

## CRANKCASE HEATERS FOR SCROLL COMPRESSORS

### 1 Crankcase heater usage



**IMPORTANT**

**Oil dilution! Bearing malfunction!** Turn the crankcase heater on 12 hours before starting the compressor.

A crankcase heater is used to prevent refrigerant from migrating into the shell during standstill periods. Due to Copeland scroll's inherent ability to handle liquid refrigerant in flooded conditions a crankcase heater is not required when the system charge does not exceed the charge limits shown in **Table 1**. This requirement is independent from system type and configuration.

Family	Product	Charge limit		
Scroll A/C	ZR18K5E	ZP24K5E to ZP31K5E	2.7 kg	
	ZR24KRE to ZR48KRE	ZRD36KRE, ZRD48KRE	3.6 kg	
	ZR22K* to ZR81K* ZRD42K* to ZRD81K ZR(D)61KRE to ZR(D)92KRE	ZP23K3E to ZP41K3E ZP36K5E to ZP83KCE, ZP91/104/122/143KCE*	ZPD34K* to ZPD91K ZRH72KTE to ZRH116KTE YRH72KT*, YRH81KT*	4.5 kg
		ZPD104K, ZPD122K*		5 kg
	ZR94KCE to ZR190KCE ZP90KCE, ZP103KCE, ZR108KRE to ZR144KRE	ZP120KCE, ZP137K*E ZP154K*E, ZP182K*E	YP195KPT, YP195KNT	7.0 kg
	ZRD94K* & ZRD125K*	ZPD103K* to ZPD182K*		7.3 kg
	ZR160KRE to ZR190KRE			7.7 kg
		ZP232KZE, ZP292KZE	YP310KZT	8.2 kg
	ZR250KCE	ZP235KCE		9 kg
	ZR310KCE, ZR380KCE	ZP295KCE, ZP385K*E		11.3 kg
		ZP485K*E	YP515KPT	13.6 kg
Scroll Heat Pump	ZH04KCU to ZH08KCU		YH04K1E to YH09K1E	1.54 kg
	ZH09KCU to ZH16KCU		YH11K1E to YH16K1E	1.93 kg
	ZH12K4E			2.7 kg
	ZH15K4E to ZH26K4E	ZH06KVE to ZH09KVE	ZH04K1P & ZH05K1P	3.6 kg
	ZH30K4E to ZH45K4E ZH06K1P to ZH19K1P	ZH13KVE to ZH18KVE ZHI05K1P to ZHI23K1P		4.5 kg
	ZHI27K1P to ZHI46K1P	ZH40K* to ZH75K*		7 kg
	ZH56K4E to ZH11M4E	ZH24KVE to ZH48KVE		7.5 kg
	ZH100K*			11.3 kg
	ZH125K*, ZH150*			13.6 kg
Scroll Ref	ZB07KAU to ZB14KAU			0.5 kg
	YBV(H)021*U to YBV(046)*U		YBVH029*	1.2 kg
	ZB12KCU to ZB20KCU		YB12K1E to YB24K1E	1.54 kg
	ZB25KCU to ZB49KCU		YB31K1E to YB45K1E	1.93 kg
	ZB15KCE to ZB29KCE ZBD21K* and ZBD29K*	ZS09KAE to ZS13KAE ZF06K*E to ZF11K*E	YBD17K1E, YBD24K1E	3.6 kg
	ZB30KCE to ZB48KCE, ZB57KCE	ZF13K*E & ZF18K*E ZFD13K* to ZFD25K*	ZBD30K* to ZBD57K* YBD31K1E to YBD45K1E	4.5 kg
	YB56K1U to YB97K1U			5.5 kg
	ZB50KCE, ZB56KCE, ZB11MCE	ZB66K* to ZB114K* ZBD58K* to ZBD114K*	ZF24K* to ZF54K* ZFD41K5E	7.5 kg
	ZB220KCE			11.3 kg

Table 1: Refrigerant charge limit

**NOTE: A crankcase heater is always required for ZO/ZOD\* compressors (CO<sub>2</sub> refrigerant).**

If a crankcase heater is fitted it is recommended that the heater be turned on for a **minimum of 12 hours** prior to starting the compressor. This will prevent oil dilution and bearing stress on initial start-up. The crankcase heater must remain energised during compressor off cycles.

The crankcase heater should be wired in such a way that it is turned on whenever the compressor is switched off.

Variable speed compressors do not require any optional external crankcase heater to be mounted on the compressor. The compressor drive has a programmable feature that will utilize the motor windings to provide up to 50 Watts DC of heating to serve as a crankcase heater. The activation of this crankcase heating function is recommended when the system charge exceeds the refrigerant charge limit of the compressor, as indicated in the variable speed compressor application guidelines.

### 1.1 Overview crankcase heater

Product			Ident number	Cable length	Capacity (Watt)
ZR18K5E	ZP24K5E to ZP 31K5E		8561161	520	40 (240 V)
ZH12K4E	ZH04K1P & ZH05K1P	ZHI05K1P			
ZB07KAU to ZB14KAU	ZS09KAE to ZS13KAE	ZO21K5E			
ZP36K5E to ZP54K5E	ZH06K1P to ZH12K1P	ZHI08K1P to ZHI14K1P	8561150 8561149	787 533	40 (240 V) 28 (400 V)
ZR22K* to ZR81K* ZR24KRE to ZR92KRE	ZRD42K* to ZRD81K ZRD36KRE to ZRD92KRE		8561105 8561092	787 533	70 (240 V) 49 (400 V)
ZP23K3E to ZP41K3E ZP61K*E to ZP83KCE	ZP91KCE, ZP104KCE, ZP122KCE, ZP143KCE	ZPD34K* to ZPD91K* ZPD104KCE, ZPD122KCE			
ZH15K4E to ZH45K4E, ZH09KVE to ZH18KVE	ZH15K1P to ZH19K1P	ZHI18K1P to ZHI23K1P			
ZB15KCE to ZB48KCE,	ZB57KCE	ZBD21K* to ZBD57K*			
ZF06K*E to ZF18K*E	ZF25K5E	ZFD13KVE to ZFD25KVE			
ZRH72KTE to ZRH116KTE	YRH72KT*, YRH81KT*	ZO34K3E to ZO104KCE, ZOD			
ZR94KCE to ZR190KCE	ZR108KRE to ZR190KRE	ZRD94K* & ZRD125K*	8622731 8622742 8625398	1240 1240 2500	73 (240 V) 67 (400 V) 67 (400 V)
ZP90KCE, ZP103KCE, ZP120KCE, ZP137KCE	ZP154K*E, ZP182K*E ZP232KZE, ZP292KZE	ZPD103KCE, ZPD120KCE, ZPD137KCE to ZPD182KCE			
ZH40KCE to ZH75KCE	ZHI27K1P to ZHI46K1P				
ZB50KCE, ZB58KCE, ZB66K*	ZB76K*, ZB95K*, ZB114K*	ZBD58K* to ZBD114K*			
ZF34K5E to ZF54K5E	ZFD41K5E	YB56K1U to YB97K1U			
YP195KPT, YP195KNT	YP195KPT, YP195KNT	YP310KZT			
ZR250KCE	ZP235KCE		8062619 8062620	750	90 (240 V) 83 (400 V)
ZH56K4E to ZH11M4E	ZH24KVE to ZH48KVE	ZH100KCE			
ZB56KCE, ZB75KCE, ZB92KCE, ZB11MCE	ZF24K* to ZF48K* (except K5E models)		8062653 8062664	750	111 (240 V) 102 (400 V)
ZR310KCE, ZR380KCE	ZP295KCE, ZP385K*E	ZP485K*E, ZP725KCE			
ZH125KCE, ZH150KCE	ZB220KCE	YP515KPT	8419179 8414947	750	53 (240 V) 49 (400 V)
ZB25KCU to ZB49KCU	ZH04KCU to ZH08KCU YH04K1E to YH07K1E	YB12K1E to YB21K1E YBD17K1E, YBD24K1E			
ZB12KCU to ZB20KCU	ZH09KCU to ZH16KCU YH09K1E to YH16K1E	YB24K1E to YB45K1E YBD31K1E to YBD45K1E	8414710 8414969	750	60 (240 V) 55 (400 V)

Table 2: Overview crankcase heater

**NOTE:** This overview presents the crankcase heaters for 240 V and 400 V. Crankcase heaters are also available for 120 V, 230 V, 480 V and 575 V. For other voltage options please refer to the spare parts and accessories software available at [www.climate.emerson.com/en-gb/tools-resources](http://www.climate.emerson.com/en-gb/tools-resources).

### 1.2 Installation recommendations



**WARNING**

**Ignition source in a potentially flammable atmosphere! Fire hazard!** In systems using A2L or A3 refrigerants, the crankcase heater is not an ignition source during normal operation but could become one if not installed properly according to installation instructions. Ensure correct electrical and mechanical installation.



**CAUTION**

**Overheating and burnout! Compressor damage!** Never apply power to the crankcase heater in free air, before the crankcase heater is installed on the compressor or when it is not in complete contact with the compressor shell.



**IMPORTANT**

**Oil dilution! Bearing malfunction!** Turn the crankcase heater on 12 hours before starting the compressor.

Table 3 gives the position of the crankcase heater per compressor model.

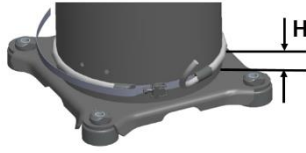
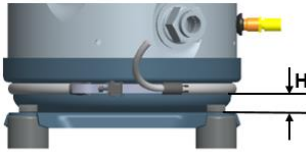


Compressor model			Crankcase heater			
			Position	Height (mm)		
ZR18K5E	ZP24K5E to ZP31K5E		5 to 31			
ZR22K3E to ZR48K3E ZR61KSE	ZR24KRE to ZR48KRE ZRD36KRE, ZRD48KRE		5 to 12			
ZB15K* to ZB29K*	ZBD21K* & ZBD29K*			10 to 40		
ZF06K* to ZF11K*	ZS21K* to ZS26K*				40	
ZR61KCE to ZR81KCE ZRD42K* to ZRD81K* ZR61KRE to ZR92KRE	ZP61KCE to ZP83KCE ZP91KCE, ZP104KCE, ZP122KCE, ZP143KCE				14 to 24	
ZB30K* to ZB48K*, ZB57K ZBD30K* to ZBD57K*	ZF13K* & ZF18K* ZFD13KVE to ZFD25KVE				13 to 18	
ZH04K1P to ZH19K1P	ZHI05K1P to ZHI23K1P				40	
ZB07KAU to ZB14KAU	ZB25KCU to ZB49KCU					10 to 15
YB12K1E to YB45K1E	YBD17K1E to YBD45K1E					32 to 45
ZH12K4E to ZH45K4E	ZH06KVE to ZH18KVE		32 to 50			
ZR94KCE to ZR144KCE	ZR108KRE to ZR144KRE					
ZP90KCE, ZP103KCE	ZP120KCE, ZP137K*E					
ZHI27K1P to ZHI46K1P	ZH40KCE to ZH50KCE					
ZBD58K* to ZBD114K*	ZFD41K5E					
ZR160KCE, ZR190KCE ZR160KRE to ZR190KRE	ZP154K*E, ZP182K*E ZH64KCE, ZH75KCE					
ZH56K4E to ZH11M4E	ZH24KVE to ZH48KVE					
ZB50KCE, ZB56KCE	ZB58K* to ZB114K*					
ZP232KZE, ZP292KZE	YP310KZT					
ZH100KCE	ZB220KCE					
ZR250KCE ZR310KCE, ZR380KCE	ZP235KCE, ZP295KCE, ZP385K*E ZP485K*E					
	ZRD94K* & ZRD125K* ZPD137K* to ZPD182K* YB56K1U to YB97K1U YP195KPT, YP195KNT ZF24K* to ZF54K* ZB11MCE ZH125KCE, ZH150KCE YP515KPT					

Table 3: Crankcase heater position

The initial start-up in the field is a very critical period for any compressor because all load-bearing surfaces are new and require a short break-in period to carry high loads under adverse conditions. **The crankcase heater must be turned on a minimum of 12 hours prior to starting the compressor.** This will prevent oil dilution and bearing stress on initial start-up. **The crankcase heater must remain energized during compressor off cycles.**

**NOTE:** Please refer to the spare parts list available at [www.climate.emerson.com/en-gb/tools-resources](http://www.climate.emerson.com/en-gb/tools-resources) to select the correct crankcase heater model.

Crankcase heaters to be used in ATEX Zone 2 locations must comply with the ATEX Directive requirements. Non ATEX-certified crankcase heaters shall NOT be used in ATEX Zone 2 locations.

**NOTE:** The crankcase heater presently available from Emerson is not ATEX-certified and can only be used in non-flammable environments.

**Caution:** Crankcase heaters must be properly grounded!

### 1.2.1 Horizontal scroll compressors (ZBH\*, ZRH\*, YRH\*)

In transport and mobile applications, crankcase heaters are not effective since there is usually no voltage during extended off-cycle periods.

In stationary applications with permanent power supply, crankcase heaters are the most effective solution to keep liquid refrigerant out of the compressor oil during off cycles. Emerson recommends using a crankcase heater. The crankcase heater should be positioned on the right-hand side of the compressor, a few centimetres from the position of the electrical connection.

### 1.2.2 Assembly instructions

For installation, the manufacturer/installer shall follow the recommendations mentioned hereunder:

- Choose the appropriate model according to compressor size and required wattage.
- Check the compressor application guidelines for crankcase heater connection and operation.
- Position the crankcase heater between the lower cover and the lower bearing weld projection (**Fig. 1**).
- Fit the heater horizontally around the crankcase, ensuring that it is in close contact with the compressor housing along the entire length.
- Avoid having the heating portion of the heater in contact with any weld projection (**Fig. 2 & 3**).
- Avoid having the assembly heater inclined (**Fig. 4**).
- Close the lock and tighten the screw, torque: 2-3 Nm.
- The excess clamp bracket may be trimmed. Sharp edges must not come into contact with wires.
- The presence of the heater shall be made evident by the posting of caution signs or markings at appropriate locations.



Figure 1



Figure 2



Figure 3



Figure 4

### 1.2.3 Electrical connection

- Connect the crankcase heater according to the compressor application guidelines.
- The crankcase heater must be connected only to its rated voltage.
- The metal braid of the heater must be connected to a suitable earthing terminal.
- Check the resistance according to the technical data.
- Perform an insulation test before start-up.
- Electrical security and safety measures are to be provided on site.

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