

**Copeland Scroll™**

Digital

## Application Guidelines

### Digital Scroll™ Compressors for Refrigeration

ZBD21K\* to ZBD114K\*  
ZFD13KVE to ZFD25KVE  
ZFD41K5E



### Mounting parts ZBD21K\* to ZBD114K\* & ZFD13K\* to ZFD41K\* - Soft mountings

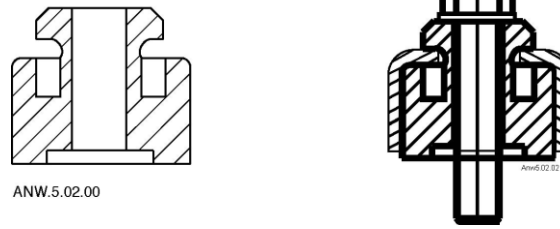


Figure 6

### 3.2 Solenoid valves for models ZBD21K\* to ZBD57K\* and ZFD13KVE to ZFD25KVE



#### IMPORTANT

The external solenoid valve is a critical component for proper function of this compressor. **Only** the Copeland brand solenoid valve supplied as a requested accessory must be used.

Care must be taken during the brazing process that no solid parts can enter the control piston compartment or the solenoid valve tubing. To prevent solid parts from entering the control valve seat, the solenoid valve kit contains a filter screen, which has to be placed into the horizontal tube of the valve before brazing the tube connections as shown in **Figure 7** below.

The solenoid valve has to be fitted in such a way that the sleeve with the stem inside – which supports the solenoid coil – is fixed and aligned in the upright position.

#### 3.2.1 Securing the filter screen in position



The filter screen should be placed into the small tube running at 90° to the solenoid valve stem. A narrow washer fixed on the filter screen will sit on the end of the tube preventing it from falling inside (see photos). The tube running from the top centre of the compressor down to the previous tube needs to be swaged at the solenoid valve end so that it covers the filter screen/tube and is then brazed into position.

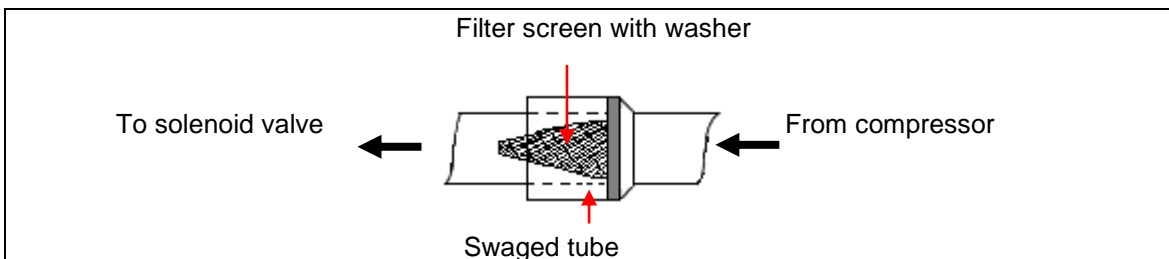


Figure 7

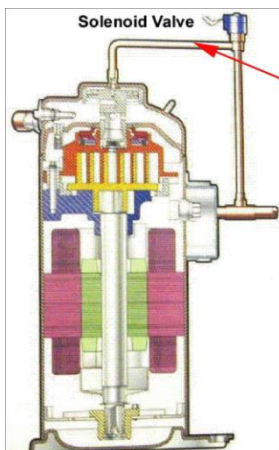


Figure 8: Position of external solenoid valve

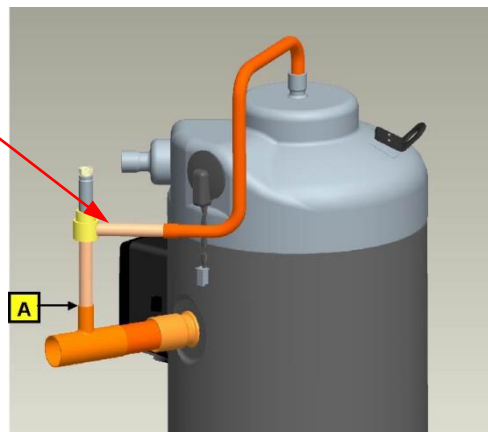


Figure 9: Recommended piping

### 3.2.2 Solenoid valve installation – General recommendations

- The solenoid must be mounted vertically, within  $\pm 15^\circ$  of vertical. Horizontal mounting is not permitted.
- If a suction rotalock fitting is used, the threaded shipping plug in the rotalock fitting must be removed prior to brazing in the vertical solenoid line.
- The valve operation is directional. See **Figures 10 & 11** below for inlet and outlet locations.
- Do not restrict the line size coming from or leaving the solenoid. Use 3/8" soft drawn copper.

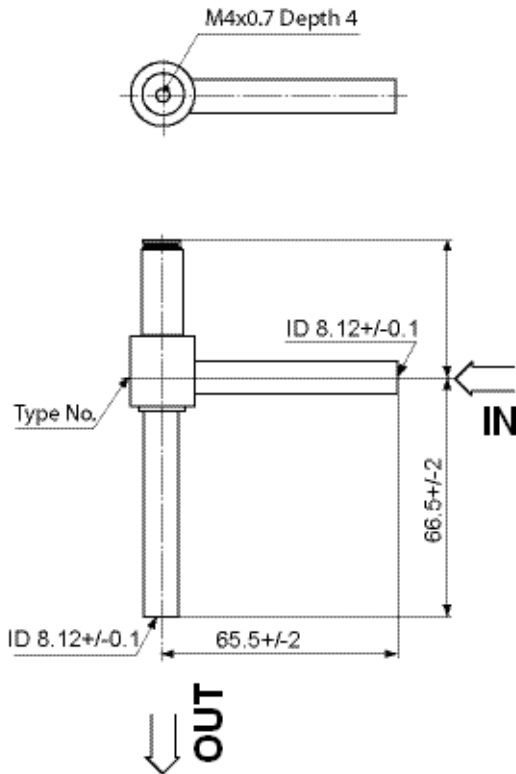


Figure 10: Control valve without coil

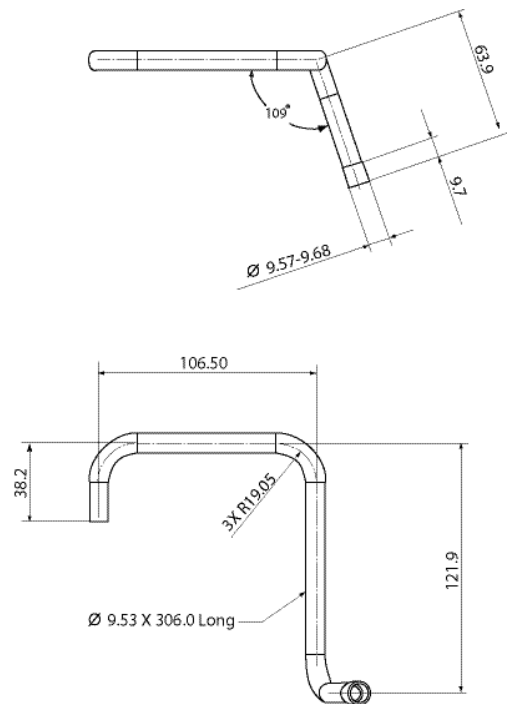
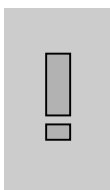


Figure 11: Control valve pipe connection

### 3.2.3 Solenoid valve installation – Tubing recommendations



#### IMPORTANT

This tube has been tested and qualified at 50 and 60 Hz operation for running stresses and resonance in a single compressor lab environment. However, in some compressor applications such as racks and transport applications, the OEM is strongly advised to re-confirm the acceptability of the tube when the compressor is subject to additional vibration inputs.

The tube from the solenoid to the suction, marked “A” (see **Figure 9**), should be as short as possible (less than 7.5 cm). Dimensions for a typical tube going from the top of the compressor are shown in **Figures 10 & 11**.

### 3.3 Copeland Scroll Digital compressors ZFD13KVE to ZFD25KVE and ZFD41K5E with vapour injection / wet vapour injection

The following injection systems can be used:

Compressor family	Liquid injection	Vapour injection	Wet vapour injection (vapour + liquid injection)
ZFD13KVE to ZFD25KVE		X	X
ZFD41K5E	X	X	X

Table 5

# Copeland Scroll™

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Copeland Scroll compressors ZFD13KVE to ZFD25KVE are vapour injection only. Liquid injection alone is not possible. For compressor model ZFD41K5E both liquid injection and vapour injection are possible.

Dedicated discharge temperature thermostats (DLT) shall be used for R407A, R407F, R448A and R449A applications and can also be used for R404A. The R407A/R407F/R448A/R449A dedicated discharge thermostat has a cut-out setting of  $130^{\circ}\text{C} \pm 4\text{K}$  with closing at  $101^{\circ}\text{C} \pm 8\text{K}$ . It should be installed approximately 120 mm from the discharge valve outlet.

### 3.3.1 Vapour injection (EVI = Economized Vapour Injection)

Compressor models ZFD13KVE to ZFD25KVE and ZFD41K5E can be used with R404A, R407A, R407F, R448A and R449A refrigerants and vapour injection.

These compressors are equipped with a vapour injection connection for economizer operation. Economizing can be achieved by using a subcooling circuit similar to the circuit shown in **Figure 12**. This increases the refrigeration capacity and the system efficiency.

The line diagram shows a system configuration for the economizer cycle. A heat exchanger is used to provide additional subcooling to the refrigerant before it enters the evaporator. This subcooling process provides the increased capacity gain measured in the system.

The evaporated refrigerant through the heat exchanger (economizer) is injected into the compressors and provides additional cooling at higher compression ratios.

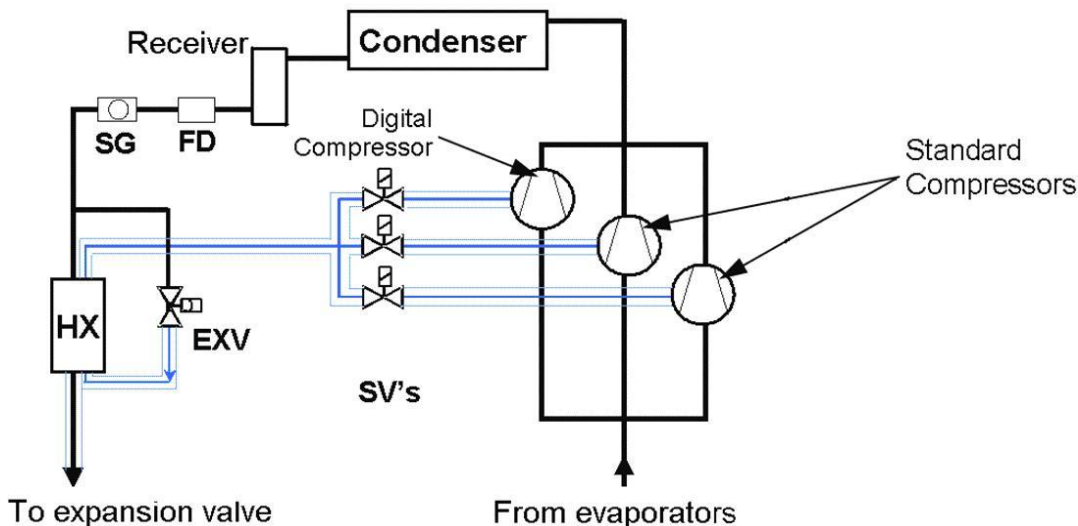


Figure 12: Vapour injection line diagram

The application envelopes for the use of R407A and R407F refrigerants with vapour injection are significantly limited, because of possible high discharge temperatures. Special attention should be paid to the maximum suction gas temperature / superheat values.

**NOTE:** For further information on vapour injection see Technical Information C7.19.2 "ZF\* Refrigeration Copeland Scroll™ Compressors Using R407A and R407F in Low Temperature Applications".

### 3.3.2 Wet vapour injection (vapour injection + liquid injection)

Compressor models ZFD13KVE to ZFD25KVE and ZFD41K5E can be used with R407A and R407F refrigerants and wet vapour injection.

The operating envelopes for R407A and R407F low temperature applications can be enlarged thanks to the use of wet vapour injection, ie, a combination of vapour injection and liquid injection (DTC valve) (see Select software at [www.emersonclimate.eu](http://www.emersonclimate.eu)).

The wet vapour injection cycle showing the main components is shown in **Figure 13** next page: