

# SERVICE AND APPLICATION NOTES

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## Hard Start Components and Crankcase Heaters on Scroll Compressors

The following recommendations from Copeland apply to the installation of start components and crankcase heaters on scroll compressors.

### Scroll Start Components

Copeland's compliant scroll compressors are designed to start unloaded, even if system pressures are not balanced. Since the compressor's internal pressures are balanced at start-up, low voltage starting characteristics are excellent and starting components are not required in most applications.

However, occasional reduction in the power supply voltage may cause a problem. This low starting voltage reduces the starting torque of the compressor, subsequently increasing the compressor start time. When this occurs, supply voltage to other appliances in the building may be lowered for a period of 300 to 400 milliseconds causing light dimming. Piston compressors with high torque start kits do not experience this delayed start, although the current draw is comparable.

Lennox has put together start component kits per Copeland specifications. The kits reduce compressor start time by one half to one third.

### Approved Start Components for Scroll Compressor:

Copeland Model	Lennox Kit#	Start Capacitor	Potential Relay
ZR16(x) to ZR48K(x)-PFV	10J4201 (LB-31200BM)	47A6001 (88-108 mfd @ 330 vac)	58327 (P-8-3577)
ZP15K(x) to ZP44(x)-PFV			
ZR46K(x) to ZR68K(x)-PFV	81J6901 (LB-31200BW)	21J2901 (270-324 mfd @ 330 vac)	58327 (P-8-3577)
ZP50K(x) to ZP57K(x)-PFV			
K1 & K2	81J6801 (LB-31200BT)	47A6001 (88-108 mfd @ 330 vac)	66463 (P-8-1617)

NOTE - x= C, 3, 4, or CE, 3E,4E

**PTC Start Components** - For applications with less severe voltage drop, positive temperature components rated from 10 to 25 ohms may be used to help boost the compressor.

**Kickstart** - Copeland has tested capacitors and relays used on their compressors in accordance with the applicable Copeland Engineering Standards. Copeland **HAS NOT** tested any kickstart assist devices and therefore cannot guarantee reliable operation of Copeland compressors with any kickstart components. Any kickstart components incorrectly matched up could result in compressor failure. The kickstart device is **NOT** approved for use with Copeland compressors.

Copeland does test and approve every capacitor/relay combination to assure reliable compressor operation. The same standards must be applied to any start devices before Copeland can approve use. At this time Copeland does not have resources or personnel to test alternate capacitor and relay start components.



## Scroll Crankcase Heaters

Compliant scroll compressors are much more tolerant of liquid refrigerant than reciprocating compressors.

**Single-phase** scroll compressors should not require a crankcase heater; however, excess refrigerant in the compressor may cause the scrolls to lock up on start. The compressor protector may trip several times before the motor heat clears the liquid.

**Three-phase** scroll compressors in the 18,000 to 72,000 capacity range **do** require a crankcase heater if the system charge exceeds 10 pounds. Due to the higher starting torque on three-phase compressors, the scrolls can be damaged during a flooded start.

### Additional Considerations

Occasionally, excessive refrigerant in the compressor during start-up results in a sound complaint. An elevated, or prolonged gurgle can occur during start-up while the liquid is being cleared from the compressor. A crankcase heater will reduce the amount of liquid refrigerant in the compressor and effectively reduce this noise. (A sound enclosure will also reduce the intensity of the start-up sounds).

Elevated oil and refrigerant levels in the compressor can add resistance to the starting of a scroll compressor. The added resistance increases current draw, and lengthens the time required for the compressor to get up to speed. (The addition of a crankcase heater can shorten starting time and minimize voltage drop).

### Crankcase Heaters

Copeland Model	Volts	Watts	Copeland #	Lennox #
ZR18K-ZR42K	240	40	018-0041-00	18K2001
	480		018-0041-02	49K1101
	575		018-0041-03	49K1201
ZR46K-ZR72K	240	70	018-0043-00	31J2001
	480		018-0043-01	31J2101
	575		018-0043-02	42J8501

**NOTE:** Copeland has approved the use of the 70 watt heater (67K900 for 208/230v and 67K8901 for 480v) is an acceptable substitute for the 40 watt heater.