycle off) parameters.

The controller will reboot when the PF1 fault is cleared or fixed.

4.6 Refrigeration system failure (rSF) alarms

The limp home aspect of this alarm ensures that the cooler continues to operate with limited disruption to the end user. The refrigeration system will operate - cooling the products - while a service engineer visit is scheduled.

The table below describes how the CMS100 Nexo controls the cooler during this time and what the end user will see:

Audio alarm	Display	
Audible alarm sounds for ten seconds every compressor cycle (compressor switches ON or OFF) - if the buzzer is enabled.		 In Ready mode
		 In Saving mode

While the controller displays the above, the controller is managing the compressor and the fans:

- The compressor cycles fifteen (15) minutes off, then five (5) minutes on.
- The fan switches on with the compressor on cycle, then cycles when the compressor is in the off cycle as set by the FCO (fan cycle on) and FCF (fan cycle off) parameters.

The fault clears and normal operation resumes when one of the following occurs:

- The appliance sensor temperature reaches SP (set point)
- The power is cycled to the controller - restarting the Ct (refrigeration system failure) timer once the compressor switches on.
- The Down button is pressed.

5. COOLER AND CONTROLLER TROUBLESHOOTING TIPS

5.1 RSF Alarms

Refrigeration system failure (rSF) alarms trigger if the set point (SP) temperature is not reached within the time defined by the compressor runtime (Ct) parameter.

The controller has detected a problem with the cooling system, please check:

- Electrical connection from the output of the controller to the compressor
- Compressor circuit failure (including fuse protection if fitted)
- Adequate airflow through condenser – Condenser grill is free from obstructions
- Condenser fan operation
- If there is Refrigeration System leakage

5.2 Door Switch Broken Alarms

The controller has detected a problem with the door switch input, please check:

- The door of the cooler is fully closed and able to be fully closed after each opening
- The door switch is properly connected to the door switch input on the controller
- The door switch is in working order – The door switch should read short circuit when a magnet is placed next to the door switch.
- The door switch input on the controller is in working order – The controller should only register door open (do) when an open circuit is seen on the door switch input

5.3 Door Broken Alarms

The controller has detected a problem with the door, please check:

- The door of the cooler is fully closed and able to be fully closed after each opening
- The door switch is properly connected to the door switch input on the controller
- The door switch is in working order – The door switch should read short circuit when a magnet is placed next to the door switch.
- The door switch input on the controller is in working order – The controller should only register door open (do) when an open circuit is seen on the door switch input

5.4 Appliance Sensor Alarms

The controller has detected an open circuit on the appliance input, please check:

- The appliance sensor is properly connected to the appliance input on the controller
- The appliance sensor is reading the correct temperature – Temperature versus resistance: Thermistor is Negative Temperature Coefficient (NTC)
- The appliance input on the controller is in working order – The controller should not register a PF1 alarm when a known working appliance sensor is connected

5.5 Condenser Sensor Alarms

The controller has detected an open circuit on the condenser input, please check:

- The condenser sensor is properly connected to the condenser input on the controller
- The condenser sensor is reading the correct temperature – Temperature versus resistance: Thermistor is Negative Temperature Coefficient (NTC)
- The condenser input on the controller is in working order – The controller should not register a PF2 alarm when a known working condenser sensor is connected

5.6 Freeze-up protection (888)

Problems with freeze-up protection may occur if the ambient temperature falls below 0°C (32°F) or if the appliance sensor fails.

The controller has detected a below nominal temperature for the cabinet, please check:

- The appliance sensor is properly connected to the appliance input on the controller
- The correct positioning of the appliance sensor
- An adequate DTT parameter setting has been selected (when taking into account the cabinets temperature settings)
- The appliance sensor is reading the correct temperature – Temperature versus resistance: Thermistor is Negative Temperature Coefficient (NTC)
- The appliance input on the controller is in working order – The controller should register a PF1 alarm when the appliance sensor is not connected

5.7 Condenser high temperature (Ht) alarms

Condenser high temperature (Ht) alarms alert to problems with the refrigeration system such as a blocked condenser or faulty condenser fan.

The controller has detected an above nominal temperature for the condenser, please check:

- Adequate airflow through condenser – Condenser grill is free from obstructions
- Condenser fan operation
- Evaporator for excessive freeze up
- An adequate HT parameter setting has been selected (when taking into account the ambient temperature)
- If there is Refrigeration System leakage

5.8 Other Problems

5.8.1 Cooler lights do not switch ON/OFF as expected

Note: Enter the service mode via the APP or the In-code test routine via the front panel of controller to ensure that the controllers intended operation is not affecting the result.

- Ensure electrical connection from the output of the controller to the lights
- If applicable - Ensure the physical switch for the lights is switched ON.
- If applicable - Ensure the physical light switch is in working order.
- If L.E.D lighting - Ensure the power supply (transformer) is in working order.
- If fluorescent lighting – Ensure the bulb is in working order.
- If fluorescent lighting - Ensure the ballast is in working order.
- If fluorescent lighting - Ensure the starter is in working order.

5.8.2 Evaporator fan does not switch ON/OFF as expected

Note: Enter the service mode via the APP or the In-code test routine via the front panel of controller (if applicable) to ensure that the controllers intended operation is not affecting the result.

- Ensure electrical connection from the output of the controller to the evaporator fan
- Ensure the fan motor is in working order (including fuse protection if fitted)
- Ensure the fan blades are free from obstruction
- Ensure the evaporator fan belt is not loose and/or worn out

5.8.3 The compressor does not switch ON/OFF as expected

Note: Enter the service mode via the APP or the In-code test routine via the front panel of controller (if applicable) to ensure that the controllers intended operation is not affecting the result.

- Ensure electrical connection from the output of the controller to the compressor
- Ensure the compressor circuit is in working order (including fuse protection if fitted)
- If thermal overload cut out protection is present - Allow the compressor time to cool off and reset the thermal overload protection (if applicable)

5.8.4 If the compressor has failed

The vast majority of all compressor failures are due to a problem with the system, that causes the compressor to fail. If you don't find this problem with the system and correct it, a replacement compressor would also soon fail.

Some of the most common contributors to compressor failure are:

- Dirty Evaporator or Condenser
- Loose Evaporator Fan Belts
- Improper Refrigerant Charge

6. PARAMETERS

Operation parameters define the alarms, self-learning, lights management, and also the delay to saving and the saving temperature disable. The parameter values vary between different cooler types, cooler characteristics, operating environments, brand requirements, and operational preferences.

Parameter settings are defined by customers and can be loaded and edited automatically, via the XML files, or manually.

This section lists the full set of parameters relevant to the CMS100 controller, with their descriptions, ranges and default values detailed for reference.

Firmware: Glass Door Cooler

6.1 Parameters by function

Temperature	Celsius or Fahrenheit (CF) Set point (SP) and Differential (dIF) Saving set point (SSP), Saving differential (Sd) and Saving temperature disable (PEr) Appliance sensor: calibration 1 (CA1)
Operation	Saving restart (Sr) Delay to saving mode (dS) Freeze-up protection (dtt) Compressor rest time (rt)
Defrost	Defrost interval (dE) and Defrost duration (dd) Defrost termination temperature (dtd) Uninterrupted pull down (IPd)
Self-learning	Learning period (LP) and activity frequency (AF)
Display	Display (dIS) and Display stability (d2)
Lights	Light delay (Ld) and Marketing mode (Ar)
Evaporator fan	Fan set point (FSP) Fan cycle on (FCO) and Fan cycle off (FCF)
Alarms	Alarm delay (Ad) Buzzer enable (b0) and Buzzer duration (b1) Refrigeration system failure (Ct) Condenser high temperature (Ht)
Voltage management	Supply high (HI) Supply low (L0)
Stock sensing	Shelf data enable (ShF)

6.2 Parameter validation

The CMS100 Nexo 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:

1. SP must be > dtt
2. SSP must be > SP
3. IPD must be > (SSP + Sd)
4. IPd must be > dtd
5. dtd must be > (SP + dIF)

If any of these rules are broken a warning will be shown on the display, in the form of the two clashing parameters and three beeps of the buzzer.

The controller will display the clashing parameters when the back button is pressed (just before “byE” is displayed and the controller reboots) when exiting the parameter listings.

The controller will only display one broken rule at a time even if all rules are broken.

Priority order as above.

6.3 Parameters definition

6.3.1 Set point (SP)

Display	
Description	Defines the compressor cut-out temperature during the Ready mode. The set point (SP) temperature is the lowest measured temperature under normal operating conditions.
Considerations	Must be above the freeze-up protection (dtt) temperature.
Range	-9.9 to 9.9°C (14 to 50°F)
Global default	3.0°C (37°F)

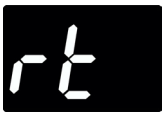
6.3.2 Differential (dIF)

Display	
Description	Defines the compressor cut-in temperature when added to the set point (SP) temperature during the Ready mode.
Considerations	If the differential (dIF) is set too low, for example, less than 2.0°C the compressor may cycle on the minimum compressor rest time (rt).
Range	0.0 to 9.9°C (0 to 18°F)
Global default	4.0°C (7°F)

6.3.3 Calibration 1 (CA1)

Display	
Description	Calibrates or adds an offset to temperatures measured by the appliance sensor.
Considerations	Applied to all temperatures measured on the appliance sensor.
Range	-4.0 to 4.0°C (-7 to 7°F)
Global default	0.0°C (0°F)

6.3.4 Compressor rest time (rt)

Display	
Description	Defines the minimum time between compressor cycles. The compressor rest time ensures that the pressures in the refrigeration system have time to equalize during compressor off-cycles. The compressor rest time (rt) helps to avoid the following: • passing peak current through the windings of the compressor motor • switching off the system on the thermal overload protection • short cycling of the system.
Considerations	If set too low, the compressor rest time may cycle on the set point (SP) and differential (dIF) temperatures or the saving set point (SSP) and saving differential (Sd) temperatures.
Range	1 to 30 minutes
Global default	3 minutes

6.3.5 Delay to saving (dS)

Display	
Description	Defines the delay in switching to the Saving mode from Ready mode. The delay starts at the end of the last active 30 minute period of the Ready mode.
Considerations	Set in multiples of 30 minutes.
Range	0 to 120 minutes (in multiples of 30 minutes)
Global default	0 (no delay)

6.3.6 Lights delay (Ld)

Display	
Description	Defines the delay to switch off the cooler lights after the controller switches to the Saving mode.
Considerations	Set in multiples of 30. Should only take affect once Delay to saving (dS) has completed.
Range	0 to 120 minutes
Global default	0 (no delay)

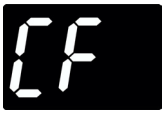
6.3.7 Saving restart period (Sr)

Display	
Description	Cooler runs at the ready mode temperatures for the duration of this period to ensure that the product is at the ready mode temperatures prior to retail outlet opening time.
Considerations	• Set and verified by OEMs through the test protocol to ensure that product temperatures are within specification when outlets open. • Set in multiples of 30 minutes.
Range	0 to 240 minutes (in multiples of 30 minutes)
Global default	120 minutes

6.3.8 Refrigeration system failure (Ct)

Display	
Description	Defines the maximum continuous runtime of the compressor without reaching the set point (SP) temperature. If the set point (SP) temperature is not reached within this time, the controller enters the RSF Limp home mode.
Considerations	None
Range	0 to 100 hours
Global default	72 hours

6.3.9 Celsius or Fahrenheit (CF)

Display	
Description	Option to set the EMS controller to Celsius (°C) or Fahrenheit (°F).
Considerations	• A global reset sets EMS controllers using Fahrenheit (°F) to Celsius (°C). • Applies to all temperature settings and values.
Range	0 (°C) or 1 (°F)
Global default	0 (°C)

6.3.10 Saving differential (Sd)

Display	
Description	Defines the compressor cut-in temperature, when added to the saving set point (SSP) temperature, during the Saving mode.
Considerations	If the saving differential (Sd) is set too low, for example less than 2.0°C, the compressor may cycle on the minimum compressor rest time (rt).
Range	0.0 to 9.9°C (0 to 18°F)
Global default	4.0°C (7°F)

6.3.11 Saving set point (SSP)

Display	
Description	Defines the compressor cut-out temperature during the Saving mode.
Considerations	Must be set above the set point (SP).
Range	0.0 to 9.9°C (32 to 50°F)
Global default	7.0°C (45°F)

6.3.12 Uninterrupted pull down (IPd)

Display	
Description	Defines the temperature that if exceeded starts an uninterrupted pull down, i.e. the controller switches on the compressor and runs the compressor continuously until the product reaches the set point (SP) temperature. During this time, defrost cycles do not occur.
Considerations	Must be set as follows: • Above the saving set point (SSP) plus saving differential (Sd) temperature. • Above the defrost termination (dtd) temperature. • Not used on Sub-Zero version
Range	0.0 to 60ºC (32 to 140ºF)
Global default	20ºC (68ºF)

6.3.13 Freeze-up protection (dtt)

Display	
Description	Defines the temperature to stop further cooling to prevent freeze-up due to low temperature.
Considerations	Must be set below the set point (SP) temperature.
Range	-10 to 10ºC (14 to 50ºF)
Global default	0.0ºC (32ºF)

6.3.14 Defrost interval (dE)

Display	
Description	Defines the period between the end of defrost cycle and beginning of the next defrost cycle. A time-based defrost cycle helps improve evaporator efficiency.
Considerations	In the event of power loss, the defrost interval (dE) is not maintained. The defrost interval is reset. If icing up occurs, review the values of the defrost parameters.
Range	0 to 199 hours
Global default	6 hours

6.3.15 Defrost duration (dd)

Display	
Description	Defines the maximum time of a defrost cycle.
Considerations	If icing up occurs, review the values of the defrost parameters.
Range	1 to 199 minutes
Global default	15 minutes

6.3.16 Fan cycle on (FCO)

Display	
Description	Defines the active period of the evaporator fan while the compressor is switched off.
Considerations	Fan cycle is the fan cycle on (FCO) time + the fan cycle off (FCF) time.
Range	1 to 30 minutes
Global default	30 minutes

6.3.17 Fan cycle off (FCF)

Display	
Description	Defines the inactive period of the evaporator fan while the compressor is switched off.
Considerations	Fan cycle is the fan cycle on (FCO) time + the fan cycle off (FCF) time.
Range	0 to 30 minutes
Global default	1 minute

6.3.18 Alarm delay (Ad)

Display	
Description	Defines the maximum time the cooler door can be open before sounding the alarm buzzer.
Considerations	If disabled, the door switch is also disabled - if so the controller does not detect door openings therefore, it does not: • Update the self-learning matrix for door activity. • Manage the evaporator fan for door activity. • Sound door alarms if the door is left open.
Range	0 to 30 minutes
Global default	0 (disabled)

6.3.19 Buzzer duration (b1)

Display	
Description	Defines the duration of the buzzer for door open alarm conditions. If the door remains open after the buzzer duration (b1), the controller switches off the compressor for the duration of RT before starting door open limp home mode.
Considerations	The controller switches off the compressor after the duration defined by alarm delay (Ad) + buzzer duration (b1).
Range	1 to 254 seconds
Global default	60 seconds

6.3.20 Motion sensor enable (Sn)

Display	
Description	Enables the input from the motion sensor.
Considerations	Must be disabled if a motion sensor is not fitted.
Range	0 (disabled) or 1 (enabled)
Global default	1 (enabled)

6.3.21 Display stability (d2)

Display	
Description	Defines the rate of change of the displayed temperature. Limiting the rate of change provides a dampening effect so as not to concern users should the air temperature rise quickly due to a door opening. Increasing the value for the display stability (d2) slows the rate of change of the displayed temperature.
Considerations	Use the global default value for normal operation.
Range	1 to 254
Global default	46

6.3.22 Low voltage (LO)

Display	
Description	Defines the minimum voltage allowed before switching off the compressor. The low voltage (LO) values are 10% of the actual line in voltages (see table below).
Considerations	• Must not be used with an external voltage stabiliser • Must only be used with an Elstat supplied transformer
Global default	0 (disabled)

110-120V line		220-240V line	
voltage	**LO**	**voltage**	**LO**
Disabled	0	170	17
80	8	180	18
90	9	190	19
100	10	200	20
110	11	210	21

Note: Voltage measurement is accurate to ± 10%

Caution
Low voltage protection is not calibrated and actual performance can be influenced by several factors. Therefore, total protection cannot be guaranteed.

6.3.23 High voltage (HI)

Display	
Description	Defines the maximum voltage allowed before switching off the compressor. The high voltage (HI) values are 10% of the actual line in voltages (see table below).
Considerations	• Must not be used with an external voltage stabiliser • Must only be used with an Elstat supplied transformer
Global default	0 (disabled)

110-120V line		220-240V line	
voltage	**HI**	**voltage**	**HI**
Disabled	0	220	22
120	12	230	23
130	13	240	24
140	14	250	25
		260	26
		270	27

Note: Voltage measurement is accurate to ± 10%

Caution
High voltage protection is not calibrated and actual performance can be influenced by several factors. Therefore, total protection cannot be guaranteed.

6.3.24 Defrost termination temperature (dtd)

Display	
Description	Defines the temperature to end the defrost cycle. Ending defrost cycles on temperature minimizes the duration of defrost cycles.
Considerations	• Must be set above the set point (SP) plus differential (dIF) temperature. • Must be set below IPd. • If icing up occurs, review the values of the defrost parameters.
Range	1 to 30°C (34 to 86°F)
Global default	10.0°C (50°F)

6.3.25 Condenser high temperature (Ht)

Display	
Description	Defines the maximum temperature measured in the refrigeration system by monitoring the condenser sensor. On reaching the condenser high temperature (Ht), the controller disables the compressor and activates an alarm.
Considerations	• Is not used with CO2 (R744) coolers. • Requires a condenser sensor. • To set the condenser high temperature (Ht), measure the refrigeration system temperature when the condenser is 75% blocked. • To disable, set below 50°C or 122°F.
Range	0.0 to 125°C (32 to 257°F)
Global default	0°C (32°F) - disabled.

6.3.26 Activity frequency (AF)

Display	
Description	Defines the minimum number of door openings or motion counts to indicate an active 30 minute period in the self-learning matrix, as described below.
Considerations	See below.
Range	See below.
Global default	0 (low frequency)

The table below describes the values for activity frequency (AF).

Value	Name	Description
00	Low frequency	1 door opening or 1 motion count
01	Medium frequency	1 door opening or 3 motion counts
02	High frequency	2 door openings or 6 motion counts
03	Automatic	The controller runs continuously for 48 hours in the ready mode. After 48 hours, the controller sets the value of the activity frequency to 0, 1, or 2.

Note

If AF is set to 3, the controller must run continuously for 48 hours to set the value of the activity frequency. If power is lost during the 48 hour period, the controller restarts the 48 hour period.
The controller must complete the 48 hour period to determine the activity frequency before starting the 1-day or 7-day learning period.

6.3.27 Fan set point (FSP)

Display	
Description	Prevents excessive condensation on the evaporator in environments where warm, and presumed humid, air is present by operating the evaporator fan. If the fan set point (FSP) temperature is exceeded, the evaporator fan runs continuously even if the door is opened. On reaching set point (SP) temperature the evaporator fan resumes normal operation and so switches off during door openings.
Considerations	Not related to fan cycle on (FCO) or fan cycle off (FCF).
Range	1 to 60°C (34 to 140°F)
Global default	15°C (59°F)

6.3.28 Buzzer enable (b0)

Display	
Description	Enables or disables a warning buzzer for alarm conditions. Door open alarms always sound the warning buzzer regardless of this parameter setting.
Considerations	Following alarm conditions trigger the buzzer: Refrigeration system failure (rSF) Sensor failure (PF1, PF2). Ht alarms Door alarms sound the buzzer as standard.
Range	0 (disabled) or 1 (enabled)
Global default	1 (enabled)

6.3.29 Saving temperature disable (PEr)

Display	
Description	Disables the saving mode temperatures so that the controller maintains the Ready mode temperatures at all times. Disabling the Saving mode temperatures does not affect the light functionality.
Considerations	None
Range	0 (off) or 1 (on)
Global default	0 (off)

6.3.30 Learning period (LP)

Display	
Description	Defines whether the controller uses a 1-day or a 7-day learning period.
Considerations	None
Range	0 (1 day) or 1 (7 days)
Global default	0 (1 day)

6.3.31 Display (dIS)

Display	
Description	Defines whether the controller displays the temperature (3.0 for example), or the word USE during the Ready mode.
Considerations	EMS Controllers will always display alarms regardless of the dIS setting.
Range	0 (USE) or 1 (temperature)
Global default	1 (temperature)

6.3.32 Marketing mode (Ar)

Display	
Description	Sets the cooler lights to remain on at all times for display purposes. The coolers lights will remain on during saving mode.
Considerations	Does not affect saving temperature.
Range	0 (off) or 1 (on)
Global default	0 (off)

6.3.33 Shelf data enable (ShF)

Display	
Description	Option to allow the Nexo controller to log stock sensing data to be sent to the cloud.
Considerations	Input will still be operational when viewed via the test routine (tSt). Stock sensing hardware currently unavailable.
Range	0 (disabled) to 1 (enabled)
Global default	0 (disabled)

7. APPROVALS

7.1 Product Approvals

Conformité Européene / European Conformity (CE)	
CE	EN60730-1 EN60730-2-9
European Norms Electrical Certification (ENEC)	
ENEC 15	EN60730-1 EN60730-2-9
International Electrotechnical Commission (IEC)	
IEC	IEC60730-1 IEC60730-2-9 Glow wire: IEC60335-1
North America (including Canada) - UL mark (Component Recognition)	
c UL us	UL60730-1 / CSA E60730-1 UL60730-2-9 / CSA E60730-2-9
Federal Communications Commission (FCC)	
FC	FCC Part 15.107 & 15.109
Electromagnetic Compatibility (EMC)	
EMC	EN55014-1, EN55014-2 EN61000-6-1, EN61000-6-3, EN61000-3-2, EN61000-3-3
European Telecommunications Standards Institute (ETSI)	
ETSI	EN301 489-1

7.2 Bluetooth Approvals

Agência Nacional de Telecomunicações (ANATEL)	
ANATEL	Resolução Anatel nº 242 * See note below
Bluetooth Special Interest Group (SIG)	
Bluetooth SPECIAL INTEREST GROUP	Bluetooth ® Qualified Design
La Comisión Nacional de Comunicaciones (CNC)	
CNC	Resolución SC 729/80 - Resolución SC 784/87
European Telecommunications Standards Institute (ETSI)	
ETSI	EN300 328 V1.8.1
Federal Communications Commission (FCC)	
FC	Part 15C
Instituto Federal de Telecomunicaciones (IFETEL)	
ift	NOM-121-SCT1-2009
IC (Industry Canada)	
Industry Canada Industrie Canada	RSS-GEN, RSS-102, RSS-247

*** Note**

Elstat Bluetooth Module

This product is approved by ANATEL, according to the procedures regulated by Resolution 242/2000, and meets applied technical requirements.

For more information, see the ANATEL site www.anatel.gov.br

8. GLOSSARY OF TERMS

8.1 Acronyms

The table below explains the meanings of the most common acronyms used in this manual.

Acronym	Meaning	
ems or EMS	Energy Management System	The Elstat range of products in this group are all energy management systems.
XML	Extensible Mark-up Language	XMLs are used by Elstat to transfer parameter sets to EMS controllers. The XMLs (parameter sets) determine how a controller will operate.
SELV	Safety Extra Low Voltage	IEC defines a SELV system as “an electrical system in which the voltage cannot exceed ELV under normal conditions, and under single- fault conditions, including earth faults in other circuits”. Safety Extra Low Voltage as described in BS EN 60335 Household and similar electrical appliances - Safety standards.
IEC	International Electrotechnical Commission	Publisher of international standards for all electrical, electronic and related technologies.
IP	Ingress Protection	A protection rating achieved by the controller preventing intrusion and water into the housing of the controller.

8.2 Controller and accessory terms

The table below describes the meanings of some of the terms used frequently within the manual in relation to the controller and accessories.

Term	Meaning
Ready mode	The cooler is operational and cooling products to the set point.
Saving mode	The cooler is saving energy and cooling products to the saving set point.
Appliance sensor	A sensor which measures the temperature inside the cooler cabinet to give an approximation of the product temperature inside.
Self-learning	How the EMS learns ready and saving periods.
Matrix	The matrix is populated according to activity levels and the EMS manages the cooling system accordingly.
microRMD	A remote motion detector (sensor) supplied with controllers which do not have an integrated motion detector. The microRMD can be fitted anywhere it can detect motion allowing the controller to be installed out of sight.
Firmware	The code written into the EMS micro-controller containing the rules and algorithms of operation. Every controller contains firmware and the version of firmware is identified during power up by two, three digit numbers.
Checksum	The checksum is a ‘sum’ which identifies which parameter set - or XML file - has been loaded onto a controller. It is unique to each parameter set.

CMS100

Product Manual

Installation & set up guide

Accessories

User guide

Troubleshooting

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