



## Product overview

The AX-CN-MAXP is a compact and cost effective solution for control of package units. The unit responds to 3 analogue inputs to control up to 4 compressors, a VFD drive for pressure control, a power regulator for temperature control and a humidifier. The AX-CN-MAXP accepts up to six temperature sensor inputs for monitoring cooling coils, automatically turning the compressors off on detection of frost. The unit also includes an alarm output for no air flow and a general alarm output.

## Features

- 2 analogue outputs for VFD and Power Regulator
- 4 Compressor, 1 Humidifier and 2 alarm relay outputs
- 3 analogue inputs (Pressure, RH & T)
- Adjustable proportional bands
- Pre-start on compressor outputs
- Din rail mounted

## Product specifications

Operating Voltage:		24Vac 50/60Hz $\pm 15\%$ or 24Vdc $\pm 15\%$ at 200mA maximum
Inputs:	Duct Pressure	0-10Vdc scaled for 0-500Pa
	RH	0-10Vdc scaled for 0-100%RH
	Temperature	0-10Vdc scaled for 0-70°C
	Airflow	Volt-free contact
	Frost sensors	Up to 6 AX-TE-FT flying lead sensors
	Outputs:	Compressor 1-4
Humidifier		1 off normally open contact 10A (Resistive), 250Vac
Common		Common terminal for compressor & humidifier outputs 10A max
VFD		0-10Vdc proportional and integral pressure control, 5mA max

## Order codes

AX-CN-MAXP    Package unit controller

## Product specifications

Outputs continued:	Heater	0-10Vdc proportional heating control, 5mA max
	24V supply	Supply out for Pressure, RH&T and Heater connections, 2A max
	Airflow alarm	1 off normally open contact 10A (Resistive), 250Vac
	General alarm	1 off normally open contact 10A (Resistive), 250Vac
LCD Display:		2 line 16 digit LCD with timed backlight
Setting ranges / defaults		See table
Wiring:		Push-on 2-part connectors with rising clamp screw terminals for 0.5-2.5mm <sup>2</sup> cable
Dimensions:		155 x 106 x 60 mm
Operating environment:		0-40°C, 5-95% RH (non-condensing)
Country of Origin:		United Kingdom

## Datasheet contents

Every effort has been taken in the production of this data sheet to ensure accuracy. Annicom do not accept responsibility for any damage, expense, injury, loss or consequential loss resulting from any errors or omissions. Annicom has a policy of continuous improvement and reserves the right to change this specification without notice.

## Installation

The AX-CN-MAXP should be installed by a suitably qualified technician in conjunction with any guidelines for the equipment it is to be connected to and any local regulations. Field wiring should be installed to satisfy the requirements set out by the manufacturer of the equipment that the module is being connected to.

## Supply Current Limitations

The 24V supply should be protected with a 2 amp fuse to protect the output supply connections.

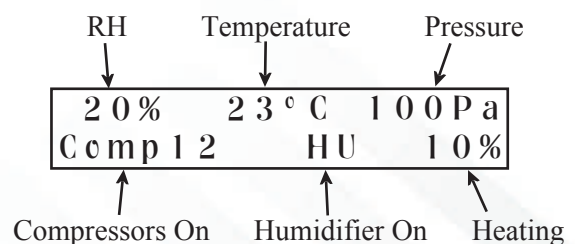
The combined current on the common pin for the compressors and humidifier outputs should not exceed 10 amps.

## Operation

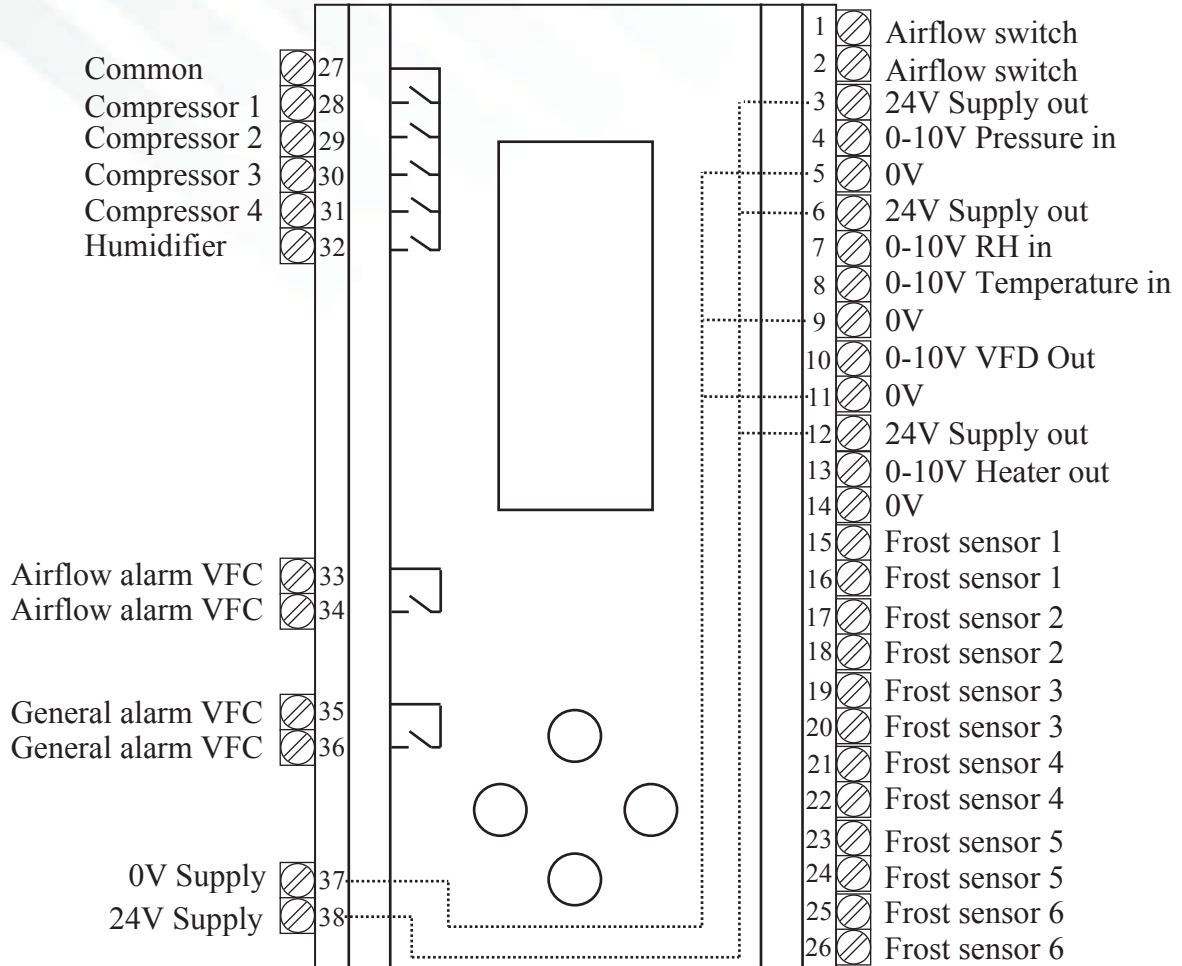
The AX-CN-MAXP is intended to control temperature, humidity and air pressure. The unit has 0-10V inputs for humidity, temperature and pressure sensors along with six frost sensor inputs and an airflow switch input. In response to the input values the unit can switch 2, 3 or 4 compressors, one humidifier, and provides analogue outputs for proportional heating and proportional and integral fan speed output for pressure control. The compressor switching can be set for linear or cyclic operation and includes a timed rotation option. Detailed AX-CN-MAXP operation and settings are described below.

## Display

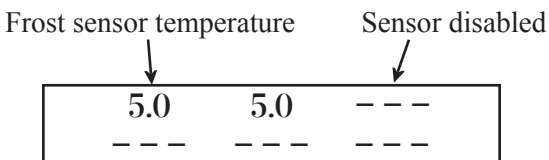
Controller information is displayed on a 16 character by 2 line LCD display, including all the controller input and output values and option menus. The main display, below, shows humidity, temperature and air pressure with active



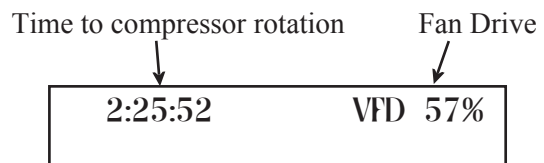
## Connections



compressors, humidifier state and percentage heating output. Two auxiliary displays show either the six frost sensor temperature values or compressor rotation time, if compressor rotation selected, and percentage fan speed output.



Aux display when INC key pressed



Aux display when DEC key pressed

## Control actions

The AX-CN-MAXP has four control actions:

- Compressor control
- Humidifier control
- Heating control
- Pressure control

## Control Inputs

The 0-10V analogue inputs are scaled as shown below

Humidity 0 to 100 % RH

Temperature 0 to 70°C

Pressure 0 to 500 Pascal

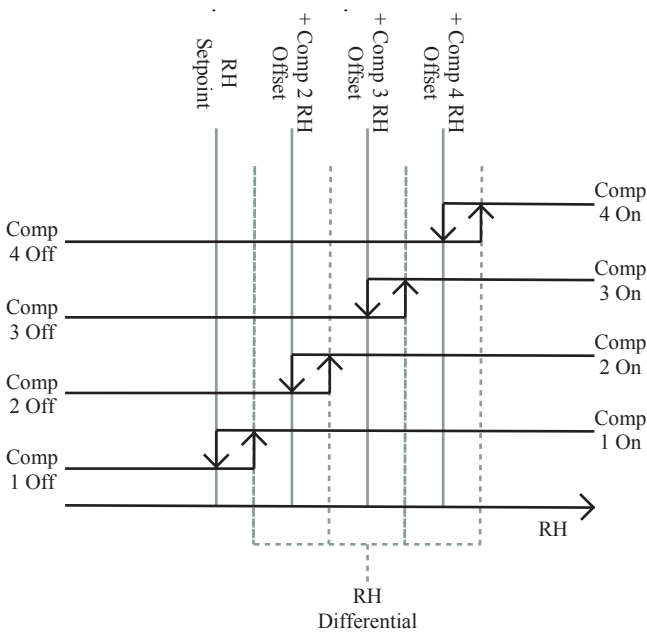
## Compressor control

Staged control of 2 to 4 compressors switched around RH setpoints, temperature setpoints and override time limits with linear or cyclic stage switching. Demand delays and stage delays are also included with a power on delay to provide compressor warm up time. The cyclic output mode includes a rotate action to continuously switch the in use compressors at set time intervals.

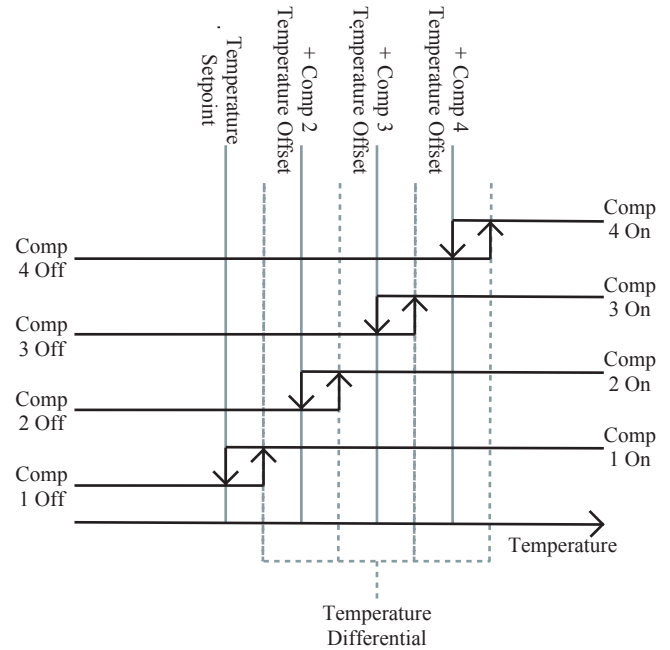
## Power On, demand and stage delays

After power has been turned on no compressor switching will be carried out until the Power On Delay time has expired. No control action is taken until the switching point is exceeded for the Demand delay time. Once a compressor has switched a second compressor switching, on or off, will not occur until the stage delay time has expired.

## Compressor switching



The compressor switching actions are shown opposite and below. A combined image is shown on the next page. Compressor 1 will be off when both the RH and Temperature values are equal to or below their setpoint.



Compressor 1 switches on when any setpoints is exceeded by the relevant differential value.

Compressor 2, 3 and 4 control actions are the same except their switching points are shifted by their offset values.

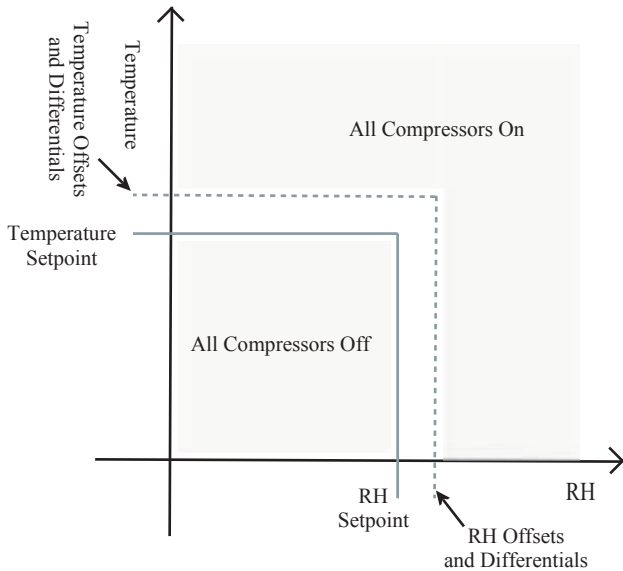
## Compressor timed override

Only valid if the Compressor Override On Delay is enabled. If the control value does not reduce after a compressor has been switched, on or off, and the control value remains at the same level for longer than the compressor override time the next compressor will switch on. This will continue until all the compressors are on. When the control value returns to the setpoint the overridden compressors will be switched off one every Compressor Override Off Delay period.

## Compressor control

The compressors can be switched in a linear sequenced or a cyclic sequence.





Combined RH and Temperature compressor switching

## Linear compressor switching

Compressor 1 is always switched on first followed by 2, 3 and 4. The compressors are switched off in the reverse order.

## Cyclic compressor switching

After power on, when required, compressor 1 is switched on first followed by 2, 3 and 4. The compressors are switched off in the same order as switching on, 1 first followed by 2, 3 then 4. Eg. if, after power on, only compressors 1 and 2 are switched on and off the next compressor to switch on will be compressor 3.

## Compressor Rotation

This is only valid when Cyclic compressor switching is selected. When enabled the compressor rotation option will switch off the compressor that has been on for the longest if no compressor switching has occurred for the Compressor Rotation Time. The next compressor will then switch on. No rotation will occur if all available compressors are on or all compressors are off.

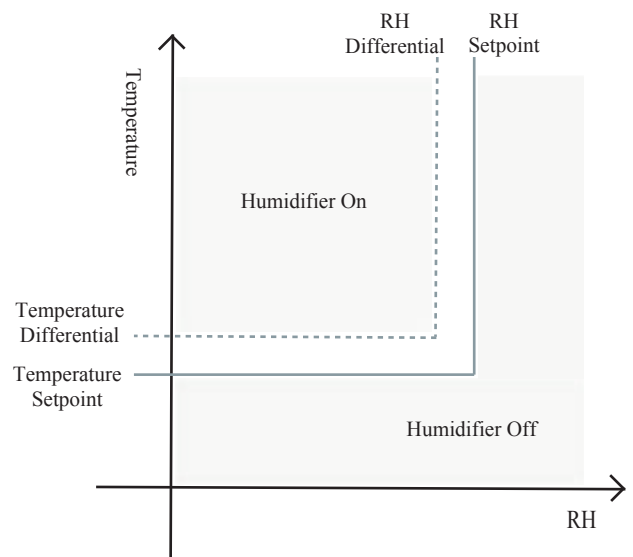
## Frost Sensors (Cooling coil)

The cooling coil can be monitored by up to six temperature sensors. The number of sensors is set with the Frost Sensor Count option. The in use sensors starts with Frost Sensor

1, eg. for a Frost Sensor Count of 3 Frost Sensors 1, 2 and 3 would be used. When the lowest sensor temperature is equal to or less than the Frost Alarm value the compressors are switched off and the general alarm relay contact is closed, a frost warning message is shown on the display. The in use sensors are monitored for open and short circuit conditions. In such an event the compressors are switched off and the general alarm is set when a fault is detected and a frost sensor fault message is shown on the display. When the main display is shown the INC switch can be pressed to show the frost sensor values, these are limited to a temperature range of -5,0 to 15.0°C, any value beyond this is shown as HI or LO. Unused sensors are shown as - - - and sensor faults are shown as O/C for open circuit and S/C for short circuit faults.

## Humidifier control

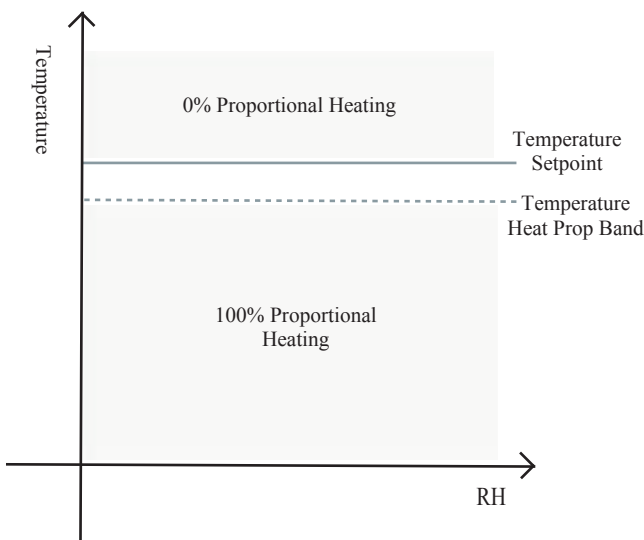
The humidifier is switched around RH and temperature setpoints and differentials as shown below. When the temperature is equal to or less than the temperature setpoint or the humidity is equal to or greater than the RH setpoint then the humidifier will be off. When the temperature is greater than the temperature setpoint plus temperature differential and the humidity is less than the RH setpoint minus RH differential the humidifier will be on.



A frost condition, frost sensor fault or airflow alarm will inhibit the humidifier.

## Heating

The heating output is controlled by the Temperature setpoint and the Temperature heating proportional band. If the temperature is equal to or above the Temperature setpoint the heating output will be 0% (0V). As the temperature falls below the Temperature setpoint the heating output will increase in line with the proportional



band. The heating output is shown on the bottom of the diagram, 0 to 100% equating to 0 to 10V.

## Air Pressure Control

The AX-CN-MAXP monitors the air pressure and provides proportional and integral control actions to maintain the air pressure at the pressure setpoint.

## Air Flow Action and Alarm

The unit has a single air flow switch input. If required several switches can be connected in parallel. The input should be connected to a closed contact to indicate air flow. When there is no airflow the contact should open. The unit will then switch off the compressors, humidifier and heating. The air flow alarm relay contacts will also go open. When the air flow restarts normal operation will resume and the airflow alarm contacts will close.

## Alarms

The unit has two alarm outputs, a general alarm and an air flow alarm. The alarm relay contacts are closed when no alarm conditions exist and open when an alarm condition exists.

## General Alarm conditions

The following will cause the general alarm relay contacts to open

- No power
- Sensor fault
- Cooling coil frosting
- Self test failure

## Air Flow Alarm conditions

The following will cause the air flow alarm relay contacts to open

- No power
- No air flow

## Options Menu and Descriptions

All of the AX-CN-MAXP settings can be checked and adjusted using the Options menu. Press the MENU button to step through the options shown below. Press the ESC button at any time to return to the main display, any value that has been changed will remain at the new value. To change a value press the INC or DEC button. The first time these buttons are pressed the ENABLE ADJUST display will be shown. Using INC to set the number and DEC to select the number set the value to 1234 and press DEC. The display should show UNLOCKED. Press MENU to return to the previous option display. The option values will now flash and can be adjusted. The UNLOCK will expire 60 seconds after the last key press.

Option	Range	Increments	Units	Default
RH Setpoint	40.0 - 90.0	0.5	RH%	60
RH Differential	0.0 - 10.0	0.1	RH%	1
Temperature Setpoint	10.0 - 30.0	0.5	°C	20
Temperature Differential	0.0 - 10.0	0.1	°C	1
Pressure Setpoint	100 - 400	1	Pascal	250
Pressure Proportional Band	50 - 200	1	Pascal	200
Pressure Integral Time	60 - 600	1	Second	180
Compressor Override On Delay	Disabled - 60 - 600	1	Second	60
Compressor Override Off Delay	30 - 600	1	Second	30
Compressor Count	2-4	1	-	2
Compressor Control	LINEAR / CYCLE	-	-	CYCLE
Compressor Rotation Time	Disabled - 1 - 24	1	Hour	Disabled
Compressor 2 RH Offset	0.0 - 20.0	0.1	RH%	1
Compressor 2 Temperature Offset	0.0 - 20.0	0.1	°C	1
Compressor 3 RH Offset	0.0 - 20.0	0.1	RH%	2
Compressor 3 Temperature Offset	0.0 - 20.0	0.1	°C	2
Compressor 4 RH Offset	0.0 - 20.0	0.1	RH%	3
Compressor 4 Temperature Offset	0.0 - 20.0	0.1	°C	3
Demand Delay	5 - 60	1	Second	10
Stage Delay	5 - 60	1	Second	30
Compressor Power On Delay	Off - 1 - 30	1	Minute	Off
Heating Temperature Proportional Band	1.0 - 20.0	0.1	°C	10
Frost Sensor Count	NONE - 1 - 6	1	-	1
Frost Sensor Alarm	0.0 - 10.0	0.1	°C	5
Frost Sensor Alarm Differential	0.0 - 5.0	0.1	°C	1

## Option Descriptions

The options are listed in the table above along with their selectable ranges, increments and default values.

## RH Setpoint

*Availability* - Always

*Action* - This is the RH setpoint for compressor 1, the humidifier, heating and all other compressor RH offsets are referenced to this.

## RH Differential

*Availability* - Always

*Action* - The RH differential is used by all compressors and the humidifier.

## Temperature Setpoint

*Availability* - Always

*Action* - This is the Temperature setpoint for compressor 1, the humidifier, heating and all other compressor Temperature offsets are referenced to this.

## Temperature Differential

*Availability* - Always

*Action* - The Temperature differential is used by all compressors and the humidifier.

## Pressure Setpoint

*Availability* - Always

*Action* - Required pressure value.

## Pressure Proportional Band

*Availability* - Always

*Action* - Proportional band for pressure control.

## Pressure Integral Time

*Availability* - Always

*Action* - Integral time for pressure control.

## Override On Delay

*Availability* - Always

*Action* - If the override function is enabled this will increase the number of compressors on every Override On Delay period if the control value does not return to the setpoint.

## Override Off Delay

*Availability* - Only available if Override On Delay set

*Action* - If the override function is enabled this will decrease the number of overridden compressors by one every Override Off Delay period when the control value has returned to the setpoint.

## Compressor Count

*Availability* - Always

*Action* - Sets the number of compressors in use

## Compressor Control

*Availability* - Always

*Action* - Selects Linear or Cycle compressor switching.

*Linear* - Compressor 1 always switches on first followed by 2,3 and 4. The compressors switch of in the reverse order.

*Cycle* - The compressors are cycled on a demand basis and switch off in the same order as switching on. Eg if compressor 1 then 2 switch on compressor 1 will switch of first followed by compressor 2. The next compressor to switch on will be compressor 3 and so on.

## Compressor Rotation

*Availability* - Only available if Compressor Control set to Cycle

*Action* - If this function is enabled a compressor will be switched off every Compressor Rotation Delay and the next compressor switched on. No rotation action will be taken if all compressors are on or off.

## Compressor 2 RH Setpoint Offset

*Availability* - Always

*Action* - This is the RH setpoint offset for compressor 2, this value is added to the main RH Setpoint to calculate the RH Setpoint for compressor 2. All compressors use the RH differential.

## Compressor 2 Temperature Setpoint Offset

*Availability* - Always

*Action* - This is the Temperature setpoint offset for compressor 2, this value is added to the main Temperature Setpoint to calculate the Temperature Setpoint for compressor 2. All compressors use compressor the Temperature differential.

## Compressor 3/4 RH Setpoint Offset

*Availability* - Depends on Compressor Count setting

*Action* - See Compressor 2 RH Setpoint Offset.



## Compressor 3/4 Temperature Setpoint Offset

*Availability* - Depends on Compressor Count setting

*Action* - See Compressor 2 Temperature Setpoint Offset.

## Demand Delay

*Availability* - Always

*Action* - The control input will not be acted on until it is out of limits for the Demand Delay time.

## Compressor Stage Delay

*Availability* - Always

*Action* - Sets the delay between any compressors switching on or off under normal conditions.

## Compressor Power On Delay

*Availability* - Always

*Action* - If enabled, inhibits compressor switching for Power On Delay time directly after power being switched on.

## Heating Temperature Proportional Band

*Availability* - Always

*Action* - Sets the heater Temperature proportional band, this is referenced to the Temperature setpoint.

## Frost Sensor Count

*Availability* - Always

*Action* - Sets the number of frost sensors in use. These should be fitted starting with sensor 1.

## Frost Sensor Setpoint

*Availability* - Only available if Frost Sensor Count not set to None

*Action* - Adjusts the temperature setpoint used by the frost sensors.

## Frost Sensor Differential

*Availability* - Only available if Frost Sensor Count not set to None

*Action* - Adjusts the temperature differential used by the frost sensors.