



## FCAx3

Advanced Electronic Temperature Controller With Energy Saving, Defrost, and Plug-in Connectivity Options

## USER MANUAL

Important: This manual contains important safety instructions. Before using this product please read all instructions carefully. Keep this manual handy for reference.

Please read the following warnings to maintain the safe function and continued performance of your Sollatek device.



#### INSTALLATION

The mounting of the unit must be in accordance with orientation as specified in this manual. The device must only be installed and configured by trained and authorized staff.

#### TEMPERATURE

The Sollatek device must only be subjected to temperatures as specified in this manual.

#### VIBRATION AND IMPACT

The device MUST be installed in such a way as to be protected from impact in operation. Do not hit or drop the device.

#### NO SERVICEABLE PARTS

There are no serviceable parts inside the device. Do NOT open the housing.

#### VOLTAGES

The Sollatek device must only be connected to power supplies that comply with the acceptable voltage ranges as specified in this manual.

#### VOLTAGE FLUCTUATIONS AND SURGES

The Sollatek device has surge protection as specified in this manual. Exposure to surge voltages outside these limits, or excessively repeated surges within the limits may cause damage to the electrical circuits.

#### CURRENTS

Outputs should not be connected to short circuits or to loads that exceed the currents as specified in this manual. Care must be taken to ensure that cables and terminations are safely terminated.

#### SEGREGATION OF POWER AND SIGNAL CABLING

Correct segregation of power and signal cabling must be followed. Do not run power and signal cables together in the same conduit. Induction from power cables may corrupt data signals, leading to incorrect operation.

#### CONSEQUENTIAL FAILURES

The Sollatek device includes features to protect both itself and connected components. However, failure of connected components may cause damage to the controller and/or connected components. Critical or vulnerable components should be protected independently against failure.

#### FIT FOR PURPOSE

The Sollatek device must only be used for the purpose and functions described in this manual. As each application requires a different configuration and setup, no liability is accepted by Sollatek UK Ltd for the correct operation of the final equipment.



Failure to comply with the warnings may result in the device becoming damaged leading to premature failure or unsafe operation. In extreme cases failure to comply may cause a risk of electrocution or fire.



## SAFETY PRECAUTIONS



Precautions should be taken when installing or disconnecting the device. Isolate the power supply before installation or servicing.

Trained and Authorised personnel only should install/service this equipment.



## THE DANGERS OF ELECTRICITY

Harm can be caused to any person when they are exposed to 'live parts' that are either touched directly or indirectly by means of some conducting object or material. Voltages over 50 volts AC or 120 volts DC are considered hazardous.

Most electrical accidents occur because of individuals:

1. Are working on or near equipment, which is thought to be dead, but which is, in fact, live.
2. Are working on or near equipment, which is known to be live, but where those involved are without adequate training or appropriate equipment, or they have not taken adequate precautions.
3. Misuse of equipment or use of electrical equipment which they know to be faulty.

## REDUCING THE RISK OF ELECTRIC SHOCK

To reduce the risk of electric shock:

1. Install the device in an area free of conductive contaminants. The ambient temperature must not exceed 60°C.
2. Isolate the power to the device before installation, repair, or removal.
3. Use tools with insulated handles.

## FIRST AID

Before commencing any work:

1. Find out the location of a suitably stocked first aid box.
2. Find out the arrangements that exist on-site for first aid, and who is responsible for taking charge of these.

## DISPOSAL



Sollatek devices are subject to the EU directive 2012/19/EU and may also be subject to other national legislation for the safe disposal of e-waste.

1. The device cannot be disposed of as municipal waste, and such waste should be collected and disposed of separately.
2. The device can be disposed of through an approved WEEE collection point, or alternatively can be returned to Sollatek UK Ltd at the end of its working life.
3. The device may contain hazardous substances, which if disposed of incorrectly may cause harm to the environment and/or human health.
4. Penalties may be applicable for incorrect disposal, as specified by local legislation.

Sollatek devices comply with EU directive 2011/65/EU (RoHS).

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# 1. INTRODUCTION

## 1.1 DESCRIPTION

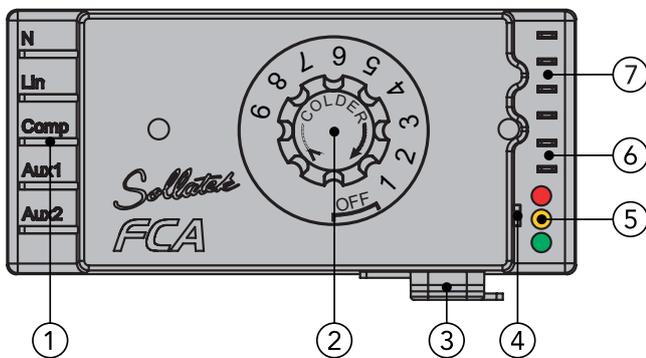
The FCAx3 is an electronic refrigeration controller designed to be a direct replacement for electro-mechanical thermostats to provide precise and efficient refrigeration control for up to 3 outputs using up to 3 inputs (temperature sensor and/or door switch). The FCAx3 provides advanced defrost modes as well as energy saving during periods of low demand using a door switch.

The FCAx3 is built to last meeting industry benchmarks and offering complete voltage protection including high/low voltage to all connected outputs. To also help protect and extend the operating life of the connected outputs the FCAx3 provides zero voltage crossing.

The FCAx3 has internal Bluetooth (optional) or can be connected to an external Bluetooth module (GBR) allowing remote access via the Smart Device App to authorized service personnel to access controller data logs and control parameters. BLE also transmits Eddystone and iBeacon for proximity marketing (nearby customer engagement).

The FCAx3 can be connected to a connectivity device to provide always-on connectivity to send telemetry and performance data to the portal, and Wi-Fi asset location or a digital display to provide live temperature reading, parameter and mode configuration and alarms/errors.

## DEVICE OVERVIEW



1	Mains and Output Connectors
2	User Adjustable Temperature Dial
3	Data Port - Connectivity / Programming
4	Test Pins - Time Delay Bypass
5	LED Indicator
6	Temperature/door Sensor Connector
7	Temperature Sensor Connectors

## 1.2 MODEL VARIANTS

The "x" in the part number FCAx3 indicates the number of controllable outputs. There are three models available:

**FCA13** = 1 relay, 16 Amp (Compressor)

**FCA23** = 2 relays, 16 Amp (Compressor) + 5 Amp (Aux1)

**FCA33** = 3 relays, 16 Amp (Compressor) + 2x 5 Amp (Aux1 & Aux2)



### 1.3 LED INDICATORS

LEDs			Mains Voltage	Compressor	Description
R	Y	G			
●	○	○	×	×	Off. Voltage Bad. Cooling Demand
⊗	○	○	×	×	Off. Voltage Bad. No Cooling Demand
○	●	○	✓	×	Wait Period (intelligent time delay). Cooling Demand
○	⊗	○	✓	×	Wait Period. No Cooling Demand
○	○	●	✓	✓	On. Voltage Good. Cooling Demand*
○	○	⊗	✓	×	Wait is Over. No Cooling Demand
●	○	●	✓	×	Defrost Mode
⊖	○	⊖	✓	✓	Pre-defrost Mode
⊗	○	⊗	✓	✓	Drip Down Mode
○	●	●	✓	✓	Post Defrost Recovery Mode
○	⊗	●	✓	×	On. Compressor Off due to Door Switch Operation*
○	☀	○	✓		Blink Once. Probe #1 Fault.Compressor Off or Cycling*
○	☀	○	✓		Blink Twice. Probe #2 Fault.Compressor Off or Cycling*
○	☀	○	✓		Blink Three Times. Probe #3 Fault.Compressor Off or Cycling*
●	☀	○	×	×	Blink Once. Probe #1 Fault and Bad Voltage
●	☀	○	×	×	Blink Twice. Probe #2 Fault and Bad Voltage
●	☀	○	×	×	Blink Three Times. Probe #3 Fault and Bad Voltage
⊖	⊖	○	×	×	Cycle every 0.5 seconds. Bad Frequency
⊗	⊗	⊗	△	✓	Test Mode
⊖	⊖	⊖	△	×	Dial in "OFF" position
⊗	⊗	⊗	△	✓	Cycle 5 times a second. Internal Power Supply Failure

**KEY** ✓ On/good ✗ Off/bad △ Not Relevant ● On ⊗ Flashing (1 second interval) ☀ Blink (2 seconds interval) ⊖ Cycling (1 second interval) ○ Off

\* ● If the Red LED turns ON momentarily, the controller is in under/over voltage blind time



## 2. FUNCTION

### 2.1 TEMPERATURE CONTROL

The FCAX3 is a microprocessor-based temperature controller utilising up to two NTC (Negative Temperature Coefficient) probes. The cooler temperature is determined by measuring the temperature of either the return airflow or evaporator temperature depending on where the customer prefers to fit the probe. This probe should be connected to the probe #1 connector.

The FCAX3 is a closed-loop temperature controller, turning the compressor OFF once the Cut-out set point has been reached and then turning the compressor ON when the Cut-in temperature is reached. Users can set both the cut-in and cut-out values.

### 2.2 ENERGY SAVING

Commercial refrigeration is energy-hungry; With rising energy costs and growing environmental concerns, the FCAX3 allows you to reduce energy consumption. You can:

- Cycle the Evaporator Fan: set the fan to cycle during operation as opposed to ON all the time.
- Temperature Setback Mode: Reduce the cooling demand by increasing the set temperature values. This will reduce how hard the compressor must work and therefore reduce energy.

The setback is designed to be initiated when the store is closed. To activate Setback there must be no door activity for a configurable set period.

### 2.3 DEFROST CONTROL

One of the primary functions of the FCAX3 controller is defrost management. The defrost cycle can be initiated or terminated by either time or temperature (active).

Every system is different but usually, for the most efficient and satisfactory refrigeration operation, you would set the controller parameters to initiate the fewest amount of defrosts in a day, for the shortest amount of time needed to clear the evaporator of ice.

Usually, parameters will be set to terminate due to temperature with a fail-safe time backup to prevent prolonged defrost because of defective defrost components or failures.

The FCAX3 supports Natural or Forced Defrost:

- Natural Defrost turns off the compressor and allows the evaporator to warm up normally.
- Forced Defrost turns the compressor and evaporator fan off and then turns a reverse fan to warm up the evaporator quicker than natural defrost.

**Standard operation during Defrost:**

Natural Defrost		Forced Defrost	
Compressor:	OFF	Compressor:	OFF
Evaporator Fan:	ON	Evaporator Fan:	OFF
		Reverse Fan or Heater:	ON

### 2.4 VOLTAGE AND COMPRESSOR PROTECTION

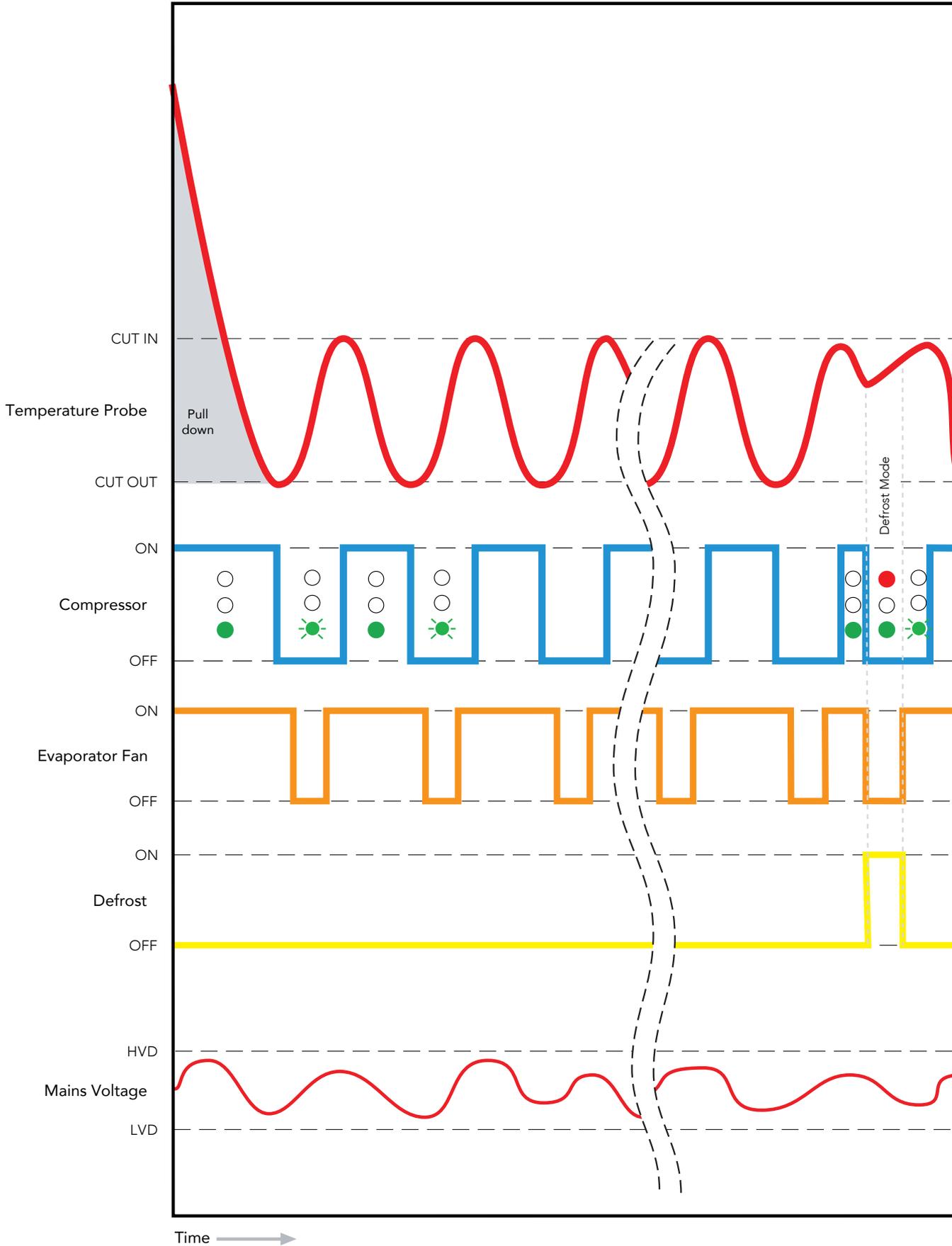
The FCAX3 has built-in voltage protection including High / low voltage, spikes/surges, and frequency monitoring to protect the controller and connected outputs to reduce equipment damage and downtime. The FCAX3 continually senses the mains supply, on sensing bad voltage (voltage is higher or lower than the present acceptable limits) the FCAX3 will disconnect the compressor and other connected outputs. Once the voltage becomes good, the FCAX3 will ensure the voltage remains good for a set period (TIMESAVE™) before reconnecting power to the compressor and other connected outputs.

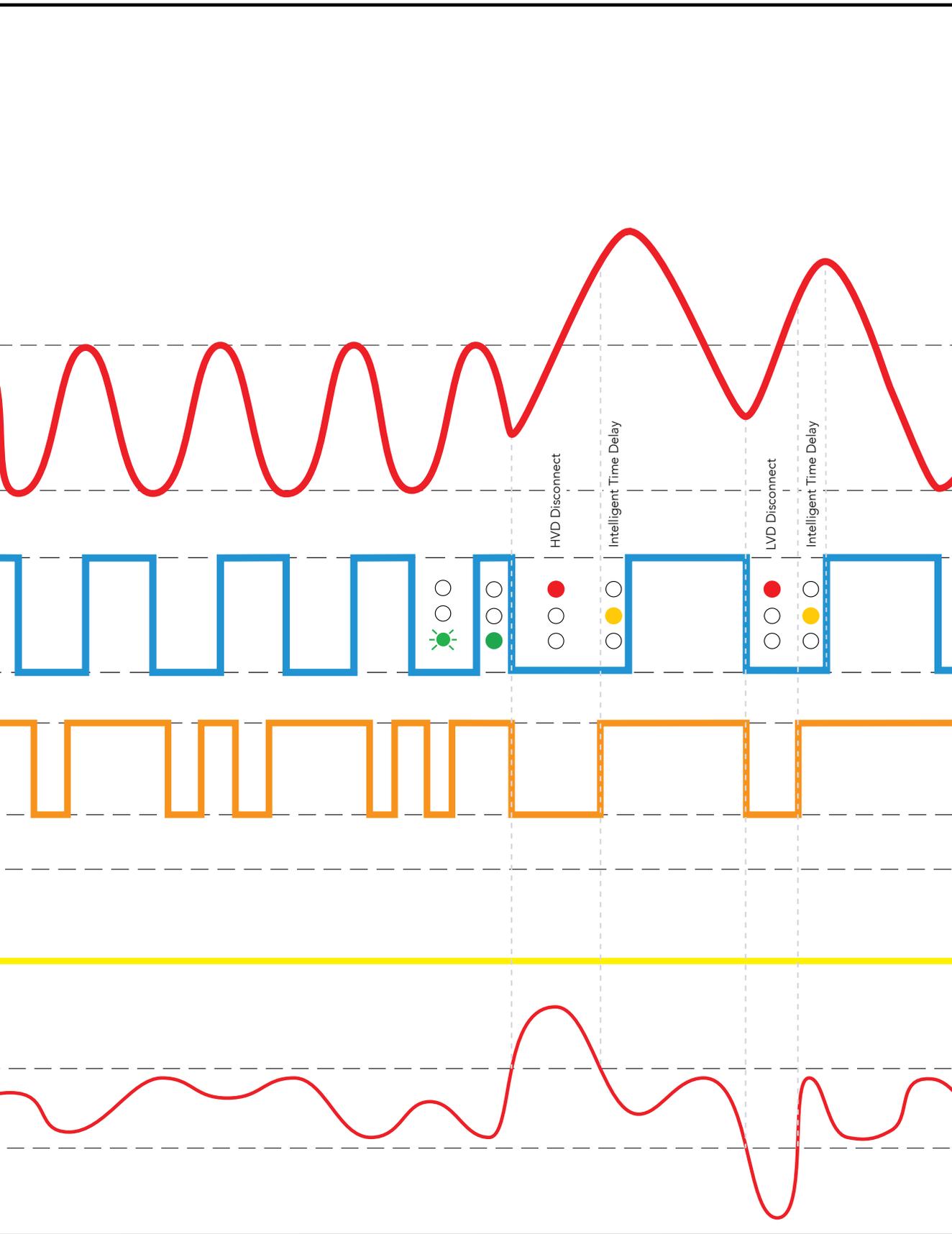
A minimum OFF period is essential in allowing compressor gases to neutralise, ensuring that the mains have stabilised before re-connection and avoiding a locked rotor condition, however, any prolonged off time can affect cooler efficiency and or the contents of the cooler. The FCAX3 will automatically adjust the reconnection period meaning the cooler will never be off for longer than required.



### 3. OPERATION

#### 3.1 STANDARD REGULATING MODE



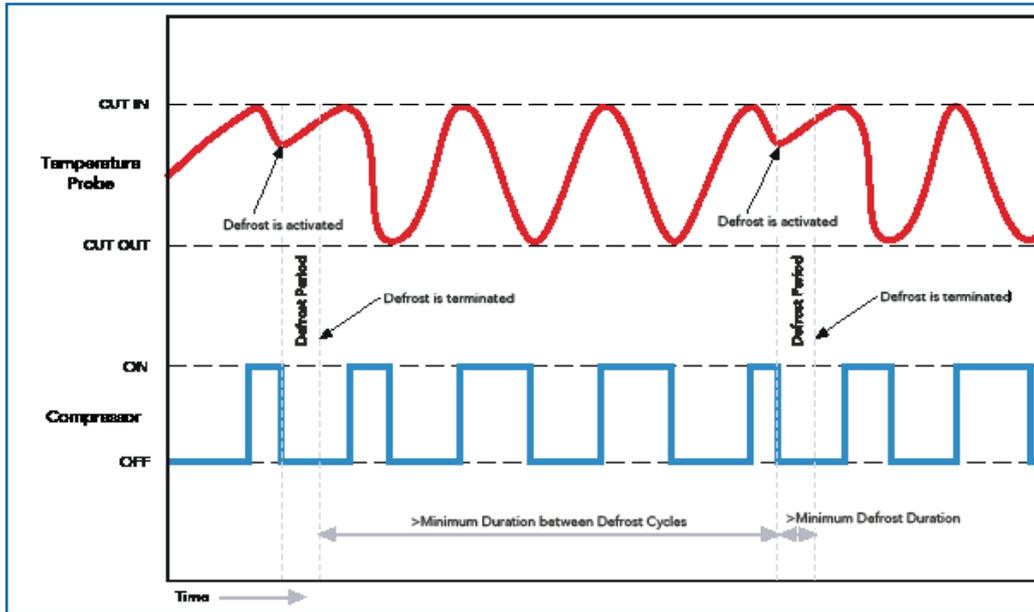


### 3.2 DEFROST MODE

#### 3.2.1 STANDARD DEFROST

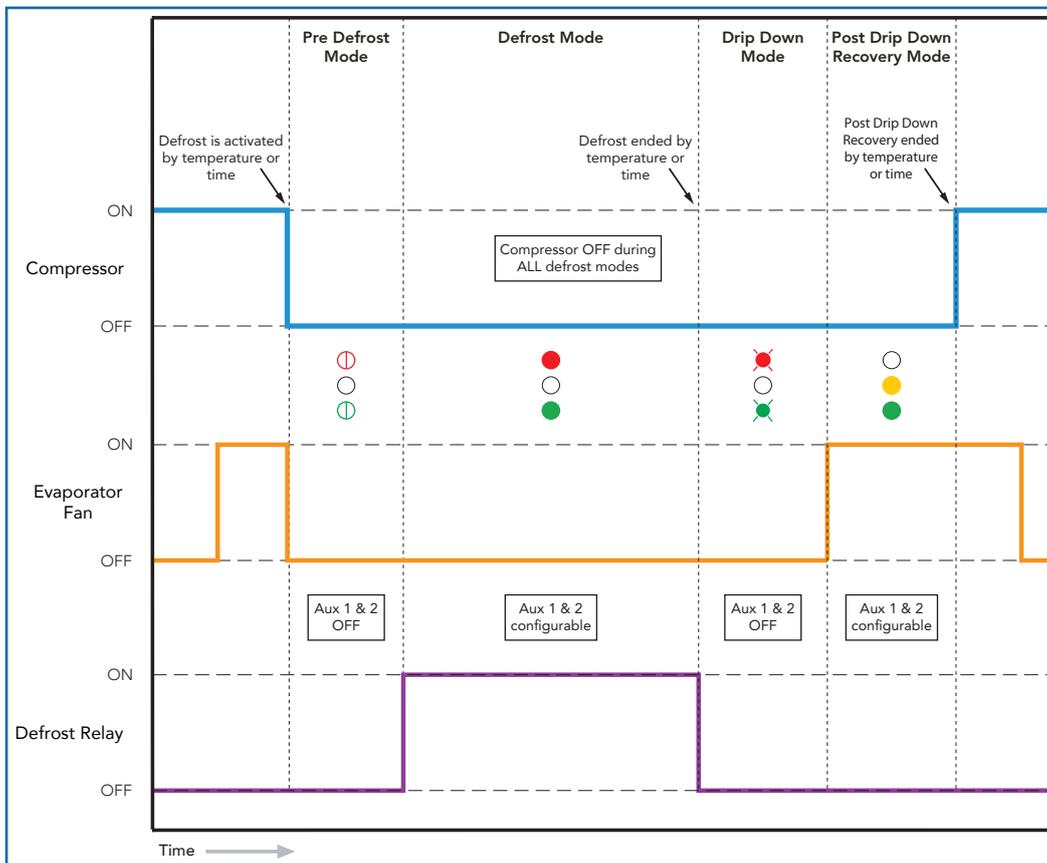
Depending on the requirement, defrost can be triggered by either using the temperature or/and by time, when both settings are enabled, whichever event happens first will trigger or end the defrost cycle.

The FCAX3 has a minimum defrost duration and minimum duration between defrost cycles which must be satisfied before it will act no matter the status of the other parameters. This is to ensure the defrost cycle is not stopped too early or defrost cycles are not initiated too close together.



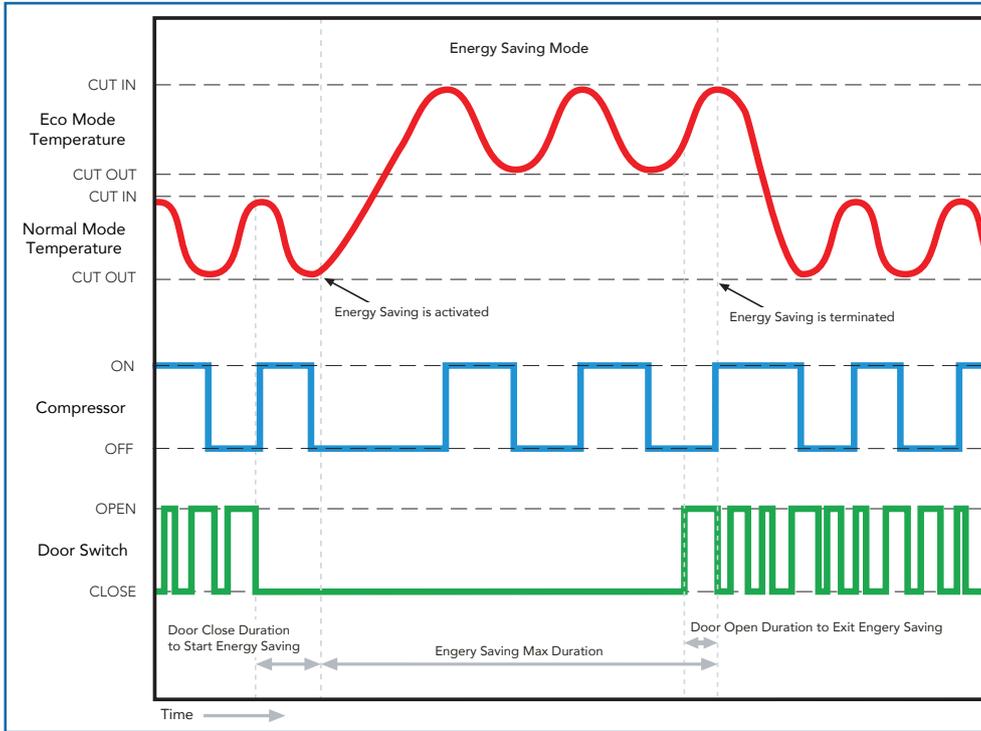
#### 3.2.2 ADVANCED DEFROST MODES

The FCAX3 has optional advanced pre- and post-defrost settings that provide extra protection to the controller and compressor as well as maximising defrost efficiency.



### 3.3 ENERGY SAVING MODE

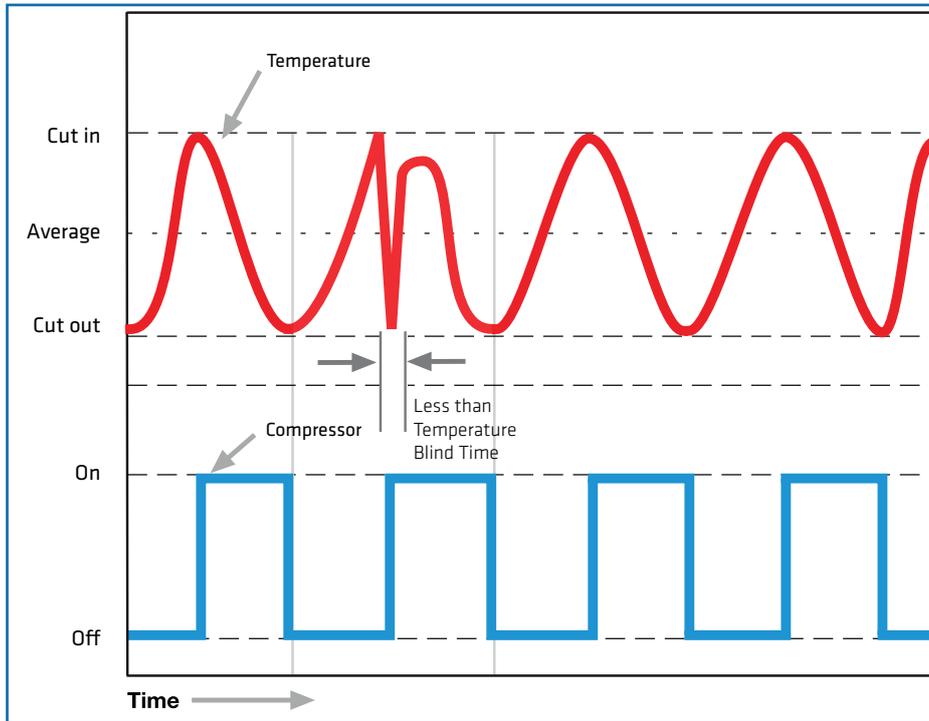
The FCAX3 has an Energy Saving mode that provides reduced compressor operation when the outlet is closed and no customer demand by setting the cut-in and cut-out temperatures higher than in normal mode. When the FCAX3 does not sense a door opening for the pre-set duration, then the FCAX3 will enter Energy Saving Mode and run using the energy-saving cut-in and cut-out temperature. When the door is opened or the maximum energy-saving timer has elapsed, the FCAX3 will resume normal operation.



## 4. FEATURES

### 4.1 TEMPERATURE BLIND TIME

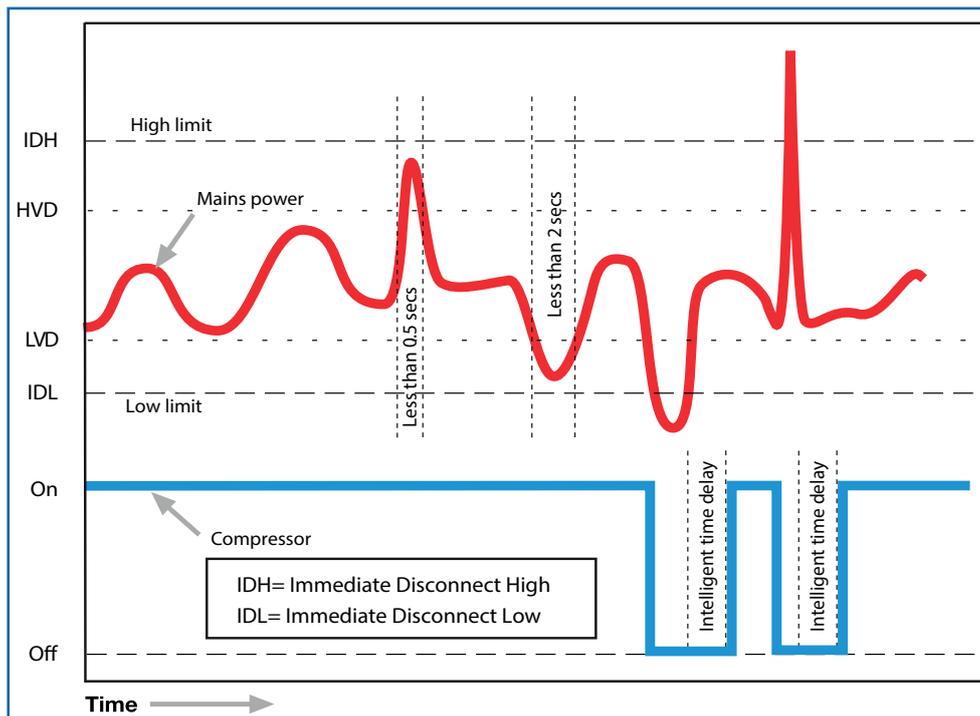
The software will ignore the sensor temperature reading for the first few seconds (a pre-set value of 10 seconds) after the compressor is switched on. This is to prevent short-term thermal effects such as those caused by the fan starting to operate causing disconnection.



### 4.2 BAD VOLTAGE BLIND TIME

The software permits high and low mains voltages transitions for short periods of time preventing inadvertent compressor stop-starts. Present values of 0.5 and 2 seconds (configurable) respectively are implemented.

However, if the mains voltage becomes too extreme (HVD + 10%) and (LVD - 20%), the FCAX3 will immediately disconnect the compressor.



### 4.3 TIMESAVE™ FUNCTION

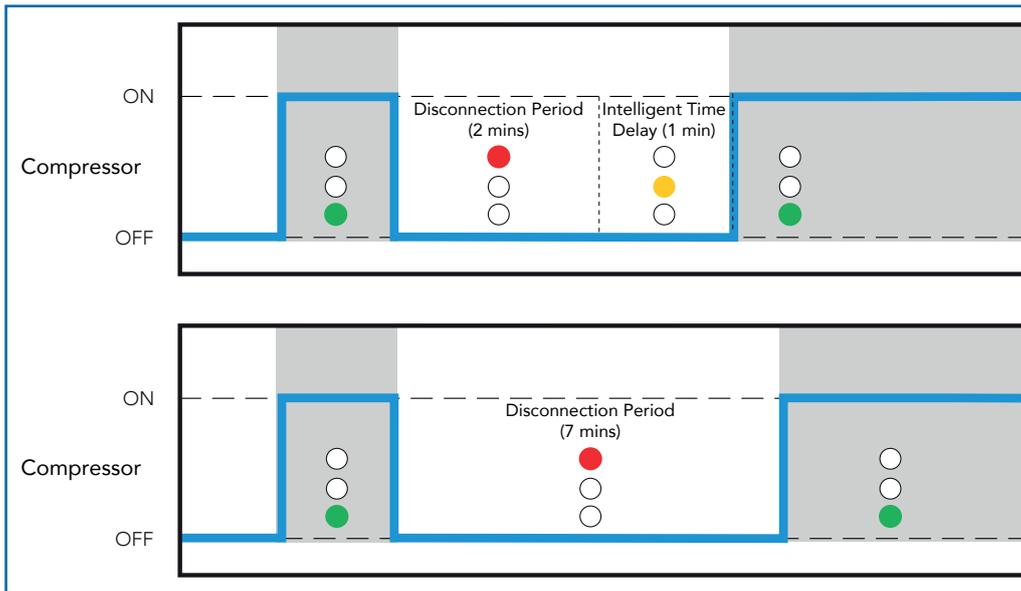
The FCAX3 has a built-in sensing period after a bad voltage event. When the voltage returns to good after a bad voltage period the FCAX3 will only reconnect power to the compressor and other connected outputs once it has sensed the voltage remains within set limits for at least 10 seconds.

### 4.4 INTELLIGENT TIME DELAY

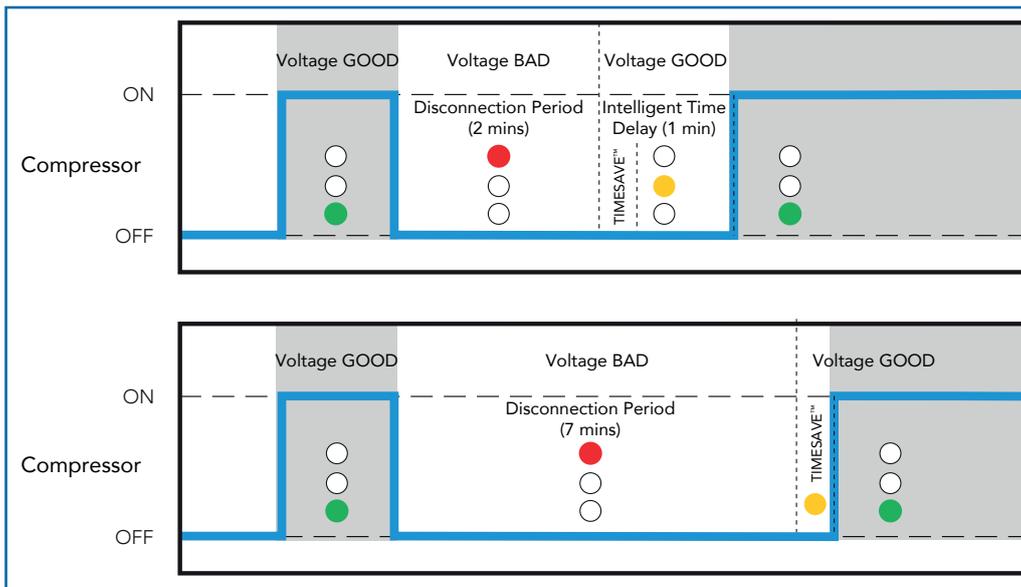
The FCAX3 controller has a built-in intelligent time delay of up to 5 minutes (customer configurable). After a compressor disconnection period, either from cycling OFF, defrost, or HVD/LVD the FCAX3 will automatically adjust the time delay on the disconnection period before allowing the compressor to turn ON. For example, if the Time delay is set to 3 minutes, a 2-minute disconnection will result in only a 1-minute additional delay, making the total delay 3 minutes. Any disconnection of 3 minutes or over and the FCAX3 will immediately turn the compressor ON.

The time delay is essential in allowing compressor gases to neutralise, ensuring that the mains have stabilised before re-connection and avoiding a locked rotor condition.

Operation of time delays during normal operation:



Operation of time delays during a brownout (bad voltage):

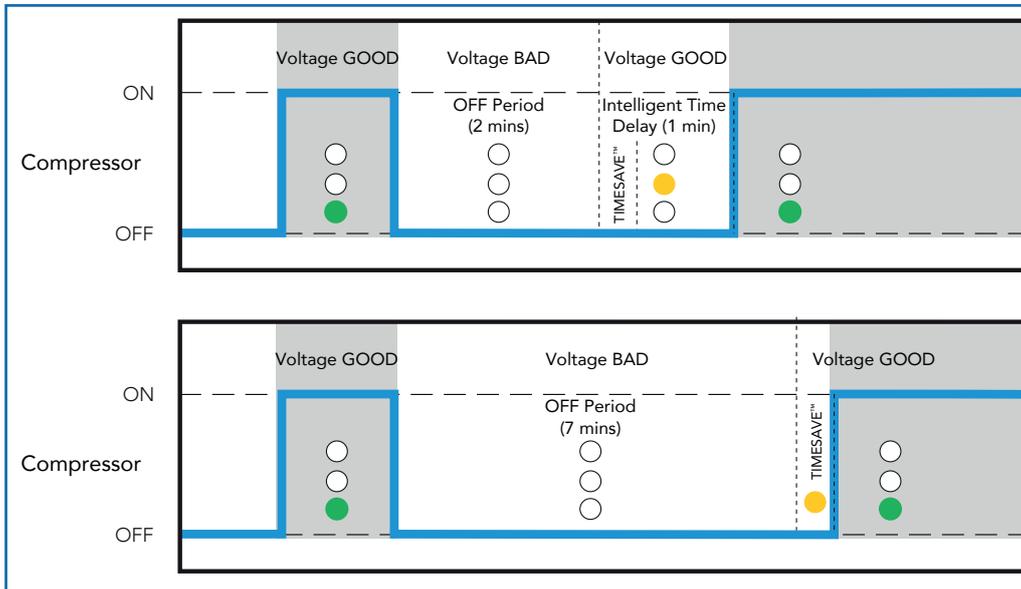


\*Above illustrations use intelligent time delay set to 3 minutes



#### 4.5 INTELLIGENT BLACKOUT TIME DELAY

The FCAX3 also has an Intelligent Blackout delay, meaning depending on the disconnection period, caused by no power i.e. power cut or mains being turned off, the FCAX3 will adjust the wait period before allowing the compressor and other outputs to turn on. For example, if the Time delay is set to 3 minutes, a 2-minute disconnection will result in only a 1-minute additional delay, making the total delay 3 minutes. Any disconnection of 3 minutes or over and the FCAX3 will immediately turn the compressor ON. Time delay is configurable (intelligent time delay and blackout time delay are set as the same value).

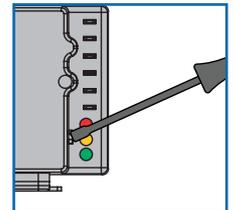


#### 4.6 TEST PINS

Next to the LED, the FCAX3 has two test pins. The test pins can be shorted by touching both pins with a conducting object such as a small screwdriver.

When the FCAX3 is first turned ON and the test pins are shorted, the time delay is bypassed and will force the FCAX3 to operate immediately according to the current temperature demand.

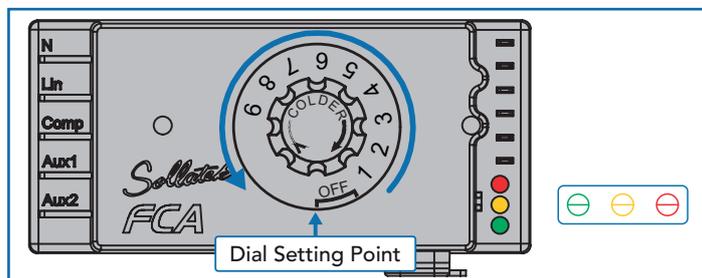
If the test pins are shorted during operation when there is no cooling demand, the FCAX3 will force the compressor ON for 10 seconds to allow technicians to check the compressor operation.



#### 4.7 DIAL POSITION & CONTROLLER OFF

The dial setting point on the FCAX3 is pointing downwards when the power/output connectors are on the left. When moving the dial into or away from the OFF position the dial will click in and out respectfully.

When the dial is set to OFF and Enable Potentiometer Off Position is enabled, the FCAX3 turns off all outputs regardless of the temperature, allowing forced defrost or cleaning. The outputs are enabled when the dial position is changed to any other value.



#### 4.8 BLUETOOTH CONNECTIVITY (INTERNAL OR EXTERNAL)

FCAX3 controllers are equipped with Bluetooth capability, enabling them to connect to the Sollatek Smart device Application. The Sollatek App has extensive cooler management capabilities providing technicians with all the tools to view and upload controller status and event data.

- Real-time Data Analysis - View real-time telemetry data, operational status, and performance data.



- Cooler Event Log - Access all historical data that has occurred between store visits to identify any issues or problems.
- Manage Settings and Parameters - View and configure predefined FCAX3 controller parameters for cooler optimisation. Set BLE Beacons protocols and event logging.
- Connect to the Cloud - Upload data to the cloud for access on the online portal for further analysis.

The FCAX3 controller also features iBeacon and Eddystone Beacon capabilities allowing proximity marketing to send engaging and interactive content to consumers' smartphones while they buy in real-time.

#### 4.8.1 RECHARGEABLE BATTERY (INTERNAL BLUETOOTH MODEL ONLY)

The internal battery allows the FCAX3 to keep Real Time Clock (RTC) while there is no mains supply. The battery can also be used to power the Bluetooth so the device can still advertise/beacon.

The battery will last approximately 15 days RTC / 10 days RTC + BLE Advertising.



#### **CAUTION! RISK OF EXPLOSION**

It is not recommended for users to replace the battery so please contact Sollatek. The replacement battery should be of the same type.

Dispose of the used batteries according to national standards and directives.



### 4.9 CONNECTIVITY DEVICE (GMC4)

#### 4.9.1 CELLULAR FEATURES

The GMC4 is equipped with cellular connectivity capabilities of 2G or Cat-M (depending on the model), enabling it to transmit data over the secure global network for you to access on the online portal for cooler monitoring. The online portal can be accessed on any device with an internet connection. The GMC4 is provided with a global roaming SIM pre-installed. Via the online portal, you can:

- Detailed Reports - View a vast list of controller operational data such as temperature, event history, and faults.
- Intelligent Data Analysis - Monitor technical and operational data in easy-to-read graphs and charts.
- Accurate Sales Performance - view and analyse cooler KPIs for enhanced sales forecasting and strategy.
- Over the Air Parameter Configuration - View and configure predefined GMC4 controller parameters for cooler optimisation
- Remote Cooler Shut-down - In the event the cooler is stolen, disable the cooler so it cannot be used. Once the cooler is recovered the cooler can then be enabled.

The transmission interval of cooler health data can be configured via the Sollatek Smart Device Application. Health data will not be transmitted while being powered by the battery.

#### 4.9.2 GEO-LOCATION

The GMC4 provides Wi-Fi geo-location for precise asset tracking anywhere in the world. The GMC4 collects and sends Wi-Fi signal strength and WAP information from nearby devices (without connecting to the Wi-Fi network). The system then uses the leading Wi-Fi location database to determine the location of the GMC4 and cooler. The location can be seen on a dynamic map on the portal.

- View current and historic cooler locations.
- Real-time tracking of cooler location during movement (depending on transmission interval set).

The transmission interval of Wi-Fi data is fully configurable via the Sollatek Smart Device Application.

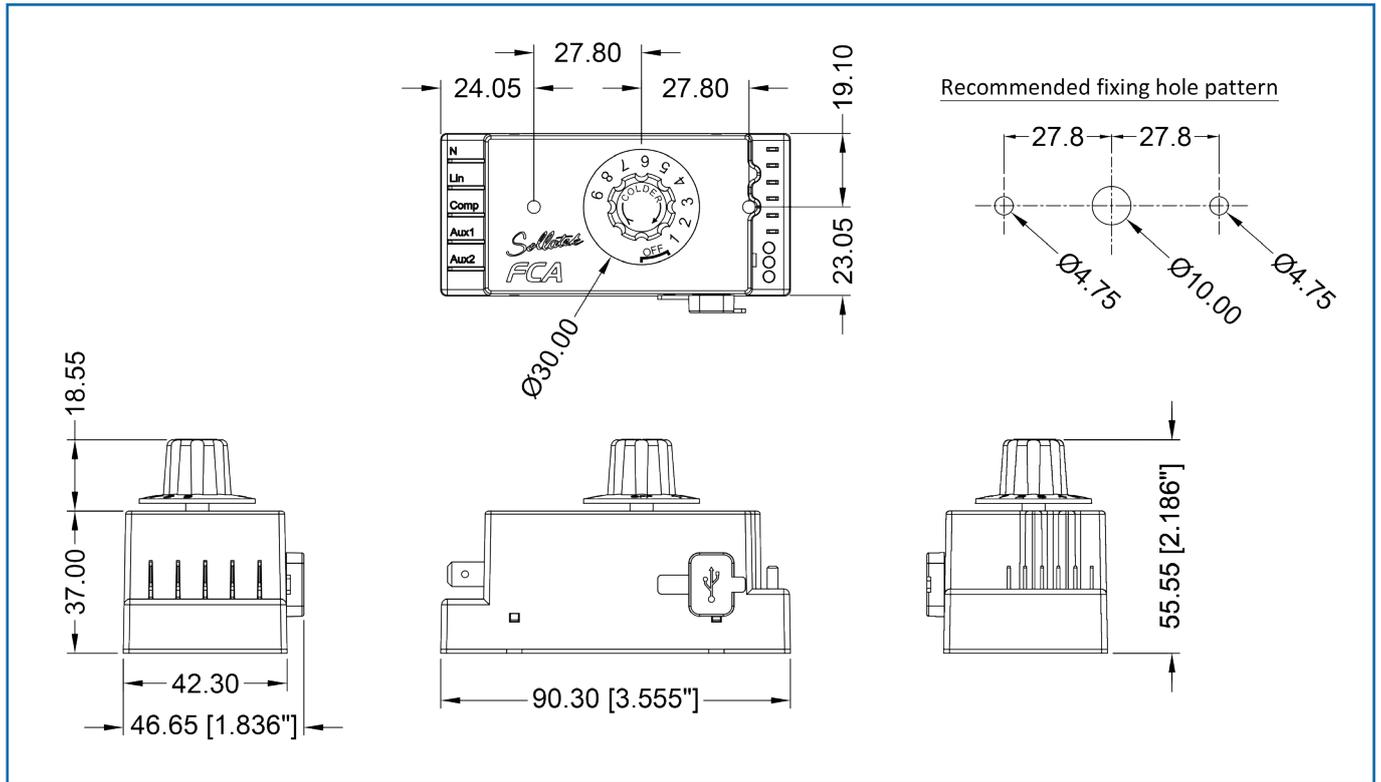
### 4.10 DIGITAL DISPLAY MODULE

The FCAX3 can be connected to the Sollatek FDM3 digital display. This allows you to:

- View and configure controller status/mode.
- Configure pre-set parameters.
- View controller alarms and faults.

## 5. INSTALLATION

### 5.1 FCAx3 DIMENSIONS



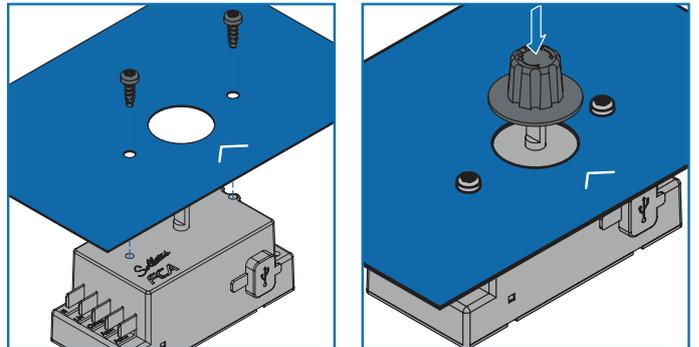
### 5.2 MOUNTING INSTRUCTIONS



#### WARNING!

FCAx3 MUST be mounted with terminals in an isolated area, either in a plastic or earthed metal case.

1. Mark and drill holes for the dial shaft and mounting screws in the surface where the FCAx3 is to be mounted according to the panel cut-out. Ensure all holes are free of burrs and sharp edges.
2. Insert the FCAx3 dial shaft through the hole from the rear of the panel.
3. align the mounting holes and secure the FCAx3 into position with the provided screws.
4. Push the dial onto the shaft.



### 5.3 WIRING CONNECTIONS



#### DANGER! ELECTRIC SHOCK HAZARD - LIVE TERMINAL

This is a non-isolated product. The sensor inputs and outputs are not electrically isolated from the power terminals therefore the supply MUST be disconnected from the controller before installing/disconnecting, repairing, or programming the controller, inputs, outputs, and external devices.

Ensure exposed connectors/wires of connected inputs, outputs and external devices do not touch the frame or chassis of the cooler or other enclosures otherwise, damage to the controller, equipment, and the cooler will occur.

This equipment is to be installed or serviced by trained personnel only.

### 5.3.1 MAINS AND OUTPUT WIRING



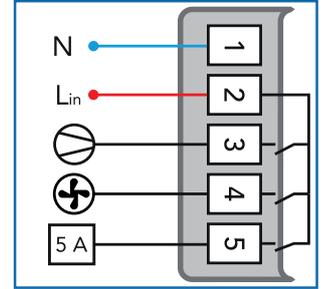
#### DANGER! - LIVE TERMINAL

Isolate the supply before installing/disconnecting or repairing the controller. Failure to do so can result in damage to equipment and electrical shock.

Ensure the connected load does not exceed the maximum relay rating it is connected to and the total current rating on at once does not exceed 18 Amps (FCA22/FCA32).

0.25" vertical male spade terminals are used for mains and output connectors. Connections should be made with equivalent female crimp connectors.

1. Connect the Mains Neutral wire to terminal 1 (labelled Neutral) on the FCAx3.
2. Connect the Mains Live-In wire to terminal 2 (labelled Live in) on the FCAx3.
3. Connect the Compressor Live wire to terminal 3 (labelled Comp) on the FCAx3.
4. Connect the required output (commonly evaporator fan) Live wire to terminal 4 (Relay #2, labelled Aux1) on the FCAx3, if required.
5. Connect the required output (commonly Lights or heater) Live wire to terminal 5 (Relay #3, labelled Aux2) on the FCAx3, if required (FCA32 ONLY)
6. Connect all output Neutrals to Mains Neutral.



Note: Output connectors are based on the default relay configuration, if the output configuration is changed via the FCAx3 configuration interface, then the equipment should be connected accordingly.

### 5.3.2 INPUT SENSOR WIRING



#### DANGER! - LIVE TERMINAL

Isolate the supply before installing/disconnecting or repairing the controller. Failure to do so can result in damage to equipment and electrical shock.



#### WARNING!

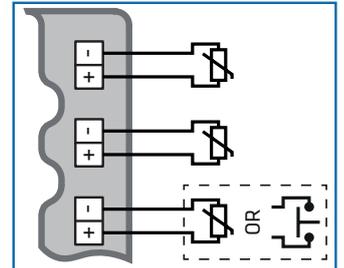
If the probes placed in an accessible area have less than 1.4 mm insulation, then the probes need to be sleeved (greater than 0.4mm thickness) to attain supplementary insulation.

Separate as much as possible the input sensors and cables carrying inductive load and power. Do Not run power and signal cables together in the same conduit.

0.11" vertical male spade terminals are used for the input connectors on the FCAx3. Temperature probes and the door switch use a 2-way female crimp terminal connector.

1. Connect the regulating temperature probe (air) to terminal PRB1 on the FCAx3.
2. Connect the defrost temperature probe (evaporator) to terminal PRB2 on the FCAx3.
3. Connect the door switch to terminal D-SW on the FCAx3

Note: Input connections are based on a typical installation. Probe inputs can be configured according to your requirements in the configuration software. PRB1 and PRB2 can only be used for temperature probes. D-SW can be used for a door switch or temperature probe.



### 5.3.3 EXTERNAL DEVICE CONNECTION



#### DANGER! - LIVE TERMINAL

Isolate the supply before connecting/repairing/disconnecting external devices. Failure to do so can result in damage to equipment and electrical shock.

Do not power the controller with connecting cables unconnected to devices as if exposed connectors were to touch the frame or chassis of the cooler, damage to the controller, equipment, and the cooler will occur.



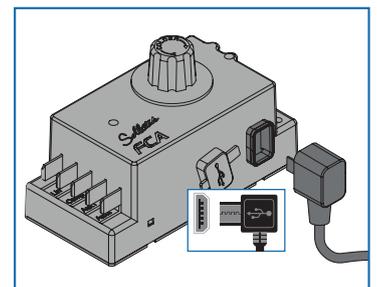
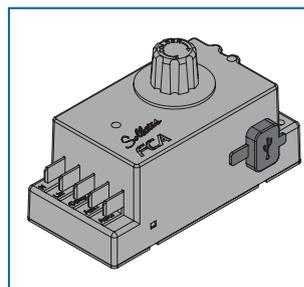
#### WARNING!

Separate as much as possible the input sensors and cables carrying inductive load and power. Do Not run power and signal cables together in the same conduit.

1. Remove the rubber dust cover from the data port on the side of the FCAx3.
2. Insert the Micro USB-B connector of the connection cable into the Micro USB-B port in the FCAx3. Ensure the connector is fully pushed down.

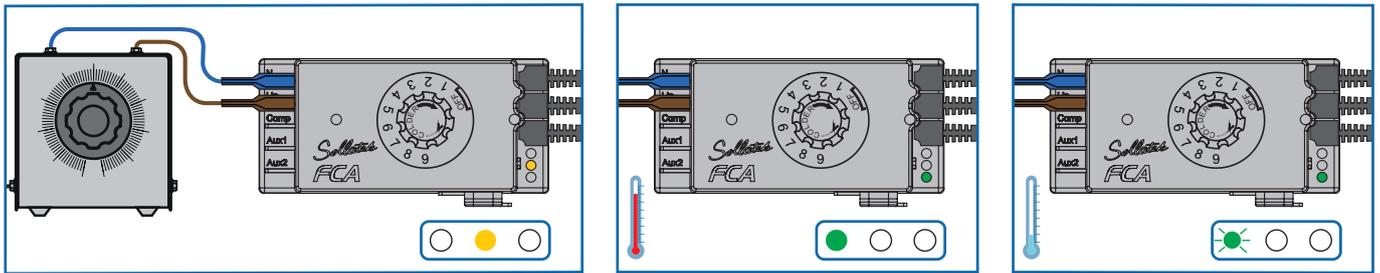
Note: The port is recessed, and the cable has a rubber boot so when a device is connected, the IP rating is maintained.

3. Plug the other end of the connector cable into the connector on the device.



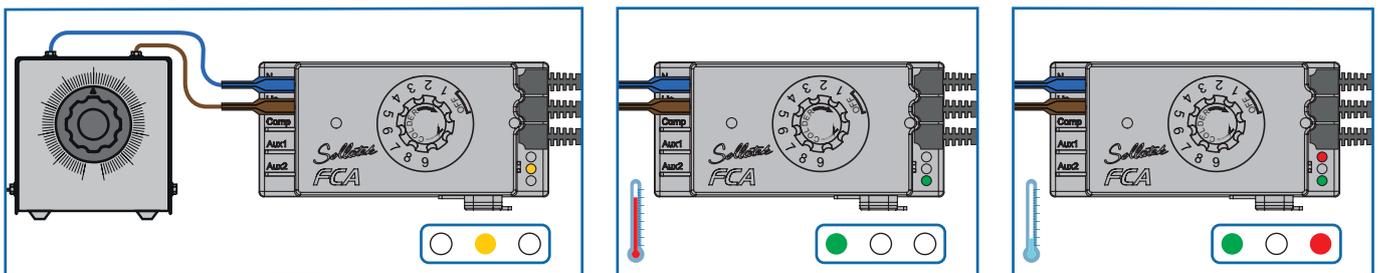
## 6. TESTING PROCEDURE

### 6.1 THERMOSTATIC FUNCTION



1. Connect the FCAx3 to a source of variable AC voltage such as a Variac and set the temperature dial to 9. Adjust the output of the Variac to a good starting voltage (within the acceptable limits) and power it on. The yellow LED will turn ON and stay on if the temperature detected by the regulation temperature probe (Probe#1) is below the cut-in temperature. If the temperature is above the cut-in value, then the yellow LED will flash.
2. When the Intelligent Time Delay is over, the FCAx3 will connect the mains supply to the compressor (assuming the temperature sensed by Probe#1 is above the cut-in temperature). The green LED will now turn ON.
3. Once the cabinet has reached the desired temperature (the temperature sensed by Probe#1 drops below the cut-out temperature), the FCAx3 will disconnect the compressor and the green LED will start flashing which indicates there is no cooling demand.

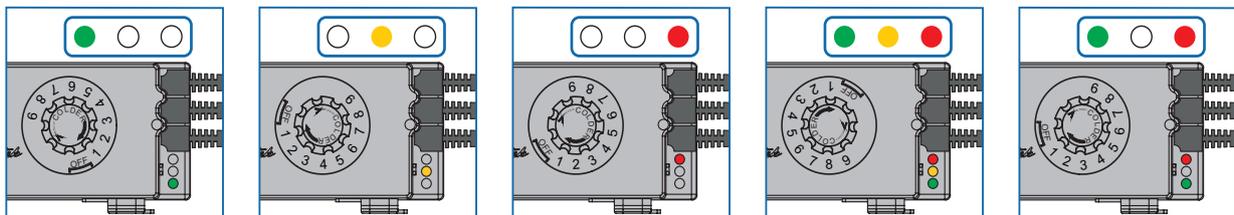
### 6.2 DEFROST FUNCTION



1. Connect the FCAx3 to a source of variable AC voltage such as a Variac and set the temperature dial to 9. Adjust the output of the Variac to a good starting voltage (within the acceptable limits) and power it on. The yellow LED will turn ON and stay on for the duration of the protection time delay (assuming the temperature is above the cut-in value).
2. When the Intelligent Time Delay is over, the FCAx3 will turn on the compressor and the green LED will turn ON.
3. The unit will go into defrost as soon as one of the defrost start criteria is met. This could be either defrost start time is over or the evaporator temperature drops below defrost start temperature value, whichever happens first, or is activated. The green and red LEDs will turn ON, and the compressor and other outputs will act according to the set operation, turning ON if set to ON.
4. The unit will stay in defrost until one of the defrost end criteria is met. This could be either defrost end duration is over or the evaporator temperature has risen above defrost end temperature value, whichever happens first, or is activated.

*Note: The FCAx3 has two built-in features which force the unit into defrost to reduce the testing time:*

Manual Defrost (Temperature dial)



1. Connect the FCAx3 to a source of variable AC voltage such as a Variac and set the temperature dial to OFF. Adjust the output of the Variac to a good starting voltage (within the set limits) and power it on. The green LED will turn ON.
2. Rotate the dial to 4 (within 7.5 seconds and stay there for at least 200mSec). The yellow LED will be ON.
3. Rotate the dial to 2 (within 7.5 seconds and stay there for at least 200mSec). The red LED will be ON.
4. Rotate the dial to 8 (within 7.5 seconds and stay there for at least 200mSec). All LEDs will be ON.
5. Rotate the dial from 8 to any other number and defrost mode will be activated. The green and red LEDs will be ON, and the

compressor and other outputs will act according to the set operation, turning ON if set to ON.

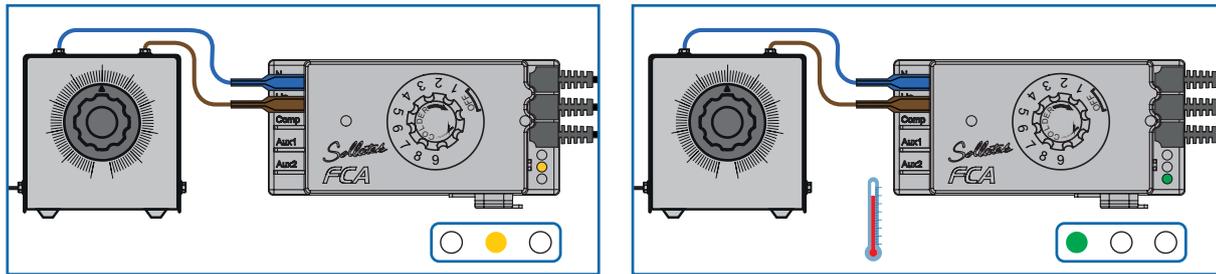
- The unit will stay in defrost until one of the defrost end criteria is met. This could be either defrost end duration is over or the evaporator temperature has risen above defrost end temperature value, whichever happens first, or is activated.

**Immediate Defrost at Power UP Enabled (programmed via the configuration software)**

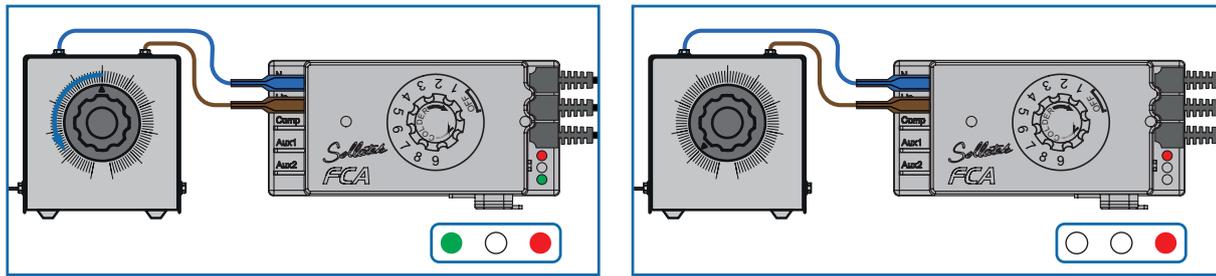
- Connect the FCAx3 to a source of variable AC voltage such as a Variac and set the temperature dial to 9. Adjust the output of the Variac to a good starting voltage (within the acceptable limits) and power it on.
- If the defrost enable temperature is met, the FCAx3 will enter defrost. The green and red LEDs will be ON, and the compressor and other outputs will act according to the set operation, turning ON if set to ON.
- The unit will stay in defrost until one of the defrost end criteria is met. This could be either defrost end duration is over or the evaporator temperature has risen above defrost end temperature value, whichever happens first, or is activated.

*Note: Ensure to disable this feature and reprogram the FCAx3 before sending the cooler/controller to market.*

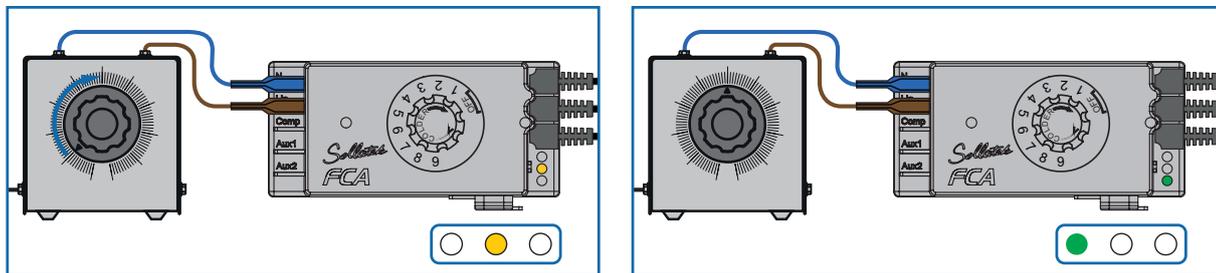
**6.3 VOLTAGE PROTECTION FUNCTION**



- Connect the FCAx3 to a source of variable AC voltage such as a Variac and set the temperature dial to 9. Adjust the output of the Variac to a good starting voltage (within the acceptable limits) and power it on. The yellow LED will turn ON and stay on for the duration of the protection time delay (assuming the temperature is above the cut-in value).
- When the Intelligent Time Delay is over, the FCAx3 will turn on the compressor and the green LED will turn ON.



- Slowly decrease the voltage until the red LED turns ON while the green LED is still ON. The LEDs will stay ON for the duration of the Under Voltage Blind Time (2 seconds),
- Then the FCAx3 will disconnect the outputs and the green LED will turn OFF so just the red LED is ON. This represents the Low Voltage Disconnect voltage.



- Increase the voltage slowly until the yellow LED turns ON. This represents the Low Voltage Reconnect voltage.
- Wait for the Protection Time Delay, then the green LED will turn ON.
- Repeat steps 3 to 6 but increase the voltage to test the overvoltage.
  - The High Voltage Blind Time is 0.5 seconds.

*Note: Low/high Blind Times are Sollatek's recommended timings. Blind times are configurable in the desktop configuration interface so actual timings may differ from the times stated depending on your settings.*

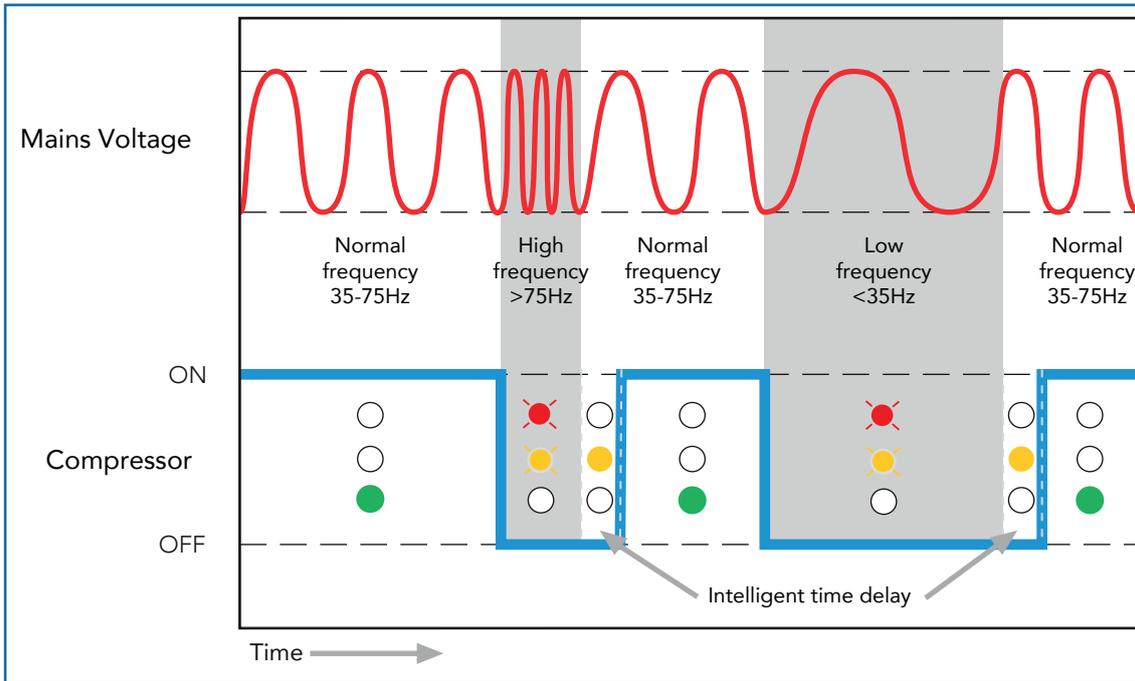
*\*\*Tip: During testing, short the test pins to bypass the set time delay and force the FCAx3 to operate immediately\*\**



## 7. ALARMS & ERRORS

### 7.1 FREQUENCY MONITORING AND ERROR DETECTION

The FCAX3 dynamically measures the frequency of the mains supply and reacts accordingly. If the mains supply frequency is too low or too high, the FCAX3 will then disconnect the compressor and indicate an error signal through the LEDs. The FCAX3 can auto-recover once the frequency is within acceptable limits.

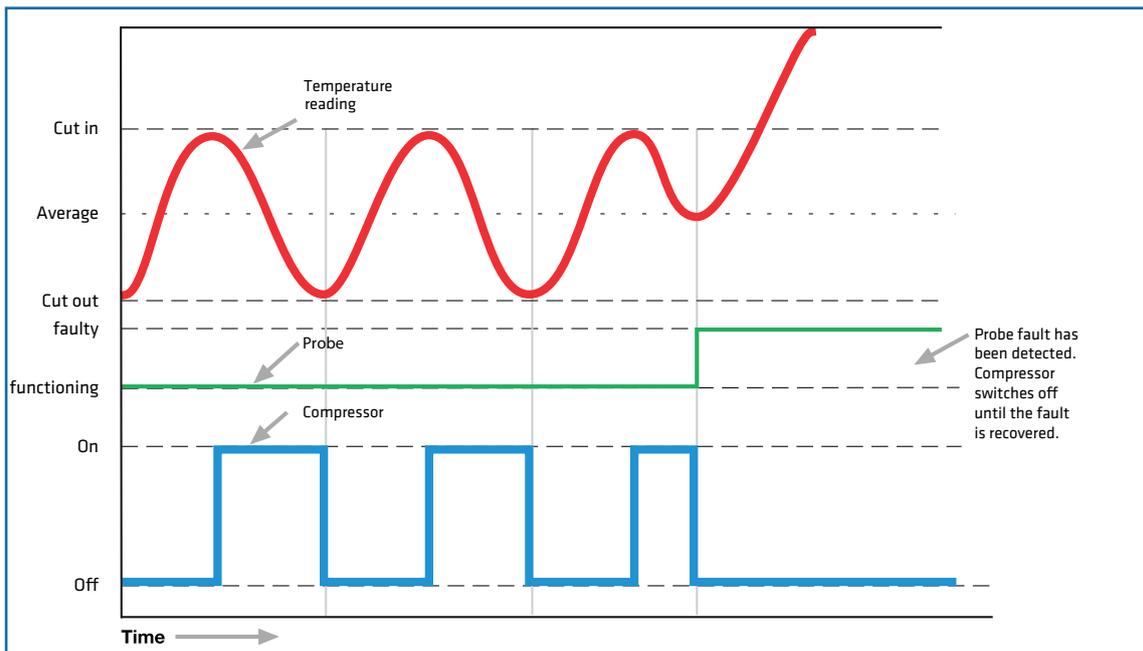


Note: The above illustration assumes that the Mains voltage RMS value is good and there is cooling demand, hence the compressor comes on after the intelligent time delay is over.

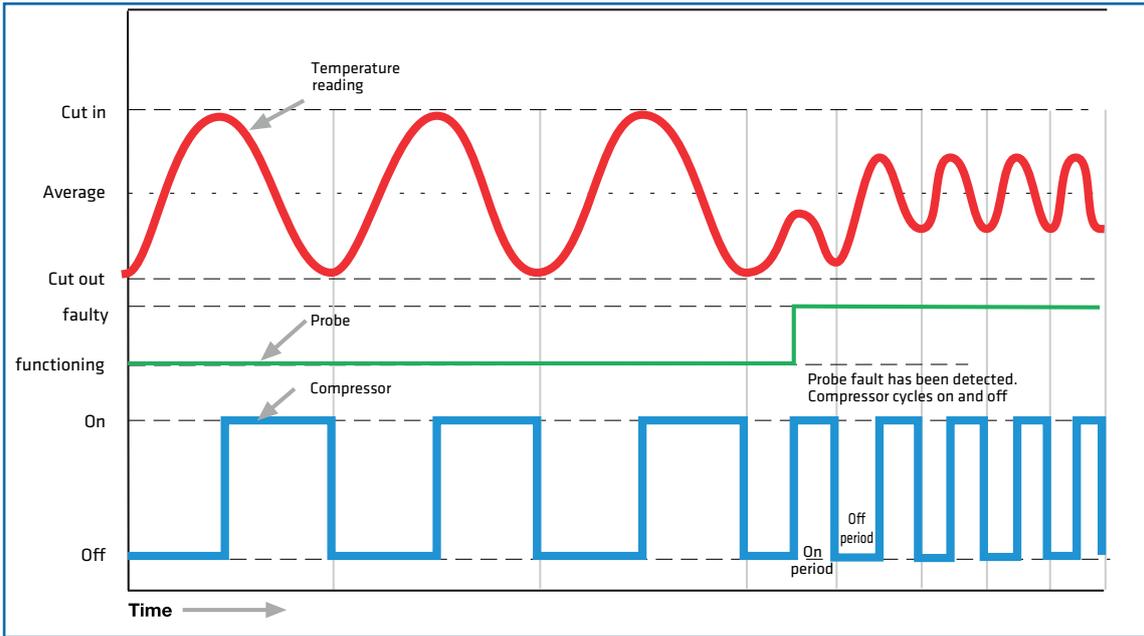
### 7.2 REGULATION PROBE (PROBE#1) ERROR DETECTION

The FCAX3 will report an error code through the LEDs indicating a sensor fault if it happens. Depending on customer preferences the FCAX3 will either:

Scenario One: Detect the fault and disconnect the compressor until the problem is resolved and then the system resumes normal operation.



Scenario Two: Detect the fault and cycle the compressor on and off for a pre-set time regardless of the cooler temperature. Once the problem is resolved the system will resume normal operation.

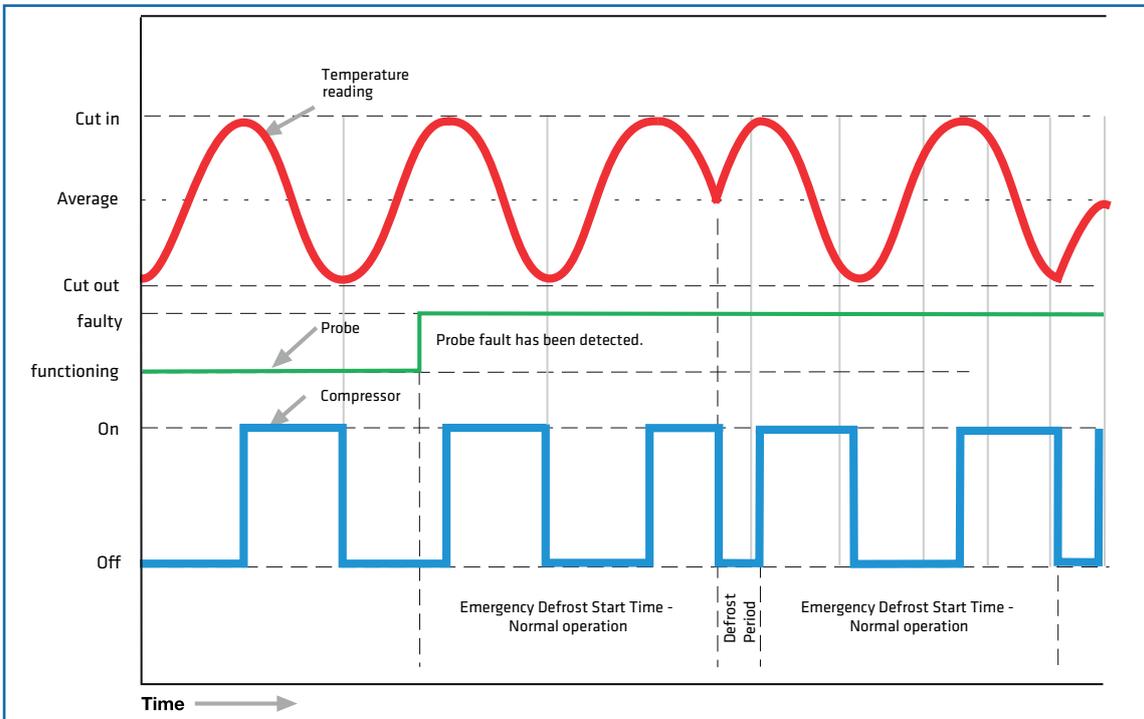


### 7.3 DEFROST PROBE (PROBE#2) ERROR DETECTION - EMERGENCY DEFROST MODE

If the defrost probe is faulty, the FCAX3 will enter emergency defrost mode (if enabled). In emergency defrost mode, the FCAX3 will ignore set defrost parameters and enter a state of continuous defrost cycling based on set parameters.

For example: The emergency defrost start time is set to 1 hour and the emergency defrost end time is set to 20 minutes.

After an hour after a defrost probe fault has been detected, the FCAX3 will enter defrost for 20 minutes before resuming normal operation for 1 hour and so on until the probe fault has been fixed.



### 7.4 INTERNAL FAULT DETECTION

If an internal fault within the FCAX3 is detected, it is reported through the LED indicators. If the fault does not automatically clear and resumes normal operation, then please contact Sollatek for help and advice.



## 8. CONFIGURATION

### 8.1 DESKTOP CONFIGURATION

The desktop configuration Interface is designed to set all refrigeration control parameters of the FCAX3, (see section 9. Parameters for a full list of parameters).

#### 8.1.1 INSTALLATION AND LOGIN

1. Run the .exe file provided by Sollatek.
2. Follow any security notifications to allow your PC to install the software.
3. The installer wizard window will appear on the screen. Follow the on-screen instructions in the wizard and enter the company name and password, as provided by Sollatek.
4. The files and data will be automatically extracted without any user intervention. Progress will be indicated on the status bar within the wizard.
5. Once the desktop configuration Interface has been installed on your computer the wizard will display a success message and the program shortcut will be saved on your desktop.
6. Click Finish to close the wizard window.
7. The desktop configuration Interface can either be opened by searching in the start menu or clicking on the desktop shortcut.



#### 8.1.2 HOME WINDOW

When the desktop configuration interface is opened, the configuration interface window appears. The menu bar includes File, Tools, and Help which have all the options for you to be able to configure / program the FCAX3.

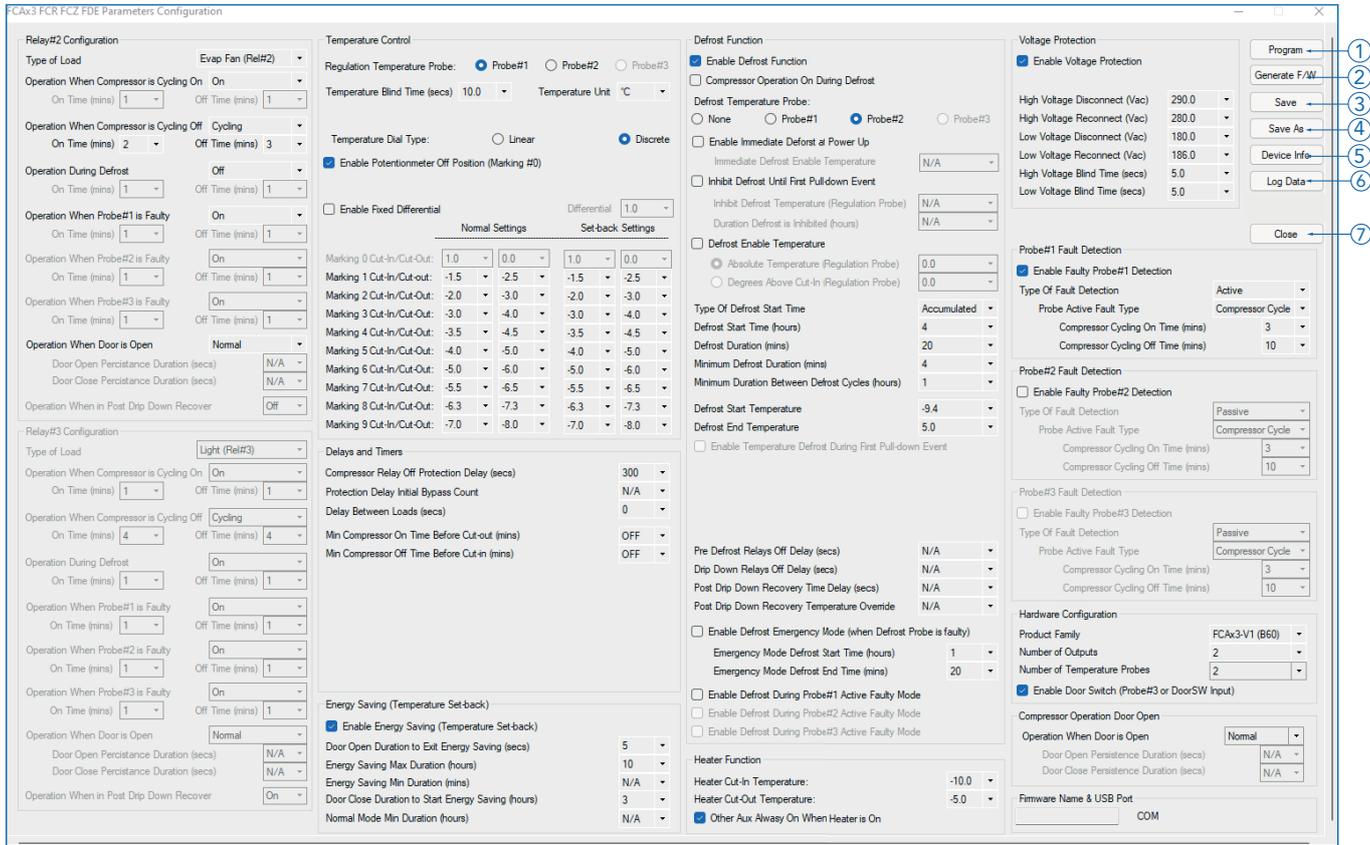


Menu Item	Description
1. File	New - Open a blank configuration where values are set to default. Open - Open a configuration file saved on your PC.
2. Tools	Program - Program an SPP02 with a saved configuration file without loading it into the configuration software.
3. Help	About Programmer - Software details including software version.



### 8.1.3 PARAMETER CONFIGURATION WINDOW

The software is intuitive, so certain options can only be adjusted if a corresponding option is selected for example: Relay #3 configuration will only be accessible if the number of outputs in the hardware configuration is set to 3.



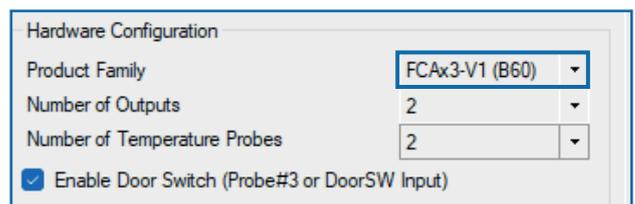
Button	Description
1. Program	Program current configuration & firmware to the SPP02.
2. Generate F/W*	Save the configuration and firmware as program files on your computer. Several files will be saved in the file location of your choice. .s19 & option.s19 files will be used to program the FCAX3. .cfg file is the parameters set in the desktop configuration interface. .stp file can also be used to program the FCAX3.
3. Save	Save the current configuration as a file on your computer. If saving for the first time you must select the file name and location. Thereafter the file will overwrite the existing file.
4. Save As	Save a copy of the current configuration with a different name or different file location on your computer.
5. Device Info	Collect and view device information from a connected controller.
6. Log Data	Collect and save various data points from a connected controller to help debug operational issues
7. Close	Close the parameter configuration window - if changes have been made you will be prompted if you want to save the changes.

\* When you Generate F/W or Save As you will be asked if you want a specification sheet saving. This is a spreadsheet of all the parameters and set values.

### 8.1.4 DEVICE SELECTION

The desktop interface can be used to program multiple Sollatek Controllers. Before proceeding to make any changes to parameters, ensure FCAX3 is selected from the product family menu within the hardware configuration section.

Note: Select the correct version number for the FCAX3 you have, if you are unsure, please contact Sollatek.



### 8.1.5 CONNECT A CONTROLLER TO THE DESKTOP CONFIGURATION INTERFACE



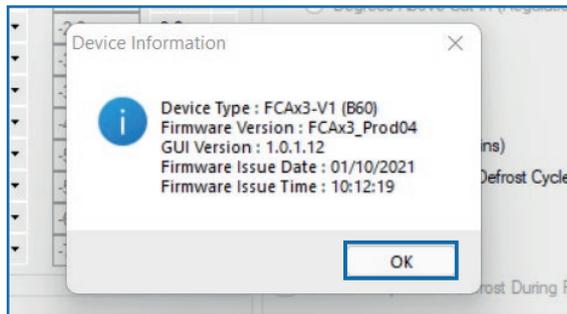
#### **DANGER! ELECTRIC SHOCK HAZARD - LIVE TERMINAL**

This is a non-isolated product. The sensor inputs and outputs are not electrically isolated from the power terminals therefore ALL terminals are energized when the device is powered ON.

1. Connect the FCAX3 interface cable to the micro-USB port on the side of the FCAX3 and the USB port on your computer.  
**WARNING!** Only a Sollatek isolated interface cable is to be used, unapproved or unisolated cables will cause damage to the FCAX3 and the computer.
2. Connect the controller to the mains supply (Live & Neutral), then turn the power ON  
**DANGER!** All terminals are energized - DO NOT touch any of the input or output terminals.
3. Open the FCAX3 Configuration Interface.

#### A. Retrieve Device Information

1. Click the **Device Info** button on the right-hand side of the window.
2. Details from the FCAX3 will be read and a pop-up window will appear when all details have been collected. This may take a few minutes.

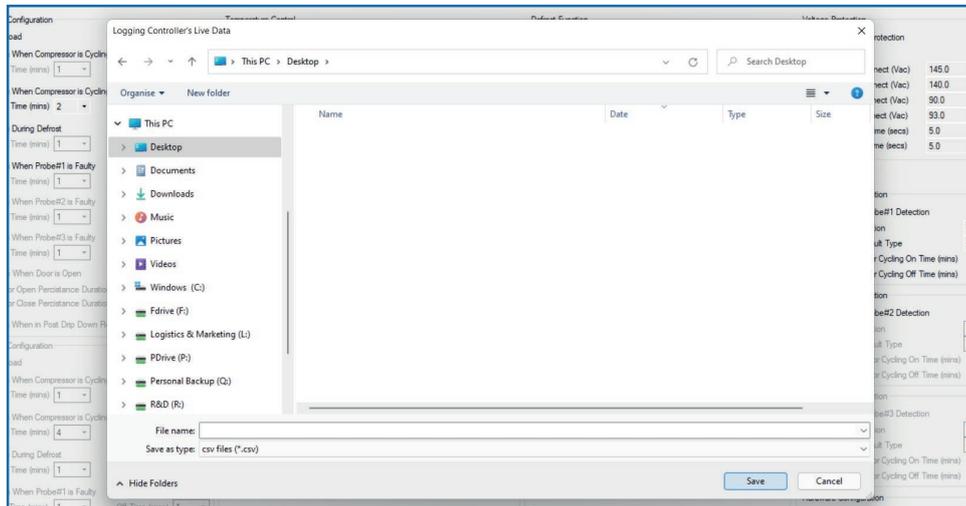


3. Click **Ok** to close the window.

Note: Firmware details and parameters can also be viewed from any FCAX3 via the android FreoUp application. Please refer to the FreoUp manual for details.

#### B. Log Data from the Device

1. Click the **Log Data** button on the right-hand side of the window.
2. The **Save As** window will appear.



3. Select the destination folder you want to save the file.
4. In the "File name" box, enter a name for the file.
5. Click **Save**. Device data will be saved as a CSV file in your chosen location.

## 8.2 REMOTE CONFIGURATION

All controller parameters are configurable via the buttons on a display if connected (view device manuals for more details). Some parameters can be configured via the smart device application.



## 9. PROGRAMMING

FCAx3 firmware and configuration can be updated via the Sollatek Product Programmer device (SPP02).

The SPP02 can be programmed directly from the controller configuration software or the SPP visual programmer (refer to SPP Visual Programmer User Instructions for details on this method) and then uploaded to the FCAx3.



### PROGRAMMING THE SPP02

There are two ways of programming the SPP02 from the Controller Desktop Interface.

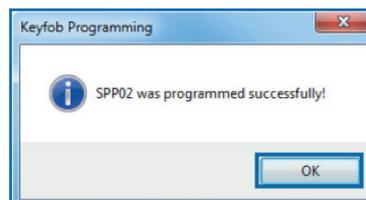
- From the main menu - for quick programming with an existing configuration file.
- From the parameter configuration window - for programming when you have made changes/checked the configuration.

#### Downloading Parameters from the Home window.

1. Open the desktop interface on your PC.
2. Plug the SPP02 into the USB port on your PC.
3. Click Tools > Program. Select a recently saved configuration or alternatively click Browse to search for the required configuration file.

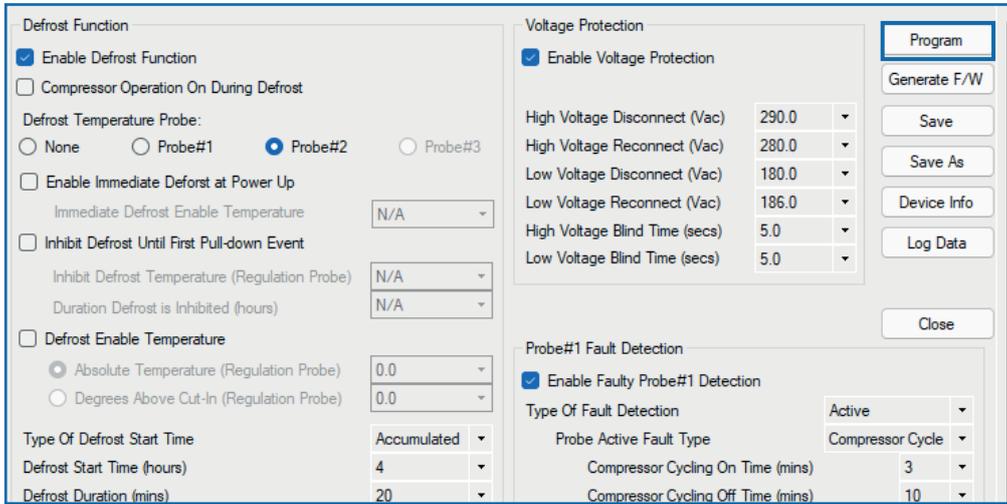


4. If the file is selected from the recent configuration window, then click proceed to start uploading, alternatively select a file from the file window then programming will automatically start when you open the file.
5. During the programming of the SPP02, the green LED labelled  on the SPP02 will light up and remain on as the data is being downloaded.
6. On successful downloading, the green LED will start flashing and then turn OFF. A success message will also appear on the screen. Click OK to close the message box. The SPP02 can now be removed from the computer.

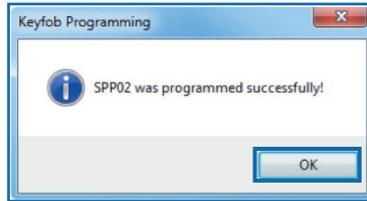


**Downloading Parameters from the Parameter Configuration Window.**

1. Open and edit/create a configuration to match your requirement.
2. Plug the SPP02 into the USB port in your computer, if plugging in for the first time please wait for all the drivers to be installed before proceeding, this may take several minutes.
3. Click the Program button in the top right corner of the parameter configuration window.



4. During the programming of the SPP02, the LED on the SPP02 will light up and remain on as the data is being downloaded.
5. On successful downloading, the LED will start flashing and then turn OFF. A success message will also appear on the screen.
6. Click OK to close the message box. The SPP02 can now be removed from the computer.



**PROGRAMMING THE FCAX3**



**DANGER! ELECTRIC SHOCK HAZARD - LIVE TERMINAL**

This is a non-isolated product. The sensor inputs and outputs are not electrically isolated from the power terminals therefore the supply **MUST** be disconnected from the controller before programming the device. This Equipment is to be serviced by trained personnel only.

1. Connect the mini-USB connector of the SPP02 to the mini-USB port on the extension cable.
2. Remove the rubber dust cover from the micro-USB port on the FCAX3. Connect the micro-USB connector of the extension cable to the Micro-USB port on the FCAX3.
3. Press the button on the side of the SPP02 programmer. The LED on the SPP02 will light up and will remain on as the FCAX3 is being programmed. The LED on the FCAX3 will also light up.
4. On Completion the LED on the SPP02 will start flashing and turn OFF. The FCAX3 LED will also turn OFF.
5. Unplug the SPP02 and extension cable from the unit. Replace the cover on the micro-USB port. Reconnect mains to the FCAX3. The FCAX3 is now ready for use.

*Note: If you have any problems during programming or want to use the SPP Visual software to upload to the SPP02, then please refer to the SPP02 Visual Programmer User Instructions for more details and troubleshooting.*



## 10. PARAMETERS

### 10.1 HARDWARE CONFIGURATION

DESCRIPTION	UNIT	RANGE
Number of Outputs	Number	1, 2 or 3
Number of Temperature Probes	Number	1, 2 or 3
Enable Door Switch		Yes or No

#### Number of Outputs

Select the number of connected outputs.

- 1 = Compressor
- 2 = Compressor + Aux 1
- 3 = Compressor + Aux 1 + Aux 2

#### Number of Temperature Probes

Select the number of connected temperature probes.

- 1 = Connect regulating probe to P1.
- 2 = Connect regulating probe to P1 and probe to P2.
- 3 = Connect regulating probe to P1 a probe to P2 and a probe to D-Sw.

*Note: If three probes are required, the door switch should be disabled.*

#### Enable Door Switch

Select whether a door switch is connected (the door switch should be fitted to P2).

No = Door switch is disabled.

Yes = Door switch is enabled. You will now be able to set compressor actions based on a door event. Probe #3 will become de-active.

### 10.2 RELAY CONFIGURATION (RELAY #2/#3)

DESCRIPTION	UNIT	RANGE
Type of Load		Compressor, Evap Fan, Cond Fan, Light, Heater, Other
Operation When Compressor is On		On, Off, Cycling, Heater, Light Control
Cycling On Time (mins)	Minutes	1 to 255
Cycling Off Time (mins)	Minutes	1 to 255
Operation When Compressor is Off		On, Off, Cycling, Heater, Light Control
Cycling On Time (mins)	Minutes	1 to 255
Cycling Off Time (mins)	Minutes	1 to 255
Operation During Defrost		On, Off, Cycling, Heater, Light Control
Cycling On Time (mins)	Minutes	1 to 255
Cycling Off Time (mins)	Minutes	1 to 255
Operation When Probe#1 if Faulty		On, Off, Cycling, Heater, On/Cycling, Same as Comp, Light Control
Cycling On Time (mins)	Minutes	1 to 255
Cycling Off Time (mins)	Minutes	1 to 255
Operation When Probe#2 if Faulty		On, Off, Cycling, Heater, On/Cycling, Same as Comp, Light Control
Cycling On Time (mins)	Minutes	1 to 255
Cycling Off Time (mins)	Minutes	1 to 255
Operation When Probe#3 if Faulty		On, Off, Cycling, Heater, On/Cycling, Same as Comp, Light Control
Cycling On Time (mins)	Minutes	1 to 255



Cycling Off Time (mins)	Minutes	1 to 255
Operation When Door is Open	Normal, Off, ON	
Door Open Response Time (secs)	Seconds	N/A, 1 to 255
Door Close Response Time (secs)	Seconds	N/A, 1 to 255
Operation When in Post Drip Down Recovery	On or Off	

### Type of Load

Select the type of load connected to the relay.

#### Operation When Compressor is ON

Select the operation of the relay when the compressor is ON.

On = Relay will turn ON (if OFF) and remain ON when the compressor is ON.

Off = Relay will turn OFF (if ON) and remain OFF when the compressor is ON.

Cycling = Relay will cycle ON / OFF for the defined periods while the compressor is ON.

Heater = Relay will turn ON (if OFF) when the temperature is less than the heater cut-in value and turn OFF (if ON) when the temperature is more than the heater cut-out value during compressor ON.

Light Control = Relay will turn ON (if OFF) when the compressor is ON during normal mode but will turn OFF (if ON) when the compressor is ON during energy-saving mode.

##### Cycling ON Time

The duration the relay will turn ON for while the compressor is ON. After this, the relay will turn OFF.

##### Cycling OFF Time

The duration the relay will turn OFF for while the compressor is ON. After this, the relay will turn ON.

#### Operation When Compressor is OFF

Select the operation of the relay when the compressor is OFF.

On = Relay will turn ON (if OFF) and remain ON when the compressor is OFF.

Off = Relay will turn OFF (if ON) and remain OFF when the compressor is OFF

Cycling = Relay will cycle ON / OFF for the defined periods while the compressor is OFF.

Heater = Relay will turn ON (if OFF) when the temperature is less than the heater cut-in value and turn OFF (if ON) when the temperature is more than the heater cut-out value during Compressor OFF.

Light Control = Relay will turn ON (if OFF) when the compressor is OFF during normal mode but will turn OFF (if ON) when the compressor is OFF during energy-saving mode.

##### Cycling ON Time

The duration the relay will turn ON for while the compressor is OFF. After this, the relay will turn OFF.

##### Cycling OFF Time

The duration the relay will turn OFF for while the compressor is OFF. After this, the relay will turn ON.

#### Operation During Defrost

Select the operation of the relay during defrost mode.

ON = Relay will turn ON (if OFF) and remain ON during defrost mode.

OFF = Relay will turn OFF (if ON) and remain OFF during defrost mode.

Cycling = Relay will cycle ON / OFF for the defined periods during defrost mode.

Heater = Relay will turn ON (if OFF) when the temperature is less than the heater cut-in value and turn OFF (if ON) when the temperature is more than the heater cut-out value during defrost.

Light Control = Relay will turn ON (if OFF) during defrost mode in normal mode but will turn OFF (if ON) during defrost in energy-saving mode.

##### Cycling ON Time

The duration the relay will turn ON during defrost mode. After this, the relay will turn OFF.

##### Cycling OFF Time

The duration the relay will turn OFF during defrost mode. After this, the relay will turn ON.

#### Operation When Probe#1/2/3 Faulty

Select the operation of Relay #2 when a probe is faulty.



ON = Relay will turn ON (if OFF) and remain ON until the probe fault has been fixed.  
 OFF = Relay will turn OFF (if ON) and remain OFF until the probe fault has been fixed.  
 Cycling = Relay will cycle ON / OFF for the defined periods until the probe fault has been fixed.  
 Heater = Relay will turn ON (if OFF) when the temperature is less than the heater cut-in value and turn OFF (if ON) when the temperature is more than the heater cut-out value until the probe fault has been fixed.  
 On/Cycling = Relay will be ON when the compressor is ON. When the compressor is OFF, the relay will cycle ON / OFF for the defined periods until the probe fault has been fixed.  
 Same as Comp = Relay will operate the same as the compressor until the probe fault has been fixed.  
 Light Control = Relay will turn ON (if OFF) when probe is faulty in normal mode but will turn OFF (if ON) when probe is faulty in energy-saving mode.

**Cycling ON Time**

The duration the relay will turn ON for while the probe is faulty. After this, the relay will turn OFF.

**Cycling OFF Time**

The duration the relay will turn OFF for while the probe is faulty. After this, the relay will turn ON.

**Operation When Door is Open**

Select the operation of the relay when a door event occurs.

Normal = Relay will ignore the door event and operate as defined with the compressor.

Off = Relay will turn OFF (if ON) and remain OFF until the door has been closed. It will then resume normal operation depending on the FCAX3 mode.

On = Relay will turn ON (if OFF) and remain ON until the door has been closed. It will then resume normal operation depending on the FCAX3 mode.

**Door Open Response Time**

The minimum duration for the door to remain open before the relay will turn OFF or ON.

**Door Close Response Time**

The duration for the door to remain closed before the relay will resume normal operation.

**Operation When in Post Drip Down Recovery**

Select the operation of the relay when the FCAX3 is in Post Drip Down Recovery mode.

ON = Relay will turn ON (if OFF) and remain ON during Post Drip Down Recovery mode.

OFF = Relay will turn OFF (if ON) and remain OFF during Post Drip Down Recovery mode.

**10.3 TEMPERATURE CONTROL**

DESCRIPTION	UNIT	RANGE
Regulation Temperature Probe	Probe#1, Probe#2 or Probe#3	
Temperature Blind Time (secs)	Seconds	0 to 125
Temperature Unit	°C or °F	
Temperature Dial Type	Linear or Discrete	
Enable Potentiometer Off Position (Marking 0)	Yes or No	
Enable Fixed Differential	Yes or No	
Differential	°C / °F	0 to 10°C / 0 to 18°F
<b>Normal Setting</b>		
Cut-in Temp (marking 0 to 9)	°C / °F	-40 to +45°C / -40 to +113°F
Cut-out Temp (marking 0 to 9)	°C / °F	-40 to +45°C / -40 to +113°F
<b>Set-back Setting</b>		
Cut-in Temp (marking 0 to 9)	°C / °F	-40 to +45°C / -40 to +113°F
Cut-out Temp (marking 0 to 9)	°C / °F	-40 to +45°C / -40 to +113°F



### Regulation Temperature Probe

Select the temperature probe used as the regulation temperature probe.

Probe 1 = Probe connected to P1.

Probe 2 = Probe connected to P2. Only available if 2 is selected from "Number of Temperature Probes".

Probe 3 = Probe connected to D-SW. Only available if 3 is selected from "Number of Temperature Probes".

### Temperature Blind Time

The duration that the regulation temperature probe reading will be ignored after the compressor switches ON.

### Temperature Unit

Select the temperature unit used by the FCAX3.

°C = Degree Celsius

°F = Degree Fahrenheit

*Note: Once a temperature range has been selected, all temperature values will be converted accordingly. If a display is connected to the FCAX3, the display by default will display the temperature in this value.*

### Temperature Dial Type

Select how the FCAX3 acts when the dial is set between values.

Linear = Temperature range will be continuous. When the dial is between two values the controller will respond to approximate cut-in/cut-out values between the set values or the corresponding markings.

Discrete = Temperature dial will be fixed. The controller will only respond to set values. When the controller is between values the controller will respond to cut-in/cut-out values of the mark which is closer to the set position.

### Enable Potentiometer Off Position (Marking 0)

Select the operation of the FCAX3 when the dial position is set to OFF (marking 0).

No = OFF is disabled. The FCAX3 controller will use the OFF position as an extra Cut-in / Cut-out setting using values set in marking 0.

Yes = OFF position is enabled. FCAX3 controller will turn relays OFF when set in the OFF position and will resume off until the dial is adjusted to another value.

### Enable Fixed Differential

Select the Cut-in temperature selection setting.

No = Fixed differential is disabled. Cut-in and cut-out temperatures will be individually settable.

Yes = Fixed differential is enabled. The differential between cut-in and cut-out temperature will be fixed for all markings. Cut-in temperatures will be set automatically based on selected cut-out temperatures for each marking.

#### Differential

The differential value between the cut-out temperature and the cut-in temperature for all dial markings.

### Normal Setting Temperature Cut-Out

The temperature at which the compressor will turn OFF when the system is running in Normal mode. The compressor will remain ON until the temperature reaches the Cut-Out temperature.

### Normal Setting Temperature Cut-In

The temperature at which the compressor will turn ON when the system is running in Normal mode. If the temperature is below this value, the compressor will remain OFF.

### Set-back Settings Temperature Cut-Out

The temperature at which the compressor will turn OFF when the system is running in Set-back (energy saving) mode. The compressor will remain ON until the temperature reaches the Cut-Out temperature.

### Set-back Settings Temperature Cut-In

The temperature at which the compressor will turn ON when the system is running in Set-back (energy saving) mode. If the temperature is below this value, the compressor will remain OFF.



## 10.4 ENERGY SAVING (TEMPERATURE SET-BACK)

DESCRIPTION	UNIT	RANGE
Enable Energy Saving (Temperature Set-back)		Yes or No
Door Open Duration to Exit Energy Saving (secs)	Seconds	N/A, 1 to 60
Energy Saving Max Duration (hours)	Hours	N/A, 1 to 24
Energy Saving Min Duration (mins)	Minutes	N/A, 1 to 240
Door Close Duration To Start Energy Saving (hours)	Hours	N/A, 2 to 8
Normal Mode Min Duration (hours)	Hours	N/A, 1 to 24

### Enable Temperature Set-back

Select whether Temperature Setback is active. Setback is an energy-saving feature by setting higher cut-in/cut-out values, therefore reducing the cooling demand required from the compressor.

No = Temperature setback is disabled. The FCAX3 will only operate in normal mode. All other set-back parameters will be de-active.

Yes = Temperature set-back is enabled. Based on set parameters, the FCAX3 will automatically switch between normal mode and setback mode to save energy.

### Door Open Duration to Exit Energy Saving

The minimum duration of a door open event, whilst in set-back mode before the FCAX3 will revert to normal mode.

### Energy Saving Max Duration

The maximum duration that the FCAX3 will remain in set-back mode before reverting to normal mode cut-in and cut-out temperature values.

### Energy Saving Min Duration

The minimum duration that the FCAX3 will remain in set-back mode before reverting to normal mode. Regardless of a door-open event, if the set time has not been satisfied, the FCAX3 will remain in energy-saving mode.

### Door Close Duration to Start Energy Saving

The duration, without any door activity before the FCAX3 will enter set-back mode.

### Normal Mode Min Duration

The minimum duration that the FCAX3 must be in normal mode before allowing energy-saving mode to initiate. After this time has elapsed, and Door Close Duration to Start Energy Saving has been respected, the FCAX3 will enter energy-saving mode.

For example: Normal Mode Min Duration is set to 6 hours ; Door Close Duration to Start Energy Saving is set to 2 hours.

After 3 hours of operation in normal mode, there is no door activity for 2 hours. The FCAX3 will resume in normal mode as the Normal Mode Min Duration has not been met. After 6 hours and no more door openings, the cooler will immediately enter energy-saving mode as both Normal Mode Min Duration and Door Close Duration to Start Energy Saving have been satisfied.

## 10.5 DELAYS AND TIMERS

DESCRIPTION	UNIT	RANGE
Compressor Relay Off Protection Delay (secs)	Seconds	0 to 600
Protection Delay Initial Bypass Count	Number	N/A, 1 to 60
Delay Between Loads (secs)	Seconds	0 to 60
Min Compressor On Time Before Cut-out	Minutes	OFF, 1 to 255
Min Compressor Off Time Before Cut-in	Minutes	OFF, 1 to 255

### Compressor Relay OFF Protection Delay

The minimum time the compressor must be OFF, before turning ON. If the compressor is OFF for longer than the set duration, then this delay will not be added before switching the compressor ON.

*Note: Protection delay must be satisfied whenever the compressor is switched off regardless of the reason (high/low voltage, temperature below cut-out, defrost, faulty probe, power down, etc).*

### Protection Delay Initial Bypass Count (for use in testing only)



The number of controller start-ups, in which the Compressor Relay OFF Protection Delay will be ignored. This will result in the compressor turning ON as soon as the FCAX3 is powered up.

*Note: The Compressor Relay OFF Protection Delay will still be respected during operation.*

### Delay Between Loads

The minimum time delay between one relay turning ON and another being allowed to turn ON.

### Min Compressor On Time Before Cut-out

The minimum duration the compressor must be ON before being allowed to turn OFF even if the temperature drops below the set cut-out value.

### Min Compressor Off Time Before Cut-in

The minimum duration the compressor must be OFF before being allowed to turn ON even if the temperature rises above the set cut-in value.

*Note: Compressor OFF Time must be satisfied when the compressor switches off due to the temperature only. Compressor Off Protection Delay and Compressor Off Time must be satisfied in this instance so the controller will remain off until the timer with the longest set time has elapsed.*

## 10.6 DEFROST FUNCTION

DESCRIPTION	UNIT	RANGE
Enable Defrost Function		Yes or No
Compressor Operation On During Defrost		Yes or No
Defrost Temperature Probe		None, Probe#1, Probe#2, or Probe#3
Enable Immediate Defrost at Power Up		Yes or No
Immediate Defrost Enable Temperature	°C / °F	N/A, 0 to 25°C / 32 to 77°F
Inhibit Defrost Until First Pull-down Event		Yes or No
Inhibit Defrost Temperature (using Regulation Probe)	°C / °F	N/A, 0 to 25°C / 32 to 77°F
Duration Defrost is Inhibited (hours)	Hours	N/A, 1 to 255
Defrost Enable Temperature		Yes or No
Absolute Temperature (using Regulation Probe)	°C / °F	N/A, -40 to +45°C / -40 to 113°F
Degrees Above Cut-In (using Regulation Probe)	°C / °F	N/A, 0 to 20°C / 0 to 36°F
Type of Defrost Start Time		Real, Accumulated or Continuous
Defrost Start Time (hours)	Hours	N/A, 1 to 255
Defrost Duration (mins)	Minutes	N/A, 1 to 255
Minimum Defrost Duration (mins)	Minutes	N/A, 1 to 255
Minimum Duration Between Defrost Cycles (hours)	Hours	N/A, 1 to 255
Defrost Start Temperature	°C / °F	N/A, -40 to +45°C / -40 to 113°F
Defrost End Temperature	°C / °F	N/A, -40 to +45°C / -40 to 113°F
Enable Temperature Defrost During First Pull-down		Yes or No
Pre-Defrost Relays Off Delay	Seconds	N/A, 1 to 255
Drip Down Relays Off Delay	Seconds	N/A, 1 to 255
Post Drip Down Recover Time Delay	Seconds	N/A, 1 to 255
Post Drip Down Recover Temperature Override	°C / °F	N/A, -40 to +45°C / -40 to 113°F
Enable Defrost Emergency Mode (when defrost probe is faulty)		Yes or No
Emergency Mode Defrost Start Time (hours)	Hours	N/A, 1 to 255
Emergency Mode Defrost End Time (mins)	Minutes	N/A, 1 to 255
Enable Defrost During Probe#1 Active Faulty Mode		Yes or No
Enable Defrost During Probe#2 Active Faulty Mode		Yes or No
Enable Defrost During Probe#3 Active Faulty Mode		Yes or No



### Enable Defrost Function

Select whether defrost is active.

No = Defrost is disabled. All defrost parameters become de-active and the FCAX3 will not go into defrost.

Yes = Defrost is enabled. FCAX3 will act according to the set parameters.

### Compressor Operation On During Defrost

Select if the compressor is ON during defrost mode.

No = Compressor will turn OFF (if ON) and remain OFF during defrost.

Yes = Compressor will turn ON (if OFF) and remain ON during defrost (for Hot Gas defrost).

### Defrost Temperature Probe

Select the temperature probe used to determine the defrost by temperature function.

None = Defrost will start and end with time only.

Probe 1 = Regulating probe connected to P1.

Probe 2 = Probe connected to P2. Only available if 2 is selected from "Number of Temperature Probes".

### Enable Immediate Defrost at Power Up

Select whether defrost is entered immediately when the FCAX3 is powered ON.

No = FCAX3 will operate normally on power-up according to set parameters and will only enter defrost when other defrost conditions are satisfied.

Yes = Defrost starts on power-up depending on the Immediate Defrost Enable Temperature.

#### Immediate Defrost Enable Temperature

The maximum temperature sensed by the defrost probe at power-up for defrost to be entered. If set to N/A, the FCAX3 will enter defrost mode at power-up regardless of the defrost temperature.

*Note: Immediate defrost will not terminate with defrost end temperature, it will ONLY be terminated when defrost duration has been satisfied. If the defrost duration is set to N/A, immediate defrost will terminate after 10 minutes.*

*Note: Immediate defrost is intended for production tests only and not for field operation. Ensure this is disabled for field units.*

### Inhibit Defrost until First Pull-down Event

Select whether defrost is enabled during the first pull-down event. The First pull-down event finishes when the compressor cycles OFF for the first time due to the temperature dropping below the cut-out value.

No = Defrost is enabled. Defrost can take place during the first pull-down event if defined defrost conditions are met.

Yes = Defrost is disabled. Defrost will not take place until the first pull-down event has finished.

#### Inhibit Defrost Temperature (using Regulation Probe)

The regulation temperature sensed after a power-up event, below which defrost will not be inhibited anymore.

#### Duration Defrost is inhibited

The duration of the first pull-down event and therefore the period of defrost will be inhibited. After this time the FCAX3 will resume normal operation and defrost will be enabled as per the set parameters.

### Defrost Enable Temperature

Select whether defrost is disabled depending on the regulation probe temperature.

No = Defrost is enabled regardless of the regulation probe and will be initiated by the set parameters.

Yes = Defrost will be disabled if the regulation temperature is above the set temperature even if other defrost parameters are satisfied. If the regulation temperature is below the set value, defrost will be initiated as normal.

#### Absolute Temperature (using Regulation Probe)

The maximum regulation temperature before the defrost function is disabled.

#### Degrees Above Cut-in (using Regulation Probe)

The temperature differential between the cut-in temperature and the regulation temperature that the defrost function will be disabled.

### Defrost Start Timer Type

Select the type of timer to start a defrost cycle.

rEL: Real-Time = The defrost start time will continuously count regardless of whether the compressor is ON or OFF and the defrost will start when the timer value exceeds the value of Defrost Start Time (if enabled).

aCC: Accumulated Time = The defrost start timer will count only when the compressor is ON and stops counting (not resetting)



when the compressor is OFF, resulting in counting the accumulated durations during which the compressor has been ON. The defrost will start when the timer value exceeds the value of Defrost Start Time (if enabled).

Cnt: Continuous Timer = The defrost start timer will count only when the compressor is ON and resets to zero whenever the compressor is OFF. The defrost will start when the timer value exceeds the value of Defrost Start Time (if enabled).

#### **Defrost Start Time**

The duration between the finish of a defrost cycle and the start of the next one, if not started due to temperature.

#### **Defrost Duration**

The duration of a defrost cycle, if not ended due to temperature.

#### **Minimum Defrost Duration**

The minimum allowable time for a defrost cycle. The Defrost cycle will not end until this time has elapsed regardless of whether Defrost End Time or Defrost End Temperature has been met.

#### **Minimum Duration Between Defrost Cycles**

The minimum allowable time between the finish of one defrost cycle and the start of the next defrost cycle. The next defrost cycle will not start until this time has elapsed regardless of whether Defrost Start Time or Defrost Start Temperature has been met.

#### **Defrost Start Temperature**

The temperature that a defrost cycle will be initiated, assuming the FCAX3 has satisfied the "minimum Duration Between Defrost Cycles" value. This will only be respected if the defrost probe is not faulty.

#### **Defrost End Temperature**

The temperature at which the defrost cycle will terminate, assuming the FCAX3 has been in defrost for longer than the "minimum Defrost Duration" value. This will only be respected if the defrost probe is not faulty.

#### **Enable Temperature Defrost During First Pull-Down**

Select if the FCAX3 goes into defrost when first powered up.

No: Defrost ON start-up is disabled. FCAX3 will only enter defrost according to other set defrost parameters.

Yes: Defrost will initiate once the FCAX3 is powered up.

#### **Pre-Defrost Relays Off Delay**

The duration between defrost start parameters being satisfied (temperature or time) and the FCAX3 entering defrost mode. During this time the compressor will turn OFF and the outputs will act accordingly to the compressor OFF configuration.

#### **Drip Down Relays Off Delay**

The duration after the defrost end parameters have been satisfied before the FCAX3 will enter Drip Down Recovery Mode. During this period the compressor and outputs will be OFF.

#### **Post Drip Down Recover Time Delay**

The duration for the FCAX3 to remain in Drip Down Recover mode before Resuming normal operation. During Drip Down Recover the compressor will turn ON and the other outputs will operate accordingly to the configuration.

#### **Post Drip Down Recover Temperature Override**

The temperature at which post drip down recover mode will terminate, if not ended due to time.

#### **Enable Defrost Emergency Mode (when defrost probe is faulty)**

Select whether the emergency defrost is active.

No = Emergency defrost is disabled. FCAX3 will resume respecting set defrost parameters.

Yes = Emergency defrost is enabled. FCAX3 will respect the below parameters.

##### **Emergency Mode Defrost Start Time**

The duration between the start of a defrost and the start of the next defrost when the defrost probe is faulty.

##### **Emergency Mode Defrost End Time**



The duration of defrost during emergency defrost.

#### Enable Defrost During Probe#1/#2/#3 Active Faulty Mode

Select if defrost is enabled when probe #1 is faulty and Probe #1 "Type of Fault Detection" is set to Active.

No = Defrost is disabled. Defrost will not occur during probe fault regardless of if defrost parameters are satisfied.

Yes = Defrost is enabled. Defrost will occur when defrost parameters are satisfied.

### 10.7 VOLTAGE PROTECTION

DESCRIPTION	UNIT	RANGE
Enable Voltage Protection		Yes or No
High Voltage Disconnect (Vac)	Vac	75 to 300
High Voltage Reconnect (Vac)	Vac	75 to 300
Low Voltage Disconnect (Vac)	Vac	75 to 300
Low Voltage Reconnect (Vac)	Vac	75 to 300
High Voltage Blind Time (secs)	Seconds	0 to 25
Low Voltage Blind Time (secs)	Seconds	0 to 25

#### Enable Voltage Protection Feature

Select whether voltage protection is active.

No = Voltage protection is disabled. All other voltage protection parameters become de-active and FCAX3 will not respond to High or Low Voltage.

Yes = Voltage Protection is enabled. FCAX3 will act according to set parameters.

#### High Voltage Disconnect

The maximum allowable voltage before the FCAX3 disconnects power to all the outputs.

#### High Voltage Reconnect

The voltage, which the FCAX3 will reconnect power to all the outputs after a High Voltage Disconnect event.

#### Low Voltage Disconnect

The minimum allowable voltage before the FCAX3 disconnects power to all the outputs.

#### Low Voltage Reconnect

The voltage, which the FCAX3 will reconnect power to all the outputs after a Low Voltage Disconnect event.

#### High Voltage Blind Time

The duration that the voltage must be higher/lower than the High Voltage Disconnect/High Voltage Reconnect before disconnecting/reconnecting power to the compressor and outputs.

#### Low Voltage Blind Time

The duration that the voltage must be lower/higher than the Low Voltage Disconnect/Low Voltage Reconnect before disconnecting/reconnecting power to the compressor and outputs.

### 10.8 DOOR SWITCH OPERATION

DESCRIPTION	UNIT	RANGE
Compressor Operation When Door Switch is Open		Normal or Off
Door Switch Open Persistence Duration (secs)	Seconds	N/A, 1 to 255
Door Switch Close Persistence Duration (secs)	Seconds	N/A, 1 to 255

#### Compressor Operation when Door Switch is Open

Select the compressor operation when a door event occurs.



Normal = The compressor ignores the door event and resumes normal operation.

OFF = The compressor will turn OFF and remain OFF during a door open event. When the door is closed, the compressor will resume normal operation.

**Door Switch Open Persistence Duration**

The duration that the door remains open before the compressor will switch OFF. If the door is open for less than the set value, the compressor will resume normal operation.

**Door Switch Close Persistence Duration**

The duration for the door to remain closed after a door open event before the compressor will turn back ON.

**10.9 HEATER FUNCTION**

DESCRIPTION	UNIT	RANGE
Heater Cut-In Temperature	°C / °F	N/A, -40 to +45°C / -40 to 113°F
Heater Cut-Out Temperature	°C / °F	N/A, -40 to +45°C / -40 to 113°F
Enable Other Aux Always On When Heater is On		Yes or No

*Note: The heater function will only be enabled if Relay #2 or #3 is configured to operate in heater mode during any of their operation modes (operation when compressor is cycling on/ operation when compressor is cycling off/ operation during defrost/ operation when probe#1 is faulty/ operation when probe#2 is faulty/ is set to "heater").*

**Heater Cut-in Temperature**

The temperature at which the heater will turn ON. If the temperature is below this value, the heater will remain OFF.

**Heater Cut-Out Temperature**

The temperature at which the heater will turn OFF. The heater will remain ON until the temperature reaches the Cut-Out temperature.

**Enable Other Aux Always On When Heater is On**

Select whether the other connected output will always be ON when the heater relay is ON.

No = Output will resume normal operation based on set parameters (relay configuration).

Yes = Output will turn ON and remain ON while the heater is ON.

**10.10 PROBE FAULT DETECTION (PROBE #1/#2/#3)**

DESCRIPTION	UNIT	RANGE
Enable Faulty Temperature Probe Detection		Yes or No
Type of Fault Detection		Active or Passive
Probe Active Fault Detection		Compressor Off or Cycle
Compressor Cycling On Time	Minutes	1 to 255
Compressor Cycling Off Time	Minutes	1 to 255

**Enable Faulty Temperature Probe Detection**

Select whether the FCAX3 detects for probe fault.

No = Probe fault detection disabled. FCAX3 will operate according to normal settings.

Yes = Probe fault detection enabled. FCAX3 will act according to set parameters.

**Type of Fault Detection**

Select the compressor operation when a fault is detected.

Active = The compressor will operate according to set parameters.

Passive = Fault will be indicated through the LED. FCAX3 will operate according to normal settings.

**Probe Active Fault Detection**

Select the compressor operation during an Active Fault Detection.

Compressor OFF = Compressor will turn OFF (if ON) and remain OFF until the probe fault has been fixed.

Compressor Cycle = Compressor will cycle ON and OFF for defined periods to maintain cooling.



## 11. SPECIFICATION

<b>REFRIGERATION CONTROL</b>			
Temperature Control Method	Air or evaporator		
Temperature Control Range	-40 to +45°C (-40 to +113°F)		
Temperature Time Delay	1 to 125 s		
Defrost control	Timed, Active or Manual		
Advanced Defrost Mode	Pre/Post Derost, Emergency Defrost		
Energy Saving	Temperature Set-back, Fan Cycling		
Input Type	Temperature Sensor & Door Switch		
Temperature Probe Type	100 KΩ NTC ( $\beta_{25/50}$ : 3990 k)		
Output control	Compressor, Lights, Evaporator Fan, Reverse Fan, or Heater		
Relays	FCA13 Compressor Only	FCA22 Compressor + Aux1	FCA32 Compressor + Aux1 + Aux2
Output Relay Ratings	UL 60730		IEC 60730
Compressor Relay	Motor Load 75-240 Vac 10 FLA 60 LRA 30k cycles Motor Load 75-120 Vac 12 FLA 72 LRA 30k cycles		16 A, 250 V
Aux1 (Relay #2)	Motor Load 75-240 Vac 1.5 FLA 9LRA 30k cycles		5 A, 250 V
Aux2 (Relay #3)	Resistive Load 75-240 Vac 5A, 50k cycles		5 A, 250 V
Intelligent Time Delay	0 to 600 s		
Refrigerant Compatibility	CO <sub>2</sub> & Hydrocarbon		
<b>BLUETOOTH &amp; BATTERY</b>			
Type/version	BLE 4.1		
RF Power Output	-20 dBm to +4 dBm		
Frequency	2.4 GHz ISM		
Connectivity	Eddystone, iBeacon & connection to the Sollatek Smart Device Application		
Bluetooth Standard	IEEE 802.15.1		
Battery Type	Rechargeable Lithium polymer		
Nominal Voltage	3 V		
Capacity	5.5 mAh		
Typical Run Time From a Single Charge	RTC Only: Approx. 15 days RTC + BLE Advertising: Approx. 10 days		
Memory Size	Internal memory for storage of approximately 11,000 events		
<b>USER INTERFACE</b>			
Temperature Control Dial	OFF, 1 to 9		
LEDs	3 x LEDs (Red, Yellow, Green)		
<b>POWER &amp; VOLTAGE PROTECTION</b>			
Operating Voltage Range	75 to 240 V		
Withstand Voltage	Up to 450 V		
Working Frequency	Auto-sense 50/60 Hz		
Type of Protection	High / Low voltage, Spike / Surge & Frequency		
High / Low Voltage Blind time	0 to 25 s		
Rated Impulse Voltage	2.5 kV		
Over voltage category	Category II		
<b>CONNECTOR / INTERFACE</b>			
Input Connector	3 pairs of 0.11" (2.80 mm) Fast-On		
Output connector	Up to 5 x 0.25" (6.35 mm) Fast-On (depending on model)		



Data / Programming	Micro USB-B
<b>ENVIRONMENTAL</b>	
IP Rating	Electronics: IP65 (PCB Encapsulated)
Operating Temperature	0 to +50°C (32 to +122°F)
Operating Humidity	<90% RH non-condensing
Storage Temperature	-40 to +60°C (-40 to +140°F)
<b>CERTIFICATION / STANDARDS</b>	
Product Certification	CE, UL60730-1 and UL60730-2-9 (file no: E242907), IEC 60730-1, IEC 60730-2-9, Hazloc approved, ANSI 2-2018
Disconnection Type	Type 1.B
Flammability	UL94 V-0 @ 0.8 mm, GWFI: 960°C, GWIT: 850°C
EMC	Per EN 301 489-1, EN 301 489-7, EN 301 489-17
Pollution Degree	2
<b>MECHANICAL</b>	
Mounting	2 x M4x12 self-tapping pozidriv screws
Unit Dimensions	90.3 x 46.6 x 37.0 mm
Unit weight	Approx. 135 g



## 12. ACCESSORIES

### INPUT SENSORS



PRODUCT CODE	PRODUCT DESCRIPTION
9TM25005BS	T PROBE 5.0/0.5/16 100K BK26 C1A
9TM25010BS	T PROBE 5.0/1.0/16 100K WT26 C1A
9TM25030BS	T Probe 5.0/3.0/16 100K BK26 C1A
9TM25035BS	T Probe 5.0/3.5/16 100K BK26 C1A
9TM25045BS	T Probe 5.0/4.5/16 100K BK26 C1A
9TM26001WS	T Probe 6.0/0.1/16 100K BK24 C1A
9TM26015BS	T Probe 6.0/1.5/16 100K BK24 C1A
9TM26015WS	T Probe 6.0/1.5/16 100K WT24 C1A



9W10120BS	D SWITCH N/O SPST 2.0/BK24/C1S
9W10120WS-Y	D Switch 2xN/O SPST 2.0/WT26/C1S

### EXTERNAL DEVICES



PRODUCT CODE	PRODUCT DESCRIPTION
92393R00	FDM3R 14mm Red 3 Digit Display
92393B00	FDM3B 14mm Blue 3 Digit Display
92393BNS	FDM3B 14mm Blue 3 Digit Display N/S
92393G00	FDM3G 14mm Green 3 Digit Display
8M293482	Cable U-Uusb R/A-Str 1m



9530BR40	GBR4 REMOTE BLE MODULE
9530BR4B	GBR 4 REMOTE BLE MODULE + BATTERY
8M293465	CABLE U-UUSB 0.4M D3534.02



95342WB0	GMC4-2BBW 2G
95344WB0	GMC4-4BBW 4G
8M293507	FCAX3-GMC4 CABLE 2M

### PROGRAMMING



PRODUCT CODE	PRODUCT DESCRIPTION
90500400-D	SPP02D FCAX3/FCR/FCZ/FDE/FDM/FSP/FTB
8M291010	Mini USB Socket to Micro USB Plug Cable
8M293504	FCAX3 Interface Cable

## 13. VERSION HISTORY

VERSION	DATE COMPLETE	DESCRIPTION	REVIEWED BY
1.0	22/08/2018	Initial Version	Bhargav Mistry
2.0	20/12/2019	Rebrand, all sections updated	Bhargav Mistry
3.0	28/05/2021	Section 1.3, 3, 8 & 10 updated	Neville Barreto
4.0	04/05/2023	Rebrand, all sections updated	Neville Barreto
4.1	06/09/2023	Section 10.2 updated	Neville Barreto



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Product specifications and other information in this manual are subject to change without prior notice to make improvements.

The information in this document has been carefully checked and is believed to be accurate. Nevertheless Sollatek assumes no responsibility for any errors or omissions.

RGB	06/09/2023	FCAx3 User Manual Sept 2023 v4.1 A/I: 10910498
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