

Guidelines

Retrofitting R-22 Systems with Forane® 427A – Refrigerant

Forane® 427A Refrigerant (R-427A) was commercialized in 2005 to supply the growing demand in Europe for an R-22 retrofit. R-427A has similar capacity, efficiency, and mass-flow rate to R-22, making it an easy retrofit option for large, medium, and small air-conditioning and refrigeration systems. Hundreds of thousands of systems have been converted over to R-427A since 2005, many using the existing mineral, and POE oil originally in the system. One major advantage of using Forane® 427A is the mass-flow rate. Unlike other retrofit refrigerants, R-427A's mass-flow rate is within 8% of R-22. Rarely will an expansion device need to be changed, while maintaining a very close capacity comparison to R-22.

RETROFITS CHECKLIST

- Record how the system is running on R-22. If the system is not running, determine a target superheat/subcooling, air temperature drop, and AMP draw. Example: How should the system run on R-22? What would the pressure/temperatures, superheat/subcooling, and AMP draw be if the system were running on R-22? See note*
- Recover the R-22 charge.
- Determine if changing or adding POE
- Check oil quality for contamination and/or acidity.
- Install new filter dryer then leak check system. See note***
- Replace rubber and neoprene external seals and gaskets. See note****
- Charge 90% liquid of the original R-22 charge and let the system run for 20 minutes.
- Add liquid refrigerant to attain target superheat/subcooling.

Different systems, different compressors, and the age/condition of the installation could all impact performance when transitioning to another refrigerant. Poor airflow and design load could also impact performance. Be aware of these conditions before retrofitting. Systems that are not running properly on R-22 most likely not perform any better with another refrigerant.



NOTES

*Forane® 427A is intended as a retrofit in systems originally designed for R-22. Therefore, how the system was running on R-22 will be a guide or target for how the system should run on R-427A. Compared to R-22, expect 0-5 psi lower on the suction side and 0-10 psi higher on the discharge. It could be higher on high load/high ambient days.

**Forane® 427A is compatible with MO/AB. However, unlike R-22, it is not completely miscible (ability to form one solution). Therefore, it is recommended to either convert 20% of the oil to POE or change over to POE completely, where circumstances warrant. Oil return could be inhibited in systems with long complex line sets and risers feeding compressor located > 5' above the evaporator. Tandem compressors without oil separators and chillers with large diameter suction lines will require a complete change to POE to assure proper oil return. Layering of liquid oil and liquid refrigerant might occur in receivers, which could prove problematic for oil return. Poor oil quality could also affect oil return and cause damage to the system. Contaminated systems should be flushed, and oil replaced with new POE. Below is a guide to when you should be concerned with oil return using MO/AB with R-427A. Be aware that compressor age, type, and condition could also impact oil return. Trane 3-D, Danfoss SM and all screw compressors will require a complete oil change to POE.

NO OIL CHANGE

1. Evaporator above compressor
2. Standard line set with minimal bends
3. Packaged units and close coupled systems
4. Systems utilizing oil separators

ADD OR CHANGE TO POE

1. Compressor above the evaporator > 5'
2. Long complex line sets
3. Tandem compressors, without an oil separator
4. Large diameter suction lines > 3"
5. Trane 3D scrolls & Danfoss SM compressors
6. Systems with receivers screw compressors

****If you add or change over to POE, you must install a new filter dryer. POE will act like a solvent and loosen dirt/grime within the system. POE oil is also hygroscopic. Pulling deep vacuums to 500 microns and installing new filter dryers are highly recommended.*

****Elastomeric seals can swell as a result of absorbing refrigerant. Different materials (different refrigerants) can be absorbed at different rates or to different amounts, and the extent of swelling will be different. The swelling is taken into account during the design of HVAC systems. HCFC refrigerants, like R-22, have chlorine. By their nature, chlorinated refrigerants will be more easily absorbed by elastomer materials than non-chlorinated refrigerants like (HFC) R- 427A. The seals/gaskets will not swell as much compared to R-22. Additionally, pulling a vacuum could further deform the seal. Arkema recommends replacing seals and gaskets, when retrofitting any R-22 system. In many HVAC systems, the Schrader core is the only external seal that needs to be replaced.*

OTHER IMPORTANT POINTS

Always charge less than the original R-22 charge. Charge 90% of the original R-22 charge, let the system run for twenty minutes, then add refrigerant, if needed. The flow rate of Forane® 427A is within 8% of R-22. Rarely will an adjustment of the expansion device be needed, in most systems. Large systems running EEVs will need to be programed for the P/T characteristics of R-427A.

Pressure Temperature (P/T) Chart:

All refrigerants have a respective P/T chart. Technicians can download the Forane® PT App (found in iTunes and Google-Play), containing all Forane® refrigerants (see QR codes below). Blended gases have two columns: Vapor and liquid. Use the vapor column for calculating superheat and the liquid column for subcooling. Use subcooling for systems utilizing a TXV.

NEW! FORANE® P/T APP

- Interactive pressure/temperature charts
- Pressure/temperature calculator
- Product finder
- Subcooling and superheat calculator
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Charging to sight glass:

Unlike R-22, which is a single component refrigerant, R-427A is blended from four component refrigerants: R-32, R-125, R-143a, and R-134a. Each component has a different boiling point, which equates to a 9° glide, when combined in ratios specific to R-427A. Seeing bubbles in a sight glass might not be indicative of a low charge, rather it could be a consequence of the glide. Therefore, charging by superheat and subcooling is the only way to attain the optimal charge.

“Topping off”:

Forane® 427A refrigerant is a non-azeotrope blend and could fractionate. The rate of fractionation is dependent of several factors: Running vs. dormant and/or liquid vs. gas. If a leak occurs, charge liquid Forane® 427A until the proper charge amount is met. Persistent leaks over time could warrant a completely new charge. The consequences of fractionation could be less than optimal performance, and the actual P/T readings will not match the P/T Chart.

Mixing refrigerants with R-22:

A technician is not supposed to mix refrigerants for three reasons.

1. Mixing refrigerants in the field will create a mixture of unknown composition that is not SNAP approved.
2. The original R-22 will be contaminated with the added refrigerant.
3. The P/T readings may not match either P/T chart.

There are no use restrictions on R-22 in the USA in the existing system. The phase down of R-22 production ends in 2020, however usage can continue until the R-22 supply is completely exhausted. Some systems might benefit by continuing to operate on R-22. Flooded evaporators and recirculation systems will be difficult to retrofit to a blended refrigerant. Arkema recommends continuing to use R-22 in these applications.



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