



# Freon™ 407C

Refrigerant (R-407C)

## Retrofit Guidelines

### Product Information

#### Introduction

Over the past six decades, HCFC-22 (R-22) has been used as a refrigerant in various refrigeration, industrial cooling, air conditioning, and heating applications. The low ozone depleting potential (ODP) of R-22 compared to CFC-11 and CFC-12, along with its excellent refrigerant properties, have helped facilitate the transition from chlorofluorocarbons (CFCs). However, hydrochlorofluorocarbons (HCFCs), including R-22, are scheduled for eventual phaseout under the Montreal Protocol. Chemours supports the current Montreal Protocol phaseout schedule for HCFCs and is committed to helping the industry prepare for the eventual phaseout of R-22.

Chemours has developed Freon™ 407C as the similar pressure replacement for R-22 in positive displacement, direct expansion (DX) air conditioners and heat pumps. This refrigerant is also suitable for use in many medium-temperature refrigeration systems that formerly used R-22. Freon™ 407C is the registered trademark for a blend of HFC-32/HFC-125/HFC-134a with a corresponding composition of 23/25/52 wt%. Freon™ 407C is commercially available for retrofit of existing equipment and as a long-term replacement option for R-22 in new equipment.

Using these retrofit guidelines, many R-22 systems can be retrofitted for use with Freon™ 407C in air conditioning, heat pump applications, and refrigeration applications to allow existing equipment to continue to operate safely and efficiently, even after R-22 is no longer available.

#### Environmental Properties and Safety

Freon™ 407C offers improved environmental properties versus R-22, with an equivalent global warming potential

(GWP) and zero ODP. Refer to the Chemours technical bulletin, "Properties and Performance of Freon™ 410A and 407C," for more detailed information on properties and performance characteristics of Freon™ 407C. Refer to the Safety Data Sheet (SDS) for safety information on the use of this product.

#### Materials Compatibility and Thermodynamic Property Information

The compatibility of plastics and elastomers should be considered before retrofitting to Freon™ 407C/polyol ester (POE) oil. Testing shows that there will be no one family of elastomers or plastics that will work with all alternative refrigerants. It is recommended that gaskets, shaft seals, and O-rings be reviewed with the equipment manufacturer before retrofit.

Field experience has shown that some systems retrofitted directly from CFC or HCFC to hydrofluorocarbon (HFC) refrigerants can have increased leakage of elastomers (O-rings, gaskets) following removal of the CFC or HCFC refrigerant, even if the existing elastomer is compatible with the HFC refrigerant. This is because the old elastomers will have swelled a certain amount, due to exposure to the CFC or HCFC refrigerant, and will swell a different amount when exposed to the HFC. The difference in swelling may cause a poor seal. If this problem is encountered, replace the used O-rings with new ones of the same material. They will then swell, due to exposure only to the new refrigerant, and seal as required.

Materials compatibility information is available through the Chemours Freon™ Answer Line, 1-800-235-7882 or at the Chemours Freon™ website, [freon.com](http://freon.com), under "Tech Info." On the website, general property and material compatibility information for Freon™ 407C is contained in the Properties, Uses, Storage, and Handling (PUSH) section. Thermodynamic property information is also available in the "Tech Info" area of the website.



Chemours™

**Table 1.** Freon™ 407C and R-22 Physical Properties

| Property  | Freon™ 407C    | R-22           |
|---|----------------|----------------|
| Boiling Point (1 atm), °F (°C)  | -46.4 (-43.56) | -41.4 (-40.80) |
| Vapor Pressure, Sat. Liquid at 77°F (25°C), Psia (kPa)                      | 170.29 (1,174) | 151.4 (1,043)  |
| Liquid Density at 77°F (25°C), lb/ft <sup>3</sup> (kg/m <sup>3</sup> )      | 70.8 (1,134)   | 74.5 (1,195)   |
| Density, Sat. Vapor at 77°F (25°C), lb/ft <sup>3</sup> (kg/m <sup>3</sup> ) | 2.62 (41.98)   | 2.76 (44.21)   |
| Ozone Depletion Potential as compared to R-11 (R-11 = 1)                    | 0              | 0.05           |
| Global Warming Potential, CO <sub>2</sub> = 1.0 (100 Year ITH*)             | 1,600          | 1,700          |

\*Integrated Time Horizon

## Lubricants

Lubricant selection is based on several factors, which can include lubricant return to the compressor, lubricity, and materials compatibility. POE lubricants are recommended for use in most HFC systems. There are many POE lubricant manufacturers; to determine which lubricant is recommended for the refrigeration system, contact the compressor manufacturer, equipment manufacturer, or a Chemours distributor.

Special care should be taken when handling POE lubricants, due to their tendency to absorb water. Contact with air should be minimized, and the lubricant should be stored in a sealed metal container.

When retrofitting R-22/mineral oil systems to Freon™ 407C/POE lubricant to achieve equivalent miscibility, the residual mineral oil should be around 5 wt% or less of the total lubricant used in the system. Allowable residual mineral oil is highly dependent on system configuration and operating conditions. If the system shows signs of poor heat transfer in the evaporator or poor oil return to the compressor, it may be necessary to further reduce the residual mineral oil. A series of successive lubricant changes using POEs can normally reduce the mineral oil concentration to low levels. Lubricant manufacturers have developed field test methods for determining the weight percent of mineral oil in POE lubricant. Contact the lubricant manufacturer for the recommended test method.

## Performance Characteristics in Existing R-22 Designs

Freon™ 407C provides similar energy efficiency and capacity to R-22 with a lower discharge temperature and slightly higher discharge pressure. As a result, minimal system modifications are anticipated when retrofitting R-22 systems to Freon™ 407C. Original equipment manufacturers should be contacted to determine if discharge pressure controls will need to be adjusted to compensate for the higher discharge pressure. **Table 2** summarizes the actual performance of Freon™ 407C versus R-22 for both cooling and heating modes in different units designed for R-22. The units were not modified or optimized for performance with Freon™ 407C.

**Table 2.** Performance of Freon™ 407C Relative to R-22 in Multiple Air Conditioners and Heat Pumps

|   | Freon™ 407C               |
|---|---------------------------|
| <b>Range of Performance: Cooling Mode*</b>  |                           |
| Relative Capacity, %                        | 98 to 106                 |
| Relative Energy Efficiency Ratio (EER), %   | 93 to 97                  |
| Change in Discharge Temperature, °F (°C)    | -15 to -8 (-8.3 to -4.4)  |
| Change in Discharge Pressure, psi (kPa)     | +15 to +40 (+103 to +276) |
| <b>Range of Performance: Heating Mode**</b> |                           |
| Relative Capacity, %                        | 93 to 106                 |
| Relative Energy Efficiency Ratio (EER), %   | 94 to 97                  |
| Change in Discharge Temperature, °F (°C)    | -18 to 0 (-10 to 0)       |
| Change in Discharge Pressure, psi (kPa)     | +9 to +34 (+62 to +234)   |

Values compared to R-22 in unmodified split system heat pumps and window air conditioners using the:

\*DOE cooling test conditions A and B

\*\*DOE heating test conditions E and H

## Influence of Leak/Recharge on Performance

Freon™ 407C has excellent refrigerant behavior, even in the event of vapor leaks from a two-phase region of a refrigeration system and subsequent refrigerant recharges.

If there is a Freon™ 407C leak from an operating unit in a two-phase region where mixing occurs (heat exchangers or expansion device), both the vapor and liquid will leak from the unit. The composition of the refrigerant left in the system will remain essentially unchanged from the original composition. After recharging Freon™ 407C to the system to get back to the original charge size, the performance of the unit will be the same as its original performance with Freon™ 407C.

**Table 3.** Theoretical Unit Performance After 50 wt% Vapor Leaks and Recharges of Freon™ 407C

| Recharge No. | Relative COP,* % | Relative Capacity,** % | Compressor Discharge |                      |
|--------------|------------------|------------------------|----------------------|----------------------|
|              |                  |                        | Temperature, °F (°C) | Pressure, psig (kPa) |
| 0            | 100              | 100                    | 178 (81.1)           | 261 (1,903)          |
| 1            | 101              | 95                     | 177 (80.6)           | 246 (1,800)          |
| 2            | 101              | 93                     | 177 (80.6)           | 239 (1,751)          |
| 3            | 101              | 92                     | 177 (80.6)           | 236 (1,731)          |
| 4            | 101              | 91                     | 177 (80.6)           | 235 (1,724)          |
| 5            | 101              | 91                     | 177 (80.6)           | 235 (1,724)          |

\*Coefficient of Performance (measure of energy efficiency) relative to the Coefficient of Performance of the original charge of Freon™ 407C.

\*\*Refrigerant cooling capacity relative to the capacity of the original charge of Freon™ 407C.

However, if the unit is not operating and there is a vapor leak from a static two-phase region, the composition of the refrigerant that remains in the unit will change. The remaining refrigerant will be more concentrated in the high boiling component (HFC-134a) and less concentrated in the lower boiling components (HFC-32 and HFC-125). The effect of this composition shift on the performance of Freon™ 407C is summarized in **Table 3**. These data reflect the theoretical performance of Freon™ 407C for multiple recharges of a system after 50 wt% of the refrigerant charge is lost through a vapor leak above a two-phase region.

Three important observations from the data generated in this leak/recharge study are:

During a vapor leak, the HFC-32 (the flammable mixture component) remaining in the system decreases in concentration, such that the mixture remains nonflammable.

Energy efficiency is maintained, and discharge temperature and discharge pressure decrease during the vapor leak/recharge scenario.

Capacity loss is limited to 9%, as the performance of Freon™ 407C levels out after four 50% leak/recharges.

**Note further that the theoretical study reflects a worst case scenario. In practice, lesser changes are normally experienced, as illustrated by results from a heat pump leak experiment that showed the capacity loss was maintained at 4% after the second recharge.**

Freon™ 407C is suitable as a replacement for R-22 in medium-temperature (20 to 40 °F [-6.7 to 4.4 °C]) evaporator conditions, but loses capacity at lower temperatures, where higher pressure refrigerants such as Freon™ 404A are recommended. **Table 4** shows expected operating performance of Freon™ 407C relative to R-22 at

40 and 0 °F (4.4 and -17.8 °C) evaporator conditions, showing the reduced capacity of 407C at low evaporator temperatures.

**Table 4.** Performance of Freon™ 407C Relative to R-22 in Refrigeration Systems (0 to 40 °F [-17.8 to 4.4 °C] Evaporator)\*

| Range of Performance:                     | Freon™ 407C    |                 |
|---|----------------|-----------------|
|   | 40 °F (4.4 °C) | 0 °F (-17.8 °C) |
| Relative Capacity, %                      | 99             | 92              |
| Relative Energy Efficiency Ratio (EER), % | 94             | 93              |
| Change in Discharge Temperature, °F (°C)  | -13 (-7)       | -23 (-13)       |
| Change in Discharge Pressure, psi (kPa)   | 17 (117)       | 17 (117)        |

\*Chemours calculations

\*\*Assumes 110°F (43.3°C) condensing temperature

## Charging a Unit with Freon™ 407C

As with any other refrigerant blend, when charging equipment with Freon™ 407C, remove liquid refrigerant from the cylinder to charge the unit. Returnable cylinders containing Freon™ 407C are equipped with liquid and vapor valves. The liquid valve is attached to a dip-tube that extends to the bottom of the cylinder, so that liquid can be removed from the cylinder as it is standing upright. Disposable containers (DACs) have instructions and arrows printed on the container that show how to orient the container to remove liquid or vapor.

Note that Freon™ 407C is not designed for use in conjunction with other refrigerants. Adding Freon™ 407C to any other refrigerant can form mixtures that could cause system performance problems.

## Overview of Retrofit Process

Retrofit of an existing R-22 system with Freon™ 407C can be accomplished using service practices and equipment commonly used by trained mechanics or service contractors in the field.

The key steps involved in the retrofit are:

- Establish baseline data with R-22.
- Remove mineral oil or alkylbenzene oil from compressor, and replace with a recommended POE lubricant. Run system for at least 8 hr or more if system has complex tubing circuits, and determine residual oil content. Perform additional lubricant changes if necessary. Three or four lubricant changes are usually sufficient to get the residual oil content in the POE down to 5% or less.
- Recover R-22 charge from the system.
- Replace filter/drier with new drier compatible with the retrofit refrigerant and POE lubricant.
- Charge system with the retrofit refrigerant.
- Start system, and adjust charge and/or controls to achieve desired operation.

For the majority of systems, the compressor lubricant charge, a filter/drier change, and a possible adjustment to the superheat setting (in systems with expansion valves) will be the only system modifications required in a retrofit to Freon™ 407C. For systems that are still under warranty, we recommend contacting the equipment or compressor manufacturers prior to performing the retrofit. Some equipment or compressor warranties may be impacted by a change from the refrigerant or lubricant originally specified for the system or compressor. Most compressor manufacturers are familiar with Freon™ 407C and can give an indication of how the compressor will operate with the retrofit refrigerant.

### Equipment and Supplies Needed for Retrofit

- Safety equipment (gloves, glasses)
- Manifold gauges
- Thermocouples to read line temperatures
- Vacuum pump
- Leak detection equipment
- Scale
- Recovery unit
- Recovery cylinder
- Container for recovered lubricant
- Replacement lubricant
- Replacement refrigerant
- Replacement filter/drier
- Labels indicating the refrigerant and lubricant charged into the system

### Retrofit Procedure

Summarized below is a more detailed discussion of the recommended procedure for retrofitting an R-22 system to Freon™ 407C.

1. **Baseline Data with R-22.** For service contractors performing their initial retrofits with Freon™ 407C, it is recommended that system performance data be collected while R-22 remains in the system. Check for correct refrigerant charge and operating conditions. The baseline of temperatures and pressures with the correct charge of R-22 at various points in the system (evaporator, condenser, compressor suction and discharge, expansion device, etc.) will be useful when optimizing operation of the system with Freon™ 407C. A System Data Sheet is attached for recording this baseline data.
2. **Drain/Charge System Lubricant.** Where mineral oil or alkylbenzene oil is the existing lubricant in the system, it will have to be drained. This may require removing the compressor from the system, particularly with small hermetic compressors that have no oil drain. In this case, the lubricant can be drained from the suction line of the compressor. In most small systems, 90-95% of the lubricant can be removed from the compressor in this manner. Larger systems may require drainage from additional points in the system, particularly low spots around the evaporator, to remove the majority of the lubricant. In systems with an oil separator, any lubricant present in the separator should also be drained.

In all cases, measure the volume of lubricant removed from the system. Compare to the compressor/system specifications to ensure that the majority of lubricant has been removed. POE lubricant is recommended for use with Freon™ 407C. In order to achieve equivalent miscibility to R-22/oil, the residual oil should be about 5 wt% or less of the total lubricant used in the system. In larger systems, this amount of residual mineral oil can be achieved by using a flushing technique. Three or more lubricant flushes may be required. Lubricant flushes involve:

- Draining existing lubricant from the system, as described above.
- Selecting a POE lubricant with similar viscosity to the existing lubricant.
- Charging an amount of POE equal to the amount of lubricant removed.

- Running the system with R-22 for thorough mixing of POE/existing lubricant (48-72 hr of operation may be required).

Repeat these steps two more times. On the last flush, R-22 will be replaced with the retrofit refrigerant.

- 3. Remove R-22 Charge.** R-22 should be removed from the system and collected in a recovery cylinder using a recovery device capable of pulling 10-20 in Hg vacuum (34-67 kPa, 0.34-0.67 bar). If the correct R-22 charge size for the system is not known, weigh the amount of refrigerant removed, as the initial quantity of the retrofit refrigerant charged in the system will be determined from this figure.
- 4. Reinstall Compressor** (if removed from system in Step 2). Use normal service practice.
- 5. Replace Filter/Drier.** It is routine practice to replace the filter/drier following system maintenance. There are two types of filter/driers commonly used in R-22 equipment:
  - Loose fill driers, which contain only the molecular sieve desiccant
  - Solid core driers, in which the molecular sieve desiccant is dispersed within a solid core binder

XH-11 desiccant from UOP is compatible with Freon™ 407C, making it a suitable replacement for use in loose fill driers with these refrigerants. For solid core driers, consult the drier manufacturer for their recommended drier for use with Freon™ 407C. In the United States, Sporlan and Alco have solid core driers, which show acceptable compatibility with this new refrigerant.
- 6. Reconnect System and Evacuate.** Use normal service practices. To remove air or other non-condensables in the system, evacuate the system to near full vacuum (29.9 in, 500 microns, 0.14 kPa, 0.0014 bar).
- 7. Leak Check System.** Use normal service practices. If a leak detector is used, consult the leak detector manufacturer for the unit's sensitivity to Freon™ 407C. Re-evacuate the system following leak check if necessary.
- 8. Charge System with Freon™ 407C.** This refrigerant should be removed from the cylinder as a liquid. The proper cylinder position for liquid removal is indicated by arrows on the cylinder and cylinder box. Once liquid is removed from the cylinder, the refrigerant can be charged to the system as liquid or vapor as required.

Use the manifold gauge set or a throttling valve to flash the liquid to vapor if needed.

The refrigerant system will typically require less weight of Freon™ 407C than R-22. The optimum charge will vary, depending on the operating conditions, size of the evaporator and condenser, size of the receiver (if present), and the length of pipe or tubing run in the system. For most systems, the optimum retrofit refrigerant charge will be between 90 and 95% by weight of the original equipment manufacturer's R-22 charge.

It is recommended that the system be initially charged with the retrofit refrigerant to about 80% by weight of the correct R-22 charge. Add as much as possible of the initial charge to the high pressure side of the system (compressor not running). When the system and cylinder pressures equilibrate, load the remainder of the refrigerant into the suction side of the system (compressor running). Liquid refrigerant should never be allowed to enter the suction side of the compressor.

- 9. Start Up System and Adjust Charge.** Start up the system and let conditions stabilize. If the system is undercharged, add more of the retrofit refrigerant in small amounts until the system conditions reach the desired levels. Refer to the refrigerant Pressure-Temperature chart (**Table 5**) to compare system operating pressures and temperatures with those of R-22. Freon™ 407C will have higher discharge pressures and lower discharge temperatures when compared to R-22 operation.
- 10. Note: Label Components and System.** After retrofitting the system with Freon™ 407C, label the system components to identify the refrigerant and lubricant in the system, so that the proper refrigerant and lubricant will be used to service the equipment in the future. Freon™ refrigerant identification labels are available from Chemours.

## Summary

With the phaseout of CFCs and HCFCs, existing refrigeration equipment will need to be replaced with new equipment or retrofitted with alternative refrigerants. Using the procedures described above, existing refrigerant R-22 systems can be retrofitted for use with Freon™ 407C, allowing them to continue in service for the remainder of their useful life.

Attached is a Retrofit Checklist, System Data Sheet, and pressure-temperature charts for Freon™ 407C to assist you in the retrofit process.

**Table 5.** Pressure-Temperature Chart—Freon™ 407C Saturation Properties (English and SI Units)

| English         |                  |           |                 |                  |           | SI             |                  |           |                |                  |           |
|-----------------|------------------|-----------|-----------------|------------------|-----------|----------------|------------------|-----------|----------------|------------------|-----------|
| Pressure (psig) | Temperature (°F) |           | Pressure (psig) | Temperature (°F) |           | Pressure (kPa) | Temperature (°C) |           | Pressure (kPa) | Temperature (°C) |           |
|                 | Sat. Liq.        | Sat. Vap. |                 | Sat. Liq.        | Sat. Vap. |                | Sat. Liq.        | Sat. Vap. |                | Sat. Liq.        | Sat. Vap. |
| 20.0*           | -84              | -71       | 120             | 62               | 72        | 10             | -83              | -75       | 800            | 11               | 17        |
| 15.0*           | -71              | -58       | 125             | 64               | 75        | 20             | -73              | -65       | 825            | 12               | 18        |
| 10.0*           | -61              | -48       | 130             | 66               | 77        | 30             | -66              | -59       | 850            | 14               | 19        |
| 5.0*            | -53              | -40       | 135             | 69               | 79        | 40             | -61              | -54       | 900            | 15               | 21        |
| 0               | -46              | -34       | 140             | 71               | 81        | 50             | -57              | -50       | 950            | 17               | 23        |
| 2               | -42              | -29       | 145             | 73               | 83        | 60             | -54              | -47       | 1000           | 19               | 25        |
| 4               | -37              | -24       | 150             | 75               | 85        | 70             | -51              | -44       | 1050           | 21               | 27        |
| 6               | -33              | -20       | 155             | 77               | 87        | 80             | -48              | -41       | 1100           | 23               | 28        |
| 8               | -29              | -17       | 160             | 79               | 89        | 90             | -46              | -39       | 1150           | 24               | 30        |
| 10              | -26              | -13       | 165             | 81               | 90        | 100            | -43              | -37       | 1200           | 26               | 31        |
| 12              | -22              | -10       | 170             | 82               | 92        | 110            | -42              | -35       | 1250           | 27               | 33        |
| 14              | -19              | -7        | 175             | 84               | 94        | 120            | -40              | -33       | 1300           | 29               | 34        |
| 16              | -16              | -4        | 180             | 86               | 96        | 130            | -38              | -31       | 1350           | 30               | 36        |
| 18              | --13             | -1        | 185             | 88               | 97        | 140            | -37              | -30       | 1400           | 32               | 37        |
| 20              | -11              | 1         | 190             | 90               | 99        | 150            | -35              | -28       | 1450           | 33               | 38        |
| 22              | -8               | 4         | 195             | 91               | 101       | 160            | -33              | -27       | 1500           | 34               | 40        |
| 24              | -6               | 6         | 200             | 93               | 102       | 170            | -32              | -25       | 1550           | 36               | 41        |
| 26              | -3               | 9         | 205             | 95               | 104       | 180            | -31              | -24       | 1600           | 37               | 42        |
| 28              | -1               | 11        | 210             | 96               | 105       | 190            | -29              | -23       | 1650           | 38               | 43        |
| 30              | 1                | 13        | 215             | 98               | 107       | 200            | -28              | -21       | 1700           | 39               | 44        |
| 32              | 3                | 15        | 220             | 99               | 108       | 210            | -27              | -20       | 1750           | 41               | 46        |
| 34              | 5                | 17        | 225             | 101              | 110       | 230            | -25              | -18       | 1800           | 42               | 47        |
| 36              | 7                | 19        | 230             | 102              | 111       | 240            | -24              | -17       | 1850           | 43               | 48        |
| 38              | 9                | 21        | 235             | 104              | 113       | 250            | -23              | -16       | 1900           | 44               | 49        |
| 40              | 11               | 23        | 240             | 105              | 114       | 260            | -22              | -15       | 1950           | 45               | 50        |
| 42              | 13               | 25        | 245             | 107              | 116       | 270            | -21              | -14       | 2000           | 46               | 51        |
| 44              | 15               | 26        | 250             | 108              | 117       | 280            | -20              | -13       | 2050           | 47               | 52        |
| 46              | 16               | 28        | 255             | 110              | 118       | 290            | -19              | -12       | 2100           | 48               | 53        |
| 48              | 18               | 30        | 260             | 111              | 120       | 300            | -18              | -11       | 2150           | 49               | 54        |
| 50              | 20               | 31        | 265             | 112              | 121       | 310            | -17              | -10       | 2200           | 50               | 55        |
| 52              | 21               | 33        | 270             | 114              | 122       | 320            | -16              | -9        | 2250           | 51               | 56        |
| 54              | 23               | 35        | 275             | 115              | 123       | 330            | -15              | -9        | 2300           | 52               | 57        |
| 56              | 24               | 36        | 280             | 116              | 125       | 340            | -15              | -8        | 2350           | 53               | 57        |
| 58              | 26               | 37        | 285             | 118              | 126       | 350            | -14              | -7        | 2400           | 54               | 58        |
| 60              | 27               | 39        | 290             | 119              | 127       | 375            | -12              | -5        | 2450           | 55               | 59        |
| 62              | 29               | 40        | 295             | 120              | 128       | 400            | -10              | -3        | 2500           | 56               | 60        |
| 64              | 30               | 42        | 300             | 121              | 129       | 425            | -8               | -2        | 2600           | 58               | 62        |
| 66              | 32               | 43        | 310             | 124              | 132       | 450            | -7               | 0         | 2700           | 59               | 63        |
| 68              | 33               | 44        | 320             | 126              | 134       | 475            | -5               | 1         | 2800           | 61               | 65        |
| 70              | 34               | 46        | 330             | 129              | 136       | 500            | -3               | 3         | 2900           | 63               | 67        |
| 75              | 38               | 49        | 340             | 131              | 138       | 525            | -2               | 4         | 3000           | 64               | 68        |
| 80              | 41               | 52        | 350             | 133              | 141       | 550            | -1               | 6         | 3100           | 66               | 69        |
| 85              | 44               | 55        | 360             | 135              | 143       | 575            | 1                | 7         | 3200           | 68               | 71        |
| 90              | 46               | 57        | 370             | 138              | 145       | 600            | 2                | 8         | 3300           | 69               | 72        |
| 95              | 49               | 60        | 380             | 140              | 147       | 625            | 3                | 10        | 3400           | 71               | 74        |
| 100             | 52               | 63        | 390             | 142              | 149       | 650            | 5                | 11        | 3500           | 72               | 75        |
| 105             | 55               | 65        | 400             | 144              | 151       | 675            | 6                | 12        | 3600           | 73               | 76        |
| 110             | 57               | 68        | 425             | 149              | 155       | 700            | 7                | 13        | 3700           | 75               | 77        |
| 115             | 59               | 70        | 450             | 154              | 160       | 725            | 8                | 14        | 3800           | 76               | 79        |
|                 |                  |           |                 |                  |           | 750            | 9                | 15        | 3900           | 78               | 80        |
|                 |                  |           |                 |                  |           | 775            | 10               | 16        | 4000           | 79               | 81        |

\*Inches of Hg vacuum

### System Data Sheet

Type of System/Location: \_\_\_\_\_

Equipment Mfg.: \_\_\_\_\_

New Lubricant: \_\_\_\_\_

Model No.: \_\_\_\_\_

Type/Mfg.: \_\_\_\_\_

Serial No.: \_\_\_\_\_

Charge Size: \_\_\_\_\_

R-22 Charge Size: \_\_\_\_\_

1st Charge Size: \_\_\_\_\_

Compressor Mfg.: \_\_\_\_\_

2nd Charge Size: \_\_\_\_\_

Model No.: \_\_\_\_\_

Additional Charge Size: \_\_\_\_\_

Serial No.: \_\_\_\_\_

Drier Type (check one):

Original Lubricant: \_\_\_\_\_

Loose Fill: \_\_\_\_\_

Type/Mfg.: \_\_\_\_\_

Solid Core: \_\_\_\_\_

Charge Size: \_\_\_\_\_

**Condenser Cooling Medium (air/water):** \_\_\_\_\_

**Expansion Device (check one):**

Capillary Tube: \_\_\_\_\_

Expansion Valve: \_\_\_\_\_

**If Expansion Valve:**

Manufacturer: \_\_\_\_\_

Model No.: \_\_\_\_\_

Control/Set Point: \_\_\_\_\_

Location of Sensor: \_\_\_\_\_

**Other System Controls (e.g., head pressure control):** \_\_\_\_\_

|  |  |  |  |  |
|--|--|--|--|--|
| Date/Time                                  |  |  |  |  |
| Refrigerant                                |  |  |  |  |
| Charge Size (lb, oz/g)                     |  |  |  |  |
| Ambient Temp. (°F/°C)                      |  |  |  |  |
| Relative Humidity                          |  |  |  |  |
| Compressor                                 |  |  |  |  |
| Suction Temperature (°F/°C)                |  |  |  |  |
| Suction Pressure (psig, psia/kPa, bar)     |  |  |  |  |
| Discharge Temperature (°F/°C)              |  |  |  |  |
| Discharge Pressure (psig, psia/kPa, bar)   |  |  |  |  |
| Evaporator                                 |  |  |  |  |
| Refrigerant Inlet T (°F/°C)                |  |  |  |  |
| Refrigerant Outlet T (°F/°C)               |  |  |  |  |
| Coil Air/H <sub>2</sub> O In T (°F/°C)     |  |  |  |  |
| Coil Air/H <sub>2</sub> O Out T (°F/°C)    |  |  |  |  |
| Refrigerant T at Superht. Ctl. Pt. (°F/°C) |  |  |  |  |
| Condenser                                  |  |  |  |  |
| Refrigerant Inlet T (°F/°C)                |  |  |  |  |
| Refrigerant Outlet T (°F/°C)               |  |  |  |  |
| Coil Air/H <sub>2</sub> O In T (°F/°C)     |  |  |  |  |
| Coil Air/H <sub>2</sub> O Out T (°F/°C)    |  |  |  |  |
| Exp. Device Inlet T (°F/°C)                |  |  |  |  |
| Motor Amps                                 |  |  |  |  |
| Run/Cycle Time                             |  |  |  |  |

## Checklist for Freon™ 407C Retrofit

- Establish baseline performance for R-22. (See data sheet for recommended data.)
- Consult the original equipment manufacturer of the system components for their recommendation on the following:
  - Plastics compatibility
  - Elastomeric compatibility
  - Lubricant (viscosity, manufacturer, additives)
  - Retrofit procedure to sustain warranty, if applicable
- Drain lubricant charge from compressor (unless POE lubricant is already in the system).\*
  - Remove 90–95% of lubricant from the system.
  - Measure and record amount of lubricant removed. \_\_\_\_\_
- Charge POE lubricant. Run system for 8 hr minimum.
  - Recharge with amount equivalent to amount of mineral oil removed.
- Repeat lubricant drain and ester charging until mineral oil content is less than 5%.
- Remove R-22 charge from system. (Need 10–20 in Hg vacuum [34–67 kPa, 0.34–0.68 bar] to remove charge.)
- Re-install compressor (if removed).
- Replace filter drier with new drier approved for use with retrofit refrigerant.
  - Loose fill driers: Use XH-11 desiccant or equivalent.
  - Solid core driers: Check with drier manufacturer for recommendation.
- Reconnect system, and evacuate with vacuum pump. (Evacuate to full vacuum [29.9 in Hg vacuum/0.0014 bar]).
- Leak check system. (Re-evacuate system following leak check.)
- Charge system with retrofit refrigerant.
  - Initially charge 80% by weight of original equipment manufacturer specified R-404A charge.
  - Amount of refrigerant charged: \_\_\_\_\_
- Start up equipment, and adjust charge until desired operating conditions are achieved.
  - If low in charge, add in increments of 2–3% by weight.
  - Amount of refrigerant charged: \_\_\_\_\_
  - Total refrigerant charged: \_\_\_\_\_
- Label components and system for type of refrigerant and lubricant (POE).
- Conversion is complete!

\*R-22 charge should only be removed if compressor must be taken out of system to drain oil, such as for small hermetics.

---

### For more information on Freon™ refrigerants, visit [freon.com](http://freon.com)

The information set forth herein is furnished free of charge and based on technical data that Chemours believes to be reliable. It is intended for use by persons having technical skill, at their own risk. Because conditions of use are outside our control, Chemours makes no warranties, expressed or implied, and assumes no liability in connection with any use of this information. Nothing herein is to be taken as a license to operate under, or a recommendation to infringe, any patents or patent applications.

© 2017 The Chemours Company FC, LLC. Freon™ and any associated logos are trademarks or copyrights of The Chemours Company FC, LLC. Chemours™ and the Chemours Logo are trademarks of The Chemours Company.

Replaces: H-70004-4  
C-11107 (2/17)