Application Engineering

Copeland Sentronic 3 Electronic Oil Pressure Control

BULLETIN NO: AE8-1366 R2

Contents

COPELAND

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

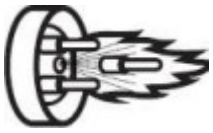
• OEMs are responsible for system design, selection of appropriate components, integration of this component into the system, and testing the system. OEMs must ensure that staff involved in these activities are competent and qualified.

• 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.

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.**

• 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.

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.

Introduction

The Sentronic 3™ oil pressure safety control replaces mechanical devices, the current Sentronic +™ as well as older versions of the Copeland Sentronic™ oil pressure control. The Sentronic 3 control offers the following features:

Cap Tube Elimination

Sentronic 3 continues to add system reliability by removing the traditional cap tube oil pressure controls that are prone to refrigerant leaks.

Precise Timing

Insufficient oil pressure time for the compressor is stored and accumulated in the module memory. Once the total time accumulated for bad oil pressure exceeds 120 seconds, the module will shut the compressor off.

LED Diagnostics

Sentronic 3 LED codes are designed to match Copeland Sentronic + and Sentronic.

• **LED GREEN** Compressor has sufficient oil pressure.

• **LED RED** Compressor has experienced insufficient oil pressure and will trip after two minutes.

• **RED/GREEN FLASHING** Compressor is experiencing erratic oil pressure indicating a possible system issue

• **NO LIGHT** If switch is in the trip state, the module has tripped due to low oil pressure. If switch is in the Reset/On position, the compressor is at the normal off condition.

Oil Pressure Reset

When oil pressure is 'good' the latch is in the **Reset ON** position. If the oil pressure falls below 7-9 psi for over 120 seconds, the switch will default to the **Trip OFF** position and the compressor will shut off. To restart, move the latch to the **Reset ON** position. (See Figure 1.)

Note: Moving the latch from **Reset ON** to Trip OFF and back to **Reset ON** can also be used to 'jog' the compressor.

Specifications

Oil Pressure

Cut Out 7-9 PSID

Cut In 12-14 PSID

Module

Time Delay 120 seconds +/- 15 seconds

Power 120/240V 500VA

Sensor Switch

Torque 60-65 ft-lb.

Wiring

The Sentronic 3 wiring remains the same as previous versions. There are several wiring schemes depending on control circuit components. Sample wiring diagrams are shown on the following page:

Diagram (1A)

Standard control circuit

Diagram (1B)

Standard control with added alarm circuit

Diagram (1C)

Standard control with alarm and current sensing relay circuit

Diagram (1D)

Standard control with alarm, current sensing relay and separate control voltage

Figure 1 - Sentronic 3 Trip and Reset Switch

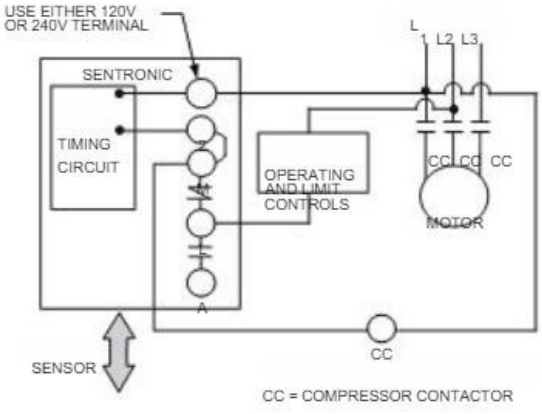


Figure 2 - Diagram 1A

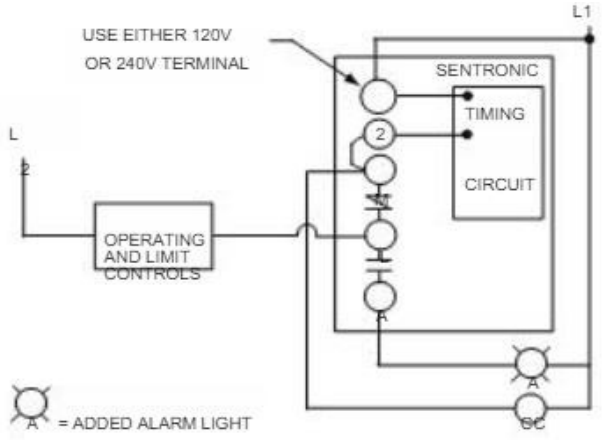


Figure 3 - Diagram 1B

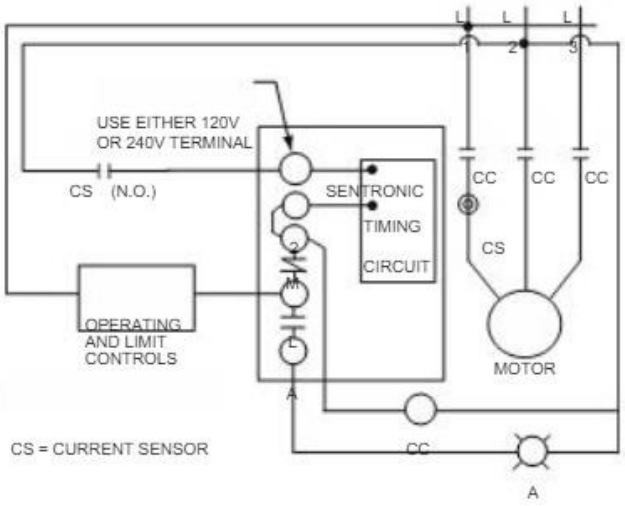


Figure 4 - Diagram 1C

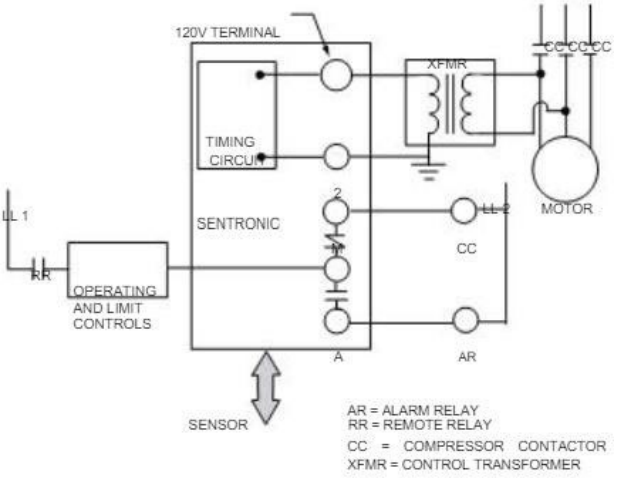


Figure 5 - Diagram 1D

START-UP QUICK CHECKS

Checking the Sensor

Unplug the sensor and start the compressor. The Sentronic module LED should be red. Simultaneously measure the oil pump pressure vs. crankcase pressure. Monitor the two terminals at the back of the sensor with an ohmmeter. If the differential pressure is below the range of 7 to 9 PSID, the sensor circuit should be open. If the pressure is above 12 to 14 PSID, the sensor circuit should be closed.

The sensor is manufactured with hysteresis between the cut out and cut in pressures. If the sensor is closed the pressure must fall below the cut out threshold before it opens. If the sensor is open the pressure m

Checking the Installed Sentronic 3 Module

• Unplug the sensor, the LED should be solid red.

• The module keeps track of running time without oil for up to 120 seconds and retains this information even when the compressor is powered down. After the module records that the compressor has been powered on for 120 seconds (+/- 15 seconds) without oil, the L-M contact should open and shut off the compressor.

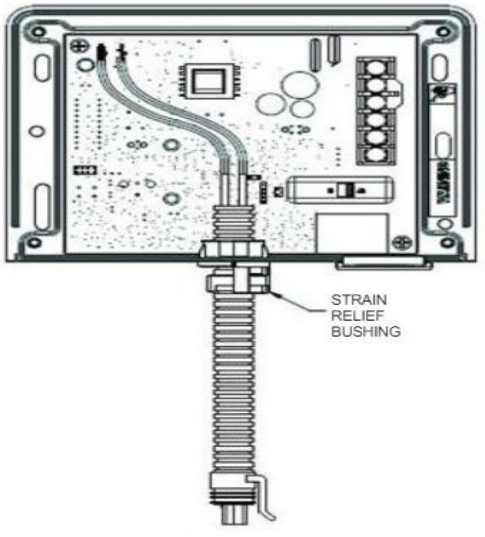


Figure 6 - Sentronic 3 Module

INTERCHANGEABILITY OF SENTRONIC AND SENTRONIC 3 MODULES AND SENSORS

The new Sentronic 3 oil pressure control uses both a new module and a new sensor. The sensors and module can be made compatible with older generation components if the following steps are taken:

Option 1: To use a Sentronic 3 module with a Sentronic sensor, the original Sentronic sensor cable must be wired to the new Sentronic 3 module.

Option 2: To use the Sentronic module with a Sentronic 3 sensor, the new Sentronic 3 sensor cable must be wired to the Sentronic module.

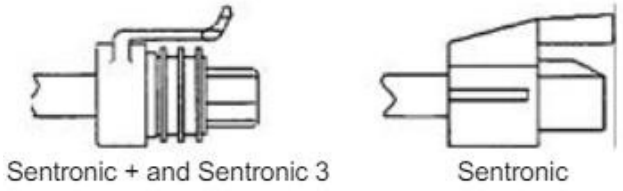


Figure 7 – Sensors.

Option 1 - Connecting the Sentronic 3 module to an older Sentronic sensor:

Removing the cable from the old Sentronic module

1. Disconnect power to the old module.

2. Disconnect the cable from the sensor.

3. Remove the cover from the old module.

4. Remove the two flag connectors from the circuit board (these are the orange and red wires).

5. Using pliers, squeeze the strain relief slots and pull to remove the cable from the module.

6. Remove the old module from the compressor by loosening the two module screw from the bracket. Save these for reuse in the installation of the new module.:

Removing the cable from the new Sentronic 3 module:

1. Remove the cover from the Sentronic 3 module.

2. Pull the 2 flag connectors from the circuit board (these are the orange and red wires).

3. Push the tabs in on the strain relief to disengage the harness from the plastic module.

4. Remove the wires from the strain relief and from the module.

Connecting the Sentronic cable to the Sentronic 3 module:

1. Feed the wires into the module through the hole in the bottom of the case and insert the old cable into the strain relief.

2. Leaving enough lead length to reach the quick connects, place the wires in the strain relief bushing and snap the bushing closed.

3. Align the 'D' slot of the strain relief to the plastic housing and snap it into place.

4. Connect the orange and red wires that have flag connectors onto the circuit board spades. (Note: the connections may be interchanged; there is no polarity on these wires.)

5. Replace the cover and tighten the screws.

6. Install the module to the compressor and make wiring and sensor connections per the general instructions.

Option 2 - Connecting the old Sentronic module to a newer Sentronic 3 sensor:

Removing the cable from the new Sentronic 3 module:

1. Remove the cover from the Sentronic 3 module.

2. Pull the 2 flag connectors from the circuit board (these are the orange and red wires).

3. Push the tabs in on the strain relief to disengage the harness from the plastic module.

4. Remove the wires from the strain relief and from the module

Removing the cable from the Sentronic module:.

1. Remove the cover from the old module.

2. To remove the two flag connectors from the circuit board, use pliers to squeeze the strain relief slots and pull to remove the cable from the module.

Connecting the new cable to the old module:

1. Feed the wires into the module through the hole in the bottom of the case.

2. Push the strain relief into position to lock it into place.
3. Connect the two flag connectors to the circuit board. There is no polarity on the leads.

4. Replace the cover.

5. Install the module on the compressor and make wiring and sensor connections per the general instructions.

Sentronic 3 Terminal Strip

• The Sentronic 3 module terminal strip is designed to accept a bare wire end or a spade terminal.

• If a Sentronic 3 module is being retrofitted to a system with spade connections, the spade may be clipped off and ¼" of the wire end stripped. Or, one leg of the spade may be clipped off for insertion into the terminal strip.

Revision Tracking R1
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.