

Application Engineering

Copeland Compressor Nameplate Voltages

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Safety

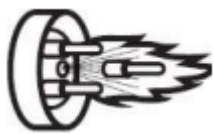
Important Safety Information

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](https://www.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

General Guidelines

Since the growth of the electrical power industry in the United States has been relatively free of any national standards or controls, a wide variety of 60 cycle power systems have been developed. In a like manner, electric motors designed to operate on those systems have been developed to varying standards.

As demands on the available power supply have grown, equipment designers must take into account the fact that variations in supply line voltage are not only possible but probable, and the dependability of service of any electric motor is directly related to its ability to operate not only at its nominal voltage, but at the extremes, both high and low, that it may encounter.

The voltage extremes at which a compressor will operate depend on the operating load imposed on the compressor. Copeland™ compressors are developed to operate at established maximum load conditions at the extremes of the voltage range, and at light load conditions will operate quite satisfactorily in some cases beyond the established voltage limits.

Because of the variation in supply voltages which are encountered, motors developed for most Copeland™ compressors are designed to operate over an extended voltage range rather than for a single service voltage. The heavy duty extended voltage motor is somewhat more costly, but the advantages of easy production scheduling, reduction in finished goods inventory, and ready service availability have been proven by experience. Few, if any, operating problems have been encountered with the extended voltage motors.

The majority of motors used in air conditioning and refrigeration equipment for 208 volt and 240-volt distribution systems are extended voltage 208/230-volt motors. 208/230-volt single-phase motors are generally limited to operation at 197 volts under Copeland's maximum design load conditions for compressors, while 208/230 volt three-phase motors are generally limited to 187 volts under similar maximum load conditions. At times,

engineers who are primarily familiar with NEMA rated single voltage motors jump to the conclusion that a 200-volt nameplate is a better motor for low voltage conditions. Such a conclusion is not necessarily true. Since Copeland maximum design load standards for compressors are quite conservative, compressors operating at normal load conditions found in systems are capable of operation at voltages far below the normal tolerance of minus 10% of the nameplate. Extended voltage motors have a stronger winding construction that allow below normal voltage conditions, but discretion is advice to avoid adverse effects.

General Voltage codes available are shown in **Table 1** Not all models are available in the listed voltages. Please log in or register for Online Product Information at Copeland.com/OPI for specific model availability. The operating voltage range listed is for Copeland's maximum load design conditions for compressors. These conditions are normally more severe than those experienced by compressors operating in systems at system maximum load conditions. More specifically, compressors which meet these standards will normally operate satisfactorily at the system conditions and voltages required by ARI Standard 110. For information related to specific Copeland™ compressor families see corresponding nomenclature in Copeland.com/OPI or follow links summarized in **Table 2**.

Note: Minimum and maximum voltages are as listed on A* and R* models individual compressor sheets. If no range is listed, the range is -10% from the lower voltage and +10% from the upper voltage.

For more detailed information related to voltage ranges for Copeland™ condensing units look on Copeland.com/OPI to determine its compressor model. The Condensing unit voltage range is defined by its compressor voltage range. See a list of available compressor nomenclatures summarized in **Table 2**.

In **Table 1**, for some codes both 60HZ and 50HZ are listed, for those cases 60HZ is primary. The 50HZ values are typical and may or may not apply. There may also be slight variations in voltage(s) for 50HZ.

Tables

Table 1 - General Voltage Codes Available

Voltage Code	60HZ Rating	50HZ Rating
A	115-1	100-1
B	230-1	200/240-1
C	208/230-3	200/220-3
D	460-3	380/420-3
E	575-3	500-3 or 550-3
F		115-1
G		230-1
H	208-1	200-1
I	208/230-1	200/230-1
J	265-1	220/240-1
K	208/230/460-3	200/380/400-3
L		210/240/380/420-3
M		380/420-3
N	230/460-3	200/400-3
O (alpha)	DC Ratings	
0 (numeric)		415-3
P		200/380-3
Q	265-1	
R		220/240-3
S		220-1
T		200/240 or 200-1
U	200-3	
V	208/230-1	200/220-1 or 200-1
W		200/220-3
X	AC Misc	
Y		500-3
Z		220/240-1
1	306/340 DC**	360/460-3**
2	600/680 DC**	180/260-1**
3	220-1	220-1
4	440-1	
5	200/230/240-3	200/230-3
6	230-3	
7	380-3, 380/400-3, 400-3	
8	200/220/380-3 or 36/48 DC	200/380-3
9	Misc DC voltages	

* When both 60HZ and 50HZ are listed the 60HZ is primary. The 50HZ values are typical and may or may not apply. There may also be slight variations in voltage(s) for 50HZ.

** Differs by Model Family

Table 2 - Copeland™ Compressors Family Nomenclature Links

Copeland™ Compressors Family	Nomenclature Link
Scroll Compressor	https://webapps.copeland.com/online-product-information/Compressor/LaunchPDF?Index=3&PDFName=nomgla.pdf
Semi-hermetic Compressors	Copelametic™ https://webapps.copeland.com/online-product-information/Compressor/LaunchPDF?Index=3&PDFName=nommetic-k.pdf Discus™ https://webapps.copeland.com/online-product-information/Compressor/LaunchPDF?Index=3&PDFName=nommetic.pdf
A* Compressor Model	https://webapps.copeland.com/online-product-information/Compressor/LaunchPDF?Index=3&PDFName=nomsystempro.pdf
R* Compressor Model	https://webapps.copeland.com/online-product-information/Compressor/LaunchPDF?Index=3&PDFName=es91-169.pdf
Copelaweld™ Compressor Model	CRKQ, CIKQ, CSKQ, CR6, CR7, CRKF, CP8, CSK6, CFK6 Models https://webapps.copeland.com/online-product-information/Compressor/LaunchPDF?Index=3&PDFName=nomenclature.pdf CRNQ, CRPQ Models https://webapps.copeland.com/online-product-information/Compressor/LaunchPDF?Index=3&PDFName=nomweld.pdf

Revision Tracking R7

The document format has been updated to the new Copeland format.

Nomenclature Links have been updated (from OPI).

All occurrences of "Emerson" have been removed.

A note regarding A3 and R290 venting has been updated.

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