Application Engineering

Liquid Line Filter Driers

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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

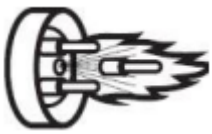
• OEMs are responsible for system design, selection of appropriate components, integration of this component into the system, and testing the system. OEMs must ensure that staff involved in these activities are competent and qualified.

• 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

Liquid Line Filter Driers

The refrigeration industry has for many years used a variety of liquid line filter-driers of three basic types:

- Solid Core
- Compressed Bead
- Loose Fill

These filter-driers were blended with varying amounts of molecular sieve desiccant for moisture removal, alumina for acid removal and activated carbon for removal of paraffin. Filter-drier manufacturers usually offer more than one type depending on the application. For example, in new uncontaminated equipment a drier with high moisture absorbing content might be specified by an OEM; whereas, in the aftermarket on an older, more contaminated system, a drier with an appropriate amount of acid capacity is preferable.

With the advent of HFC refrigerants and polyol ester lubricants we must reconsider the application of the filter-drier and its proper design to accomplish the intended purpose.

Polyol esters differ from mineral oils in four basic ways:

- They are extremely hygroscopic, absorbing moisture much more rapidly than mineral oils.
- They are “polar” in nature; meaning particulate matter (such as wear materials) will not settle but will instead remain in suspension and be circulated throughout the refrigeration system.
- They will hydrolyze in the presence of water, thereby creating acids.
- They may possess unique additive packages designed to enhance their performance.

A filter-drier specifically designed for use with polyol esters will therefore have characteristics to accommodate these differences. It should have excellent moisture removal properties with capacity greater than the filter-driers used in mineral oil systems. Its filtration ability should be increased so as to remove any particulate. matter without causing unacceptably high pressure drops. It should have reasonable acid removal capacity but minimal lubricant additive stripping ability. And lastly, it must be so constructed so as to minimize “attrition” caused by desiccant particles rubbing together when not tightly packed.

Copeland engineering lab tests have found that existing filter-driers, although compatible with the new refrigerants and lubricants, are not optimized for use with polyol ester oils.

As a result, Copeland highly recommends the use of the Copeland EK series of filters for use in polyol ester and HFC systems. These filter-driers have the following features:

- Spring compacted extra hard desiccant to prevent attrition.
- High water capacity.
- Superior filtration with 20 micron filter rating .
- HFC/POE desiccant blend with maximum 25% activated alumina

Recommended Filter-Drier Sizing

ARI Standard 710 suggests a filter-drier water capacity of 9 drops of water per pound of refrigerant (1 cc or gram of water per kg of refrigerant.) Copeland recommends doing the same for the POE lubricant charge, since POE oil can hold similar amounts of water as the refrigerant.

For example:

A field installed air-conditioning system with a 10 lbs. (4.5 kg) R-410A charge and 40 ounce (2.5 lbs. or 1.1 kg) POE oil charge would need a filter-drier with 113 drops of water capacity.

(10 + 2.5) lbs. x 9 drops/lbs. = 113 drops

- Water capacities are based on the following Equilibrium Point Dryness (EPD) values.

EPD = point at which the moisture level in a refrigerant will be when the dryer is saturated with the specified amount of water at a specific temperature and pressure.

R-12: 15 ppm

R-22: 60 ppm

R-502: 30 ppm

R-134a, R-404A/507A, R-407C, R-410A: 50ppm

** 20 drops of water = 1 gram or 1 cc

Revision Tracking R7

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