Honeywell
REFRIGERANTS
EUROPE

R-407C

Introduction

R-407C (a ternary blend of HFC-32/HFC-125/HFC-134a, assigned R-407C by ASHRAE) serves as a non-ozone-depleting replacement for R-22 (HCFC-22) in various air-conditioning applications, as well as in other refrigeration systems.

Since R-407C is a close match to R-22, it also serves as a retrofit fluid in applications where R-22 is generally used.

Pressure/Temperature table

Temperature (°C)	Bubble pressure (liquid) (kPa)	Dew pressure (vapour) (kPa)
-30.0	188	139
-25.0	231	174
-20.0	281	215
-15.0	339	264
-10.0	405	320
-5.0	481	386
0.0	568	461
5.0	666	547
10.0	776	645
15.0	899	755
20.0	1036	880
25.0	1188	1019
30.0	1356	1175
35.0	1541	1348
40.0	1745	1539
45.0	1967	1751
50.0	2210	1985
55.0	2475	2242
60.0	2763	2524

Applications

Unitary Air conditioning

R-407C can serve as a non-ozone depleting replacement for R-22 in residential and light commercial air-conditioning systems. Relative to R-22 there is little to no capacity decrease with R-407C, making it easier to use in existing equipment designs. However, some loss of efficiency will occur and some equipment modifications will be required when retrofitting these systems to R-407C. In designing for new equipment, some design changes may be needed if retention of efficiency ratings are required.

Chillers

R-407C can serve as a replacement for R-22 in positive displacement chillers without flooded heat-exchangers. Because R-407C is a blend with a temperature glide, it is not recommended for use in chillers with a flooded evaporator.

Commercial refrigeration

R-407C may be used to replace R-22 in existing medium-temperature commercial refrigeration systems, including supermarket display cases and reach-in coolers.

Physical properties

Components:	Chemical name:	Molecular formula:	Weight %:
HFC-32	Difluoromethane	CH_2F_2	23%
HFC-125	Pentafluoroethane	CHF_2CF_3	25%
HFC-134a	1,1,1,2 Tetrafluoroethane	CH_2FCF_3	52%

Chemical name		Difluoromethane/Pentafluoroethane/Tetrafluoroethane
Molecular formula		$CH_2F_2/CHF_2CF_3/CH_2FCF_3$
Molecular weight		86.2
Ozone Depletion Potential (ODP – R11=1)		0
Bubble point temperature (°C)	at 101.3 kPa	- 43.7°C
Bubble point pressure (kPa) (*)		1193
Dew point temperature (°C)	at 101.3 kPa	- 36.7°C
Dew point pressure (kPa) (*)		1019
Critical temperature (°C)		87.3
Critical pressure (kPa)		4819
Critical volume (m^3/kg)		0.0019
Critical density (kg/m^3)		515.8
Vapour density (kg/m^3)	at 101.3 kPa	4.585
Liquid density (kg/m^3) (*)		1153
Liquid heat capacity † (kJ/kg·°K) (*)		1.481
Vapour heat capacity (at constant pressure) † (kJ/kg·°K)		0.963
Heat of vaporization at boiling point (kJ/kg)		249.73
Vapour pressure † (kPa)		1287.01
Liquid thermal conductivity † (W/m·°K)		0.08626 (*)
Vapour thermal conductivity † (W/m·°K)		0.01314 (*)
Liquid viscosity † (µPa·sec)		164.3 (*)
Vapour viscosity † (µPa·sec)		12.83
Flammability limits in air at 1 atm (vol%)		None
ASHRAE Safety Group Classification		A1/A1

(*) Information based on estimated properties.
† All measurements are at 25°C and 1 atm (101.3 kPa) unless otherwise noted.

R-407C must be only liquid charged into a system to ensure proper refrigerant composition and system performance.

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Materials compatibility

Compatibility: plastics/elastomers

Material	R-407C
Ethylene-Propylene Diene Terpolymer	S
Ethylene-Propylene Copolymer	S
Chlorosulfonated Polyethylene	S
Chlorinated Polyethylene	Su
Neoprene (Chloroprene)	S
Epichlorohydrin	Su
Fluorinated Rubbers	U
Silicone	Su
Polyurethane	Su
Nitriles	Su
H-NBR	Su
Butyl Rubber	Su
Polysulfide	S
Nylon	S
Polytetrafluoroethylene	S
PEEK	S
ABS	U
Polypropylene	Su
Polyphenyl Sulfide	U
Polyethylene Terephthalate	Su
Polysulfone	Su
Polyimide	S
Polyetherimide	S
Polyphthalamide	Su
Polyamideimide	S
Acetal	Su
Phenolic	S

S: Suitable
Su: Suitable with some exceptions
U: Unsuitable

The table below is a summary of materials compatibility data resulting from tests performed by Honeywell and other worldwide industry organisations.
Since there are many different grades and formulations of these materials, we recommend that compatibility testing be performed on the specific grade of materials under consideration when designing new systems. This data should be used only as a guide to the compatibility of materials with Honeywell R-407C. The rankings in the table at the right should be used with caution since they are judgments based on limited samplings. Customers should consult with the manufacturer or conduct further independent testing. Return empty cylinders to your Honeywell distributor.

Servicing considerations

R-407C is a ternary blend of HCF-32/HFC-125/HFC-134a. This product can generally be used to successfully retrofit existing R-22 systems. Unlike pure fluids and azeotropes, blends boil and condense at varying temperatures for a given pressure. The range over which the temperature varies is referred to as temperature glide. R-407C has moderately high temperature glides between about 5°C and 7°C, depending upon pressure.

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Safety

Honeywell recommends reading the Material Safety Data Sheet (MSDS) before using R-407C.

Toxicity

R-407C can be safely used in all of its intended applications, based on data developed by the Program for Alternative Fluorocarbon Toxicity Testing (PAFT 1).

Leaks

If a large release of R-407C a vapour occurs, the area should be evacuated immediately. Vapours may concentrate near the floor, displacing available oxygen. Once the area is evacuated, it must be ventilated using blowers or fans to circulate the air at floor-level.

Flammability

According to ASHRAE Standard 34, R-407C is classified in safety group A1/A1, i.e., it is non-flammable at 1 atm. pressure (101.3 kPa) and 18°C.

Leak detection

Use leak detectors for pinpointing leaks or for monitoring an entire room on a continual basis. Leak detection is important for refrigerant conservation, equipment protection and performance, reduction of emission and protection of those coming in contact with the system. Never use air to perform leak detection.

Retrofitting existing systems

As the industry moves away from the use of CFCs and HCFCs, refrigerant service personnel will play a key role in the transition to HFC alternatives through retrofitting. Honeywell has prepared the following guidelines to help service technicians better understand the various technical and operational aspects of performing retrofits on air conditioning or refrigeration systems using Honeywell's R-407C.

Although the information can be helpful as a general guide, **it should not be used as a substitute for the equipment manufacturers specific recommendations.** For this reason, Honeywell recommends contacting the equipment manufacturer for detailed information on retrofitting the specific equipment under consideration. And, always refer to the MSDS for safety information on the use of R-407C.

Applications

Since R-407C is a close match to R-22, it also serves as a retrofit fluid in many applications where R-22 is generally used, including unitary air conditioning, positive displacement chillers and commercial refrigeration.

Retrofit

R-407C can be used successfully as a retrofit fluid, but may require some system modifications such as changing the lubricant. Mineral oils and alkylbenzene lubricants, which have been used traditionally with R-22 are immiscible with R-407C and must therefore be replaced with new lubricants. Consult the original equipment manufacturer for the recommended lubricants.

Storage and handling

Bulk and cylinder

Some special handling and storage procedures are required for R-407C to minimise or prevent liquid compositional changes, particularly those occurring during liquid level depletion or vapour leaks from the storage container. Because these procedures and/or systems are sometimes site specific for designed leak storage systems, contact a Honeywell Technical Service Representative to discuss each application.

Among the most important handling practices that must be followed for R-407C is to ensure that all transfers be executed by using liquid flow instead of vapour. This practice will help minimise compositional changes in the liquid phase and, as a result, provide a more consistent product.

R-407C cylinders must be clearly marked and kept in a cool, dry and properly ventilated storage area away from heat, flames, corrosive chemicals, fumes, explosives -- and be otherwise protected from damage. Under no circumstances should an empty cylinder be refilled **with anything other than virgin product.** Once empty, properly close the cylinder valve and replace the valve cap.

Return empty cylinders to your Honeywell distributor.

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Cylinders of R-407C should be kept out of direct sunlight, especially in warm weather. Liquid R-407C expands significantly when heated, reducing the amount of vapour space left in the cylinder. Once the cylinder becomes liquid-full, any further rise in temperature can cause it to burst, potentially resulting in severe personal injury. **Never allow a cylinder to get warmer than 52°C.** Vessels, containers, transfer lines, pumps and other equipment used with R-407C should not be exposed to high-temperature sources (such as welding, brazing and open flames) until they have been thoroughly cleaned and found free of vapours or liquid. Cylinders must never be exposed to welding, brazing or open flames. Exposure to high temperatures can cause fire, explosion and decomposition of R-407C. This may result in the formation of toxic or corrosive compounds.

When possible, maintenance or cleaning of equipment should be performed without entering the vessel. If a tank or any confined space must be entered, then formal confined space entry procedures must be followed. These procedures require that a fully qualified work team be used and a confined space entry form be completed and placed at the job site.

Available literature

Honeywell has a wide range of literature available on topics including: retrofitting procedures, product specifications and product descriptions.
Please ask for the CD-rom containing Refrigerant Properties, Cycle Analysis and Pipe Sizing

For further information and/or technical assistance on refrigerants, please contact us at our sales & technical offices:

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