# Application Engineering

## SecureStart for Copeland Compressors

**BULLETIN NO:** AE8-1370 R7

## Contents

**Safety**

Important Safety Information 2
Responsibilities, Qualifications and Training 2
Terminal Venting and Other Pressurized System Hazards 2
Flammable Refrigerant Hazards 3
Electrical Hazards 3
Hot Surface and Fire Hazards 3
Lifting Hazards 3
POE Oil Hazards 3
Precautions 3
Signal Word Definitions 5

**Introduction**

SecureStart Introduction 6
Operation 6
Agency Recognition 6
Module Dimensions 6
Product Specifications 7
Ordering Information 7
Hardware Installation 7
SecureStart Wiring Diagram 7
Service 8
Warranty Information 8
Support 8

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# Safety

## Important Safety Information

Those involved in the design, manufacture, and installation of a system, system purchasers, and service personnel may need to be aware of hazards and precautions discussed in this section and throughout this document. OEMs integrating the compressor into a system should ensure that their own employees follow this bulletin and provide any necessary safety information to those involved in manufacturing, installing, purchasing, and servicing the system.

## Responsibilities, Qualifications and Training

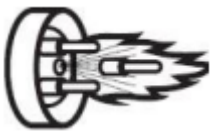
• OEMs are responsible for system design, selection of appropriate components, integration of this component into the system, and testing the system. OEMs must ensure that staff involved in these activities are competent and qualified.

• OEMs are also responsible for ensuring that all product, service, and cautionary labels remain visible or are appropriately added in a conspicuous location on the system to ensure they are clear to any personnel involved in the installation, commissioning, troubleshooting or maintenance of this equipment.

• Only qualified and authorized HVAC or refrigeration personnel are permitted to install, commission, troubleshoot and maintain this equipment. Electrical connections must be made by qualified electrical personnel.

• Observe all applicable standards and codes for installing, servicing, and maintaining electrical and refrigeration equipment.

## Terminal Venting and Other Pressurized System Hazards



If a compressor's electrical terminal pin loses its seal, pressurized oil, refrigerant, and debris may spray out. This is called "terminal venting".

The ejected debris, oil, and refrigerant can injure people or damage property. The oil and refrigerant spray can be ignited by electrical arcing at the terminal or any nearby ignition source, producing flames that may project a significant distance from the compressor. The distance depends on the pressure and the amount of refrigerant and oil mixture in the system. The flames can cause serious or fatal burns and ignite nearby materials.

Each compressor has a terminal cover or molded plug that covers electrical connections. The cover or plug helps to protect against electric shock and the risks of terminal venting. If terminal venting occurs, the cover or plug helps contain the spray of refrigerant and oil and reduces the risk of ignition. If ignition occurs, the plug or cover helps contain the flames. However, neither the terminal cover nor the molded plug can completely eliminate the risk of venting, ignition, or electric shock.

See copeland.com/terminal-venting for more details about terminal venting. Additionally, a compressor's refrigerant lines keep refrigerant and oil under pressure. When removing or recharging refrigerant from this component during service, this can pose a pressurized fluid hazard.

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## Flammable Refrigerant Hazards



If flammable refrigerant is released from a system, an explosive concentration can be present in the air near the system. If there is an ignition source nearby, a release of flammable refrigerant can result in a fire or explosion. While systems using flammable refrigerant are designed to mitigate the risk of ignition if the refrigerant is released, fire and explosion can still occur.

See copeland.com/flammable-refrigerants for more information on flammable refrigerant safety.

## Electrical Hazards



Until a system is de-energized, and capacitors have been discharged, the system presents a risk of electric shock.

## Hot Surface and Fire Hazards



While the system is energized, and for some time after it is deenergized, the compressor may be hot. Touching the compressor before it has cooled can result in severe burns. When brazing system components during service, the flames can cause severe burns and ignite nearby combustible materials.

## Lifting Hazards



Certain system components may be very heavy. Improperly lifting system components or the compressor can result in serious personal injury. Use proper lifting techniques when moving.

## POE Oil Hazards

This equipment contains polyol ester (POE) oils. Certain polymers (e.g., PVC/CPVC and polycarbonate) can be harmed if they come into contact with POE oils. If POE oil contacts bare skin, it may cause an allergic skin reaction.

## Precautions

• Always wear personal protective equipment (gloves, eye protection, etc.).

• Keep a fire extinguisher at the jobsite at all times.

• Keep clear of the compressor when power is applied.

- IMMEDIATELY GET AWAY **if you hear unusual sounds in the compressor. They can indicate that terminal pin ejection may be imminent. This may sound like electrical arcing (sizzling, sputtering or popping). However, terminal venting may still occur even if you do not hear any unusual sounds.**

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• Never reset a breaker or replace a blown fuse without performing appropriate electrical testing

- **A tripped breaker or blown fuse may indicate an electrical fault in the compressor. Energizing a compressor with an electrical fault can cause terminal venting. Perform checks to rule out an electrical fault.**

• Disconnect power and use lock-out/tag-out procedures before servicing.

- Before removing the terminal cover or molded plug, check that ALL electrical power is disconnected from the unit. Make sure that all power legs are open. (Note: The system may have more than one power supply.)

- Discharge capacitors for a minimum of two minutes

- Always use control of hazardous energy (lock-out/tag-out) procedures to ensure that power is not reconnected while the unit is being serviced.

• Allow time for the compressor to cool before servicing.

- Ensure that materials and wiring do not touch high temperature areas of the compressor.

• Keep all non-essential personnel away from the compressor during service.

• For A3 refrigerants (R290) remove refrigerant from both the high and low sides of the compressor. Use a recovery machine and cylinder designed for flammable refrigerants. Do not use standard recovery machines because they contain sources of ignition such as switches, high- and low-pressure controls and relays. Only vent the R290 refrigerant into the atmosphere if the system is in a well-ventilated area.

• Never use a torch to remove the compressor. Only tubing cutters should be used for both A2L and A3 refrigerants.

• Use an appropriate lifting device to install or remove the compressor.

• Never install a system and leave it unattended when it has no charge, a holding charge, or with the service valves closed without electrically locking out the system.

• Always wear appropriate safety glasses and gloves when brazing or unbrazing system components.

• Charge the system with only approved refrigerants and refrigeration oils.

• Keep POE oils away from certain polymers (e.g., PVC/CPVC and polycarbonate) and any other surface or material that might be harmed by POE oils. Proper protective equipment (gloves, eye protection, etc.) must be used when handling POE lubricant. Handle POE oil with care. Refer to the Safety Data Sheet (SDS) for further details.

• Before energizing the system:

1. Securely fasten the protective terminal cover or molded plug to the compressor, and

2. Check that the compressor is properly grounded per the applicable system and compressor requirements.

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## Signal Word Definitions

The signal word explained below are used throughout the document to indicate safety messages.




**DANGER** indicates a hazardous situation which, if not avoided, will result in death or serious injury.




**WARNING** indicates a hazardous situation which, if not avoided, could result in death or serious injury.




**CAUTION**, used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

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# Introduction

## SecureStart Introduction

Single phase compressors typically have starting inrush currents that range from five to seven times their normal running current. The SecureStart module is designed to reduce inrush current to the compressor by up to 70%. Other benefits of SecureStart include a reduction in perceived light dimming/flicker, better starting during low voltage conditions, compressor low voltage protection, longer contactor life, and compliance with certain local utility requirements for reduced inrush current. SecureStart is designed for use with permanent split capacitor 1-phase compressors with Rated Load Amps (RLA) of 16-32A. **SecureStart does not provide over current protection.**

## Operation

When the system control calls for compressor operation, the compressor contactor will energize. If the supply voltage to the module (module terminals L2 to compressor common - refer to wiring diagram on Page 2) is less than 195 volts the module will initiate a 50 second delay. At the end of the 50 second delay the module will attempt to start the compressor if the supply voltage is equal to or greater than 195 volts. SecureStart uses an optimized starting process that learns the starting characteristics of the compressor to further refine the starting cycle on each recurring start. If the compressor fails to start, the module will terminate the start attempt after 1 second and initiate a 3-minute lockout before attempting a restart. If the supply voltage falls below 190 volts for 2 seconds or below 130 volts for 0.1 seconds while the compressor is running the module will stop the compressor and initiate a 3-minute lockout. A restart will be attempted after 3 minutes if the supply voltage is 195 volts or higher. This is done to protect the compressor against a sudden drop in supply voltage.

SecureStart is able to detect an interruption in power, when the interruption is 0.1 seconds or longer. When a power interrupt is detected, SecureStart will shut down the compressor for 3 minutes. SecureStart is also able to determine if the compressor is running backwards. If this condition is detected, SecureStart will stop the compressor for 3 minutes before a restart is attempted. A power interrupt that is shorter duration than 0.1 seconds may result in a compressor running backwards, which the SecureStart can detect and stop compressor operation.

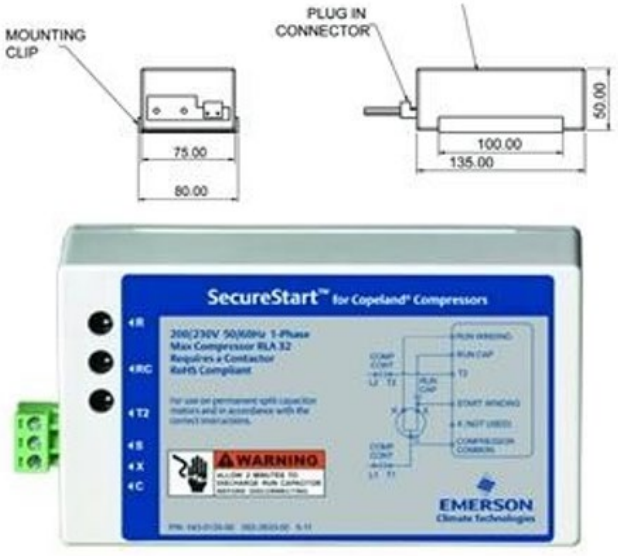
If the run capacitor is faulty or has failed, SecureStart will shutdown the compressor for 3 minutes before attempting a restart.

## Agency Recognition

ETL File 4004190
RoHS Compliant
CE
BS EN 60335-2-40

## Module Dimensions

All dimensions are in millimeters.



## Product Specifications

Operating Temperature: -4°F to 140°F (-20°C to 60°C)
Storage Temperature: -40°F to 185°F (-40°C to 85°C)
Frequency: 50 & 60 Hz
Operating Voltage Range: 185-253 Volts AC Starting Voltage: 195 Volts AC Minimum
Compressor Rated Load Amps (RLA): 32 Amps Max IP Rating: 207
Duty Cycle: 10 Starts Per Hour
Off Time Between Cycles: 3 Minutes

## Ordering Information

OEM part number 543-0120-00 (50 pack)
Service part number 943-0120-00 (individually packed)

## Hardware Installation

SecureStart attaches to the mounting clip that is provided with the module. The mounting clip can be mounted to an electrical panel using two to four #8 or #10 screws. Maximum screw head height is 2.5 mm; therefore a pan head screw type is recommended.

The module connections for the run winding, run capacitor, and T2 will accept up to a #8 AWG wire. These connections will carry the compressor current so care must be taken to ensure a good connection. The screw terminal tightening torque is 10.5 inch- pounds (1.2 Nm) on the SecureStart module for these connections. The Start Winding and Compressor Common connections provide input to the SecureStart on the operation of the compressor. These connections should be tightened to 4.4 inch-pounds (0.5 Nm).

## SecureStart Wiring Diagram

Refer to the wiring diagrams in Figures 1 and 2, which show how the SecureStart module should be wired into a new or existing system. The wiring diagrams illustrate SecureStart wired with a two-pole contactor. SecureStart can also be used with a one pole contactor with the contacts located in either the L1 or L2 lines. If the compressor is wired with a conventional start capacitor and relay, PTCR start device, or other type of hard start kit, those devices should be removed. The specified run capacitor for the compressor must be used. To determine the specified run capacitor value refer to the nameplate of the Copeland Scroll™ compressor. The compressor must be wired as a permanent split capacitor (PSC) with the SecureStart module. SecureStart is compatible with Comfort Alert and CoreSense Diagnostics technology. Conductor type shall be stranded copper with a 75°C minimum temperature rating. **The system must be grounded, and all applicable codes adhered to.**

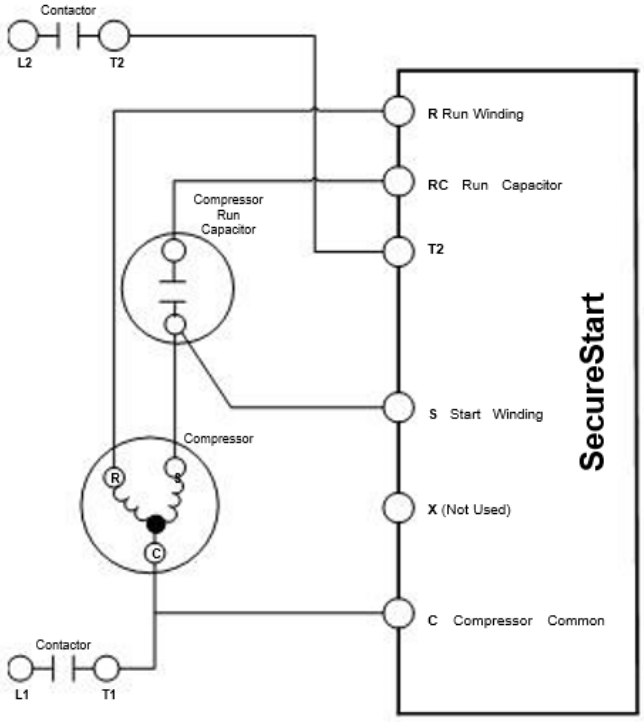



*Figure 1 – Wiring Diagram with Run Capacitor*

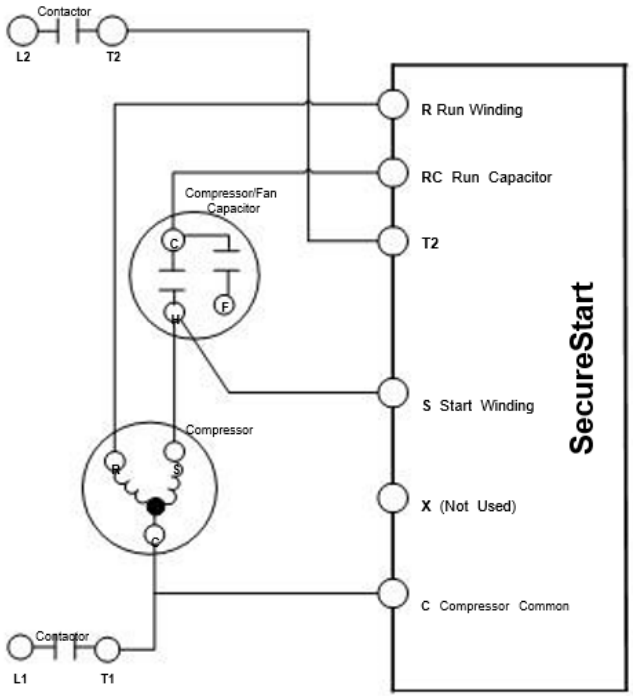



*Figure 2 – Wiring Diagram with Dual Run Capacitor*

**Note:**

*Wire gage:*

- 6 to 8 AWG for terminal (Run Winding (R) and Active (T2) )
- 12 to 16 AWG for terminals (Run Capacitor (RC), Start Winding (S) and Motor Common (C))

*Torque values:*

- Large terminals 10.5 lbs-in
- Small terminals 4.5 lbs-in

## Service

SecureStart has no serviceable internal parts. If the SecureStart module is non-functioning, it should be replaced or bypassed.

Unauthorized opening of the SecureStart module will void the warranty.

## Warranty Information

Copeland LP warrants SecureStart to be free from defects in materials and workmanship under normal use for a period of one year from the date of purchase or twenty months from manufacture, whichever comes first. During this period, Copeland will replace any defective SecureStart without charge.

For more information on product warranty please visit www.Copeland.com.

## Support

For more information visit www.Copeland.com or contact Copeland LP at 1- 888-367-9950.

**WARNINGS**

Remove all other starters (e.g. PTC, hardstarters).
Do not swap the run and start windings.
The module shall not be installed into an enclosure smaller than 10x8x6 inches.

Allow two minutes to discharge run capacitor before disconnecting.

**Revision Tracking R7**

The document format has been updated to the new Copeland format
All occurrences of "Emerson" have been removed
A note regarding A3 and R290 venting has been updated

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