



RS-70 (R453A)

All purpose low GWP Drop-in replacement
for R22 in air conditioning & refrigeration



*Compatible with mineral, alkyl benzene
& polyol ester lubricants*

from

REFRIGERANT SOLUTIONS LIMITED

The Refrigerant Specialists

RS-70 (R453A)



All purpose, low GWP & zero ODP Drop-in replacement for R22, & compatible with all lubricants

RS-70 (R453A) is a new non-flammable Drop-in replacement for R22 which has been designed to have the lowest possible Global Warming Potential (GWP) consistent with high thermodynamic performance having a similar cooling capacity & Coefficient of Performance (COP) as R22. Consequently, RS-70 can be used to replace R22 in both air conditioning and refrigeration applications across the temperature range where R22 is commonly used.

RS-70 is compatible both with the traditional mineral & alkylbenzene oils, and also the polyol ester lubricants so that there is no need to change the existing lubricant in the system when retrofitting to R22. With its high technical performance, compatibility with all lubricants and low GWP, RS-70 is an excellent choice to replace R22 as the end of R22 approaches as mandated under the Montreal Protocol, the F Gas regulation in the European Union and other country based restrictions.

The GWP of RS-70 is lower than all other Drop-in replacements for R22 available on the market including R438A, R417A, R422B, R422D, R417B, and others. The GWP of RS-70 is also lower than R427A, R407A, R407F & R421A. However, this has not been achieved by sacrificing performance since RS-70 is similar to R22 in terms of cooling capacity, COP, mass flow, compression ratio & discharge pressure while having a lower discharge temperature. Accordingly, RS-70 is an excellent choice to replace R22 in the majority of applications where R22 is found.

Performance Characteristics

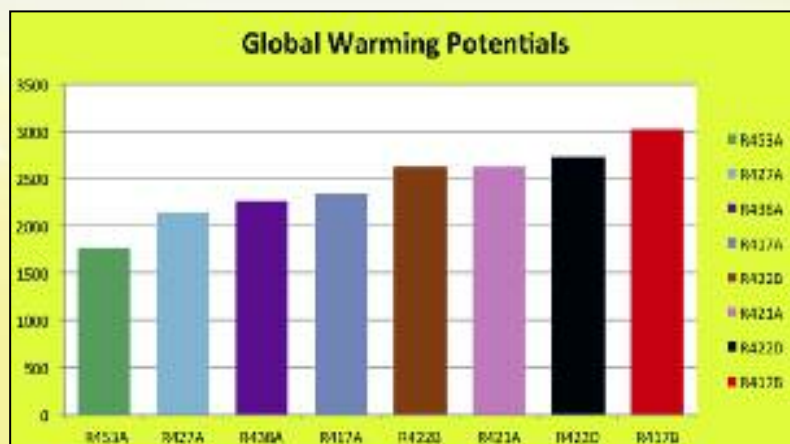
- Lowest direct GWP Drop-in replacement for R22 on the market
- Similar energy efficiency to R22
- Close match for R22 in cooling capacity
- Similar discharge pressure to R22 & lower than R407C, R407A, R407F, R422D, R417B & R427A
- No changes to hardware required during retrofitting
- Compatible with MO, AB & POE lubricants
- Replaces R22 in air conditioning and refrigeration applications
- Similar flow rate to R22
- Application in systems with both fixed and variable expansion devices
- Lower discharge temperature than R22
- Zero Ozone Depletion Potential
- Non flammable & low toxicity



Low Global Warming Potential

The whole subject of global warming and climatic change has become arguably one of the most important environmental issues of the day. Much research has been conducted on an international basis culminating in the recent report of the Inter Governmental Panel on Climate change, which concludes that there is overwhelming evidence of warming of the planet caused by man-made activities. Increasing quantities of carbon dioxide are considered as the prime cause of global warming taking place, and the Authorities are increasingly minded to restrict the emissions of materials with a GWP.

The recent IPCC report indicates that HFCs would contribute less than 2% to global warming, far less than the effects of carbon dioxide emitted by fossil combustion and deforestation. HFC refrigerants under-pin present refrigeration and air-conditioning technologies giving customers an excellent combination of high efficiency with low hazard. Nevertheless, governments are minded to increasingly restrict HFC emissions by regulation and/or taxation, eg revision of the F Gas regulation in the European Union in December 2013.



RS-70 has been specifically designed to mitigate these changes to the refrigerant user by reducing the direct GWP of the refrigerant while not compromising its energy efficiency and technical properties as a suitable Drop-in replacement for R22.

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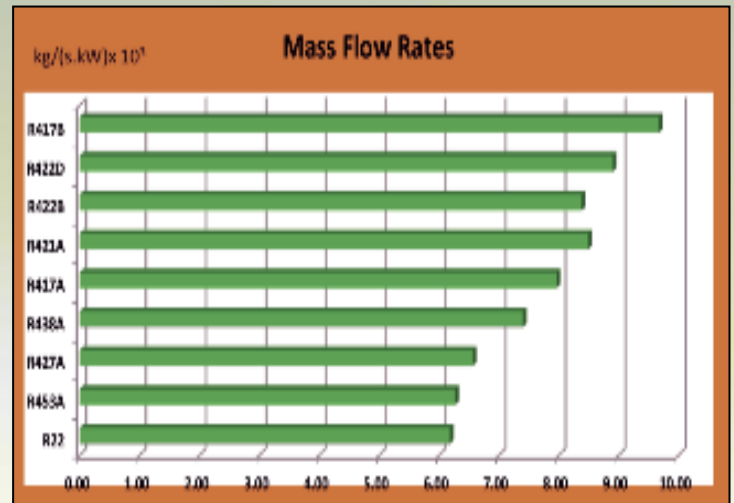
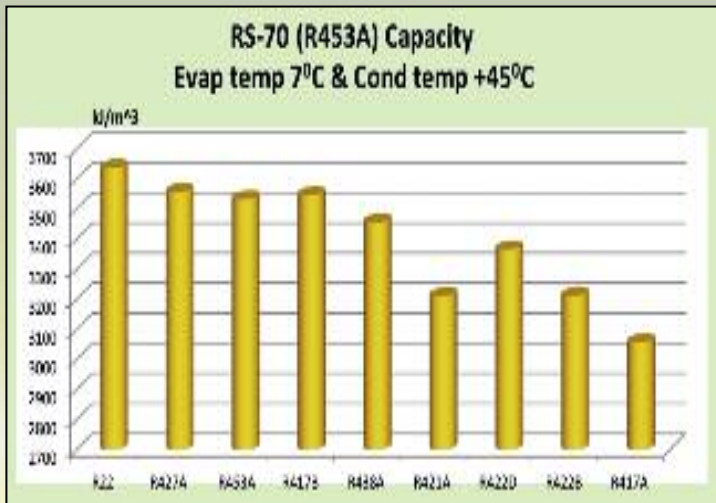
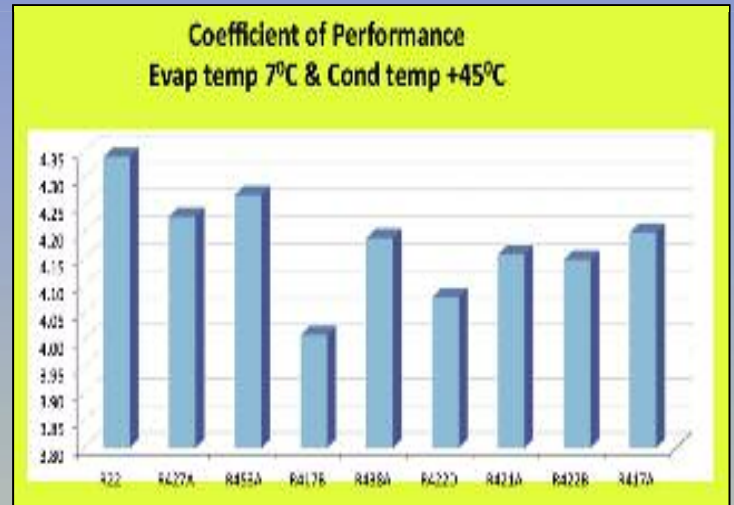
Applications

RS-70 (R453A) has similar energy efficiency, cooling capacity, mass flow rate, compression ratio & discharge pressure as R22. RS-70 is therefore a single solution replacement for R22 across the range of applications where R22 is commonly found.

Because the mass flow of RS-70 is similar to R22, RS-70 can be freely used in systems both with a capillary, fixed orifice or variable expansion devices.

RS-70 is compatible both with existing traditional lubricants, such as mineral & alkyl benzene oils, and also with polyol ester lubricants.

Applications for RS-70 include but are not restricted to air conditioning, commercial & industrial refrigeration, chillers, beer cellars, cold stores, refrigerated transport, supermarkets, appliances, dairy chillers, and others.



Lubricants

RS-70 is compatible with both the traditional & new synthetic lubricants so that there is no need to change the oil when converting from R22 to RS-70. RS-70 is suitable for use with mineral, alkylbenzene and polyol ester oils.

Safety

RS-70 is non flammable as per ASHRAE Standard 34. The components of RS-70 have been subjected to toxicity tests carried out by the Alternative Fluorocarbons Environmental Acceptability Study (AFEAS), and have been declared to be of low toxicity. RS-70 has been designated a refrigerant number of R453A by the ASHRAE with a safety classification of A1.

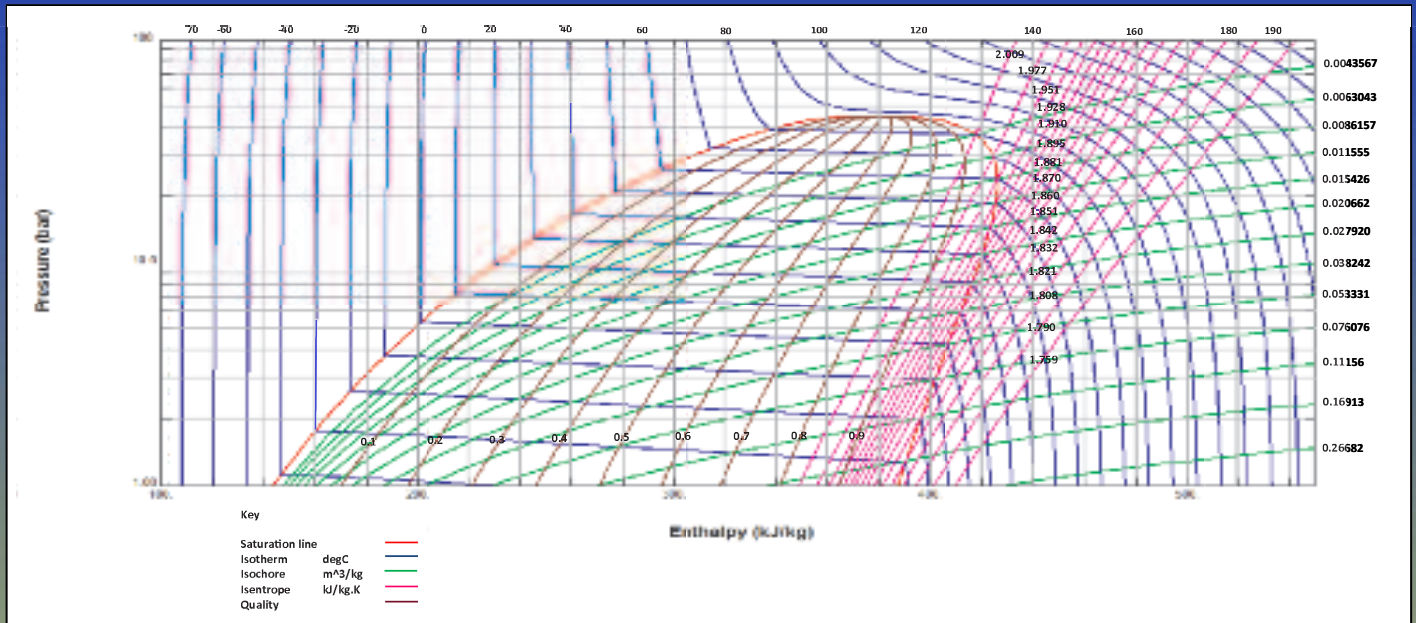
Servicing

Because RS-70 is a blend, it should be charged into the system in the liquid as opposed to vapour form. There is no need to make any hardware changes when converting from R22 to RS-70 and can be used with expansion devices having a fixed orifice or adjustable setting.

RS-70 (R453A)



RS-70 (R453A) Pressure-Enthalpy chart



RS-70 (R453A) Physical properties

		RS-70 (2)	R22
Molecular Mass		88.8	86.5
Boiling point (1 atm) (1)	°C	- 42.2	- 40.8
	°F	- 44.0	- 41.5
Temperature Glide (4)	K	4.2	0.0
Critical Temperature	°C	88.8	96.1
	°F	191.8	205.1
Critical Pressure	bara	45.26	49.90
	psia	656.5	724
Liquid Density (25 °C) (1)	kg/m ³	1136	1191
Density of saturated vapour (25 °C) (1)	kg/m ³	41.69	44.23
Latent Heat of Vaporisation at boiling point (3)	kJ/kg	243.3	233.8
Heat capacity constant volume Cv (25 °C & 1bara)	kJ/kg.K	0.7457	0.5587
Heat capacity constant pressure Cp (25 °C & 1bara)	kJ/kg.K	0.8480	0.6619
Cp/Cv (25 °C & 1 bara)		1.137	1.185
Vapour Pressure (25 °C) (1)	bara	11.53	10.44
	psia	167.2	151.4
Vapour Viscosity (25 °C & 1 bara)	cP	0.0122	0.0126
Liquid Viscosity (25 °C) (1)	cP	0.1572	0.164
Liquid Thermal Conductivity (25 °C)	W/m.K	0.0833	0.0835
Surface Tension (25 °C) (1)	N/m	0.00723	0.00808
Specific heat of liquid (25 °C) (1)	kJ/kg.K	1.5209	1.2568
Ozone Depletion Potential	ODP	0	0.06
Flammability limit in air (1 atm)	vol%	none	none
Inhalation exposure (8 hour day & 40 hour week)	ppm	1000	1000
GWP AR4		1765	1810

Notes:

- (1) Bubble Point
- (2) RS-70 refrigerant properties obtained from NIST's REFPROP program.
- (3) Difference between bubble point liquid enthalpy and dew point vapour enthalpy at 1 atm.
- (4) Evaporator temperature glide calculated using NIST CYCLE D in accordance with high evaporating condition specified in Standard EN 12900:2005 Section 7 Table 2 assuming 100% compressor and motor efficiencies.



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