

RS-45 (R434A)



RS-45 OEM TECHNICAL BULLETIN

R22 REPLACEMENT AT ALL TEMPERATURES

CAPACITY

RS-45 is unique in being a capacity match for R22 across the range of applications where R22 is commonly found. No other refrigerant mirrors the capacity of R22 at low temperature (-35°C evap) & high temperature ($+7^{\circ}\text{C}$ evap)

APPLICATION RANGE

Owing to its unique thermodynamic properties, RS-45 has a much wider application range when replacing R22 than R404A, R507, R410A, R407C & others. Whereas R404A & R507 are effective at low temperatures, they are not suitable at high temperatures. Conversely while R410A & R407C are effective at high temperatures, they are not suitable at low temperatures. RS-45 is an excellent replacement for R22 both at high & low temperatures, which is illustrated in charts 1 & 2

Chart 1: RS-45 Capacity & Coefficient of Performance - Refrigeration

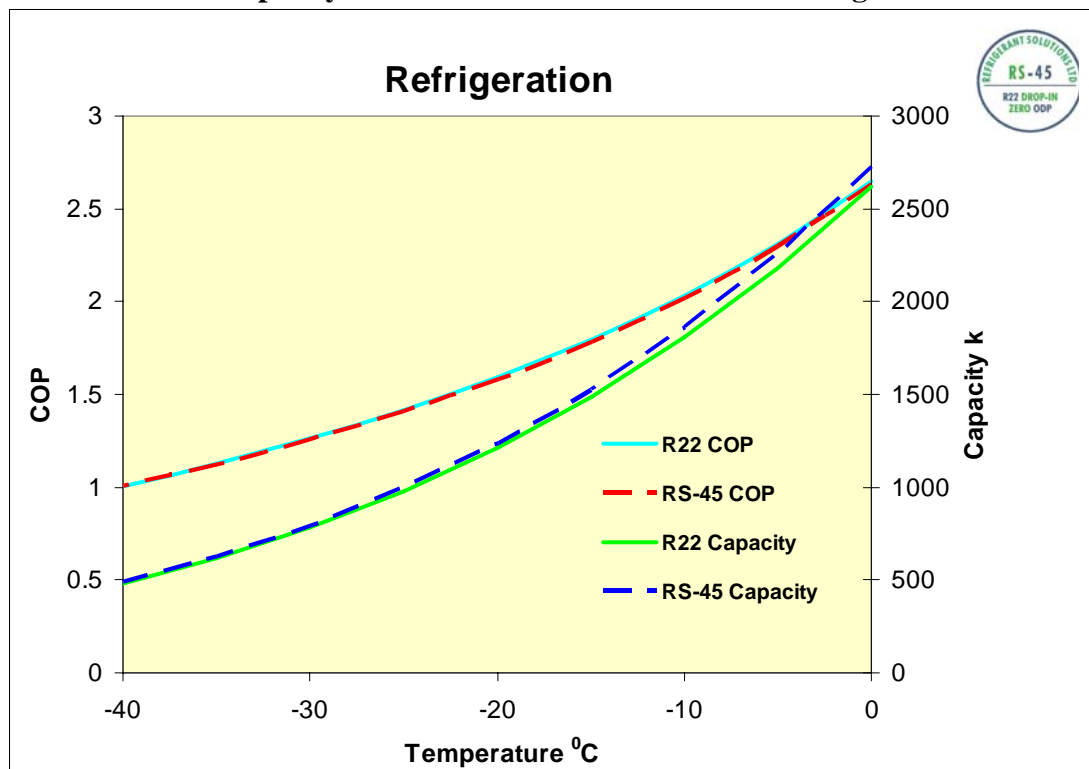
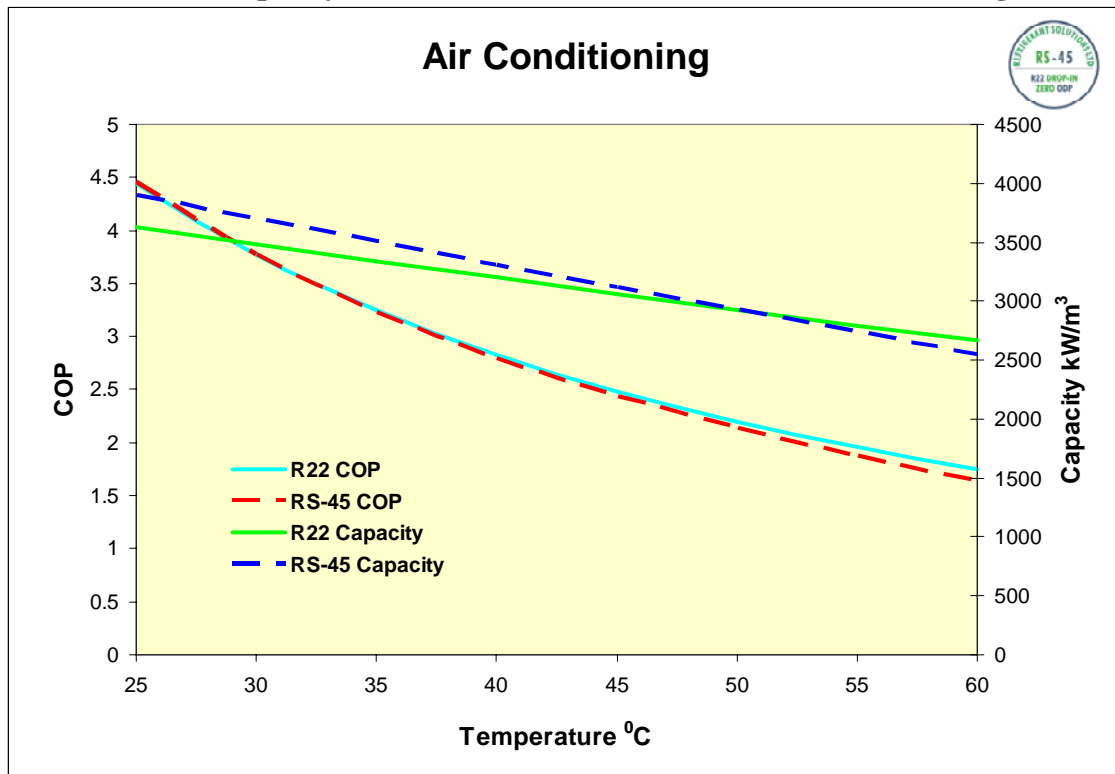


Chart 2: RS-45 Capacity & Coefficient of Performance – Air conditioning



LUBRICANTS

RS-45 is suitable for use with both the traditional lubricants including mineral (MO) & alkylbenzene (AB) oils, & also the new synthetic oxygen containing lubricants including polyol ester (POE), polyalkylglycol (PAG) & others. The ability to use traditional lubricants both reduces cost and avoids the use of hygroscopic synthetic oils which can absorb moisture during maintenance.

COEFFICIENT OF PERFORMANCE

RS-45 has a Coefficient of Performance which matches R22 as illustrated in charts 1 and 2

COMPRESSION RATIO

RS-45 has a compression ratio which matches R22 across the range of applications where R22 is commonly found.

FLAMMABILITY

RS-45 is non flammable according to ASHRAE Standard 34 **with a safety classification of A1** which includes non flammability as formulated & at worst case fractionation.

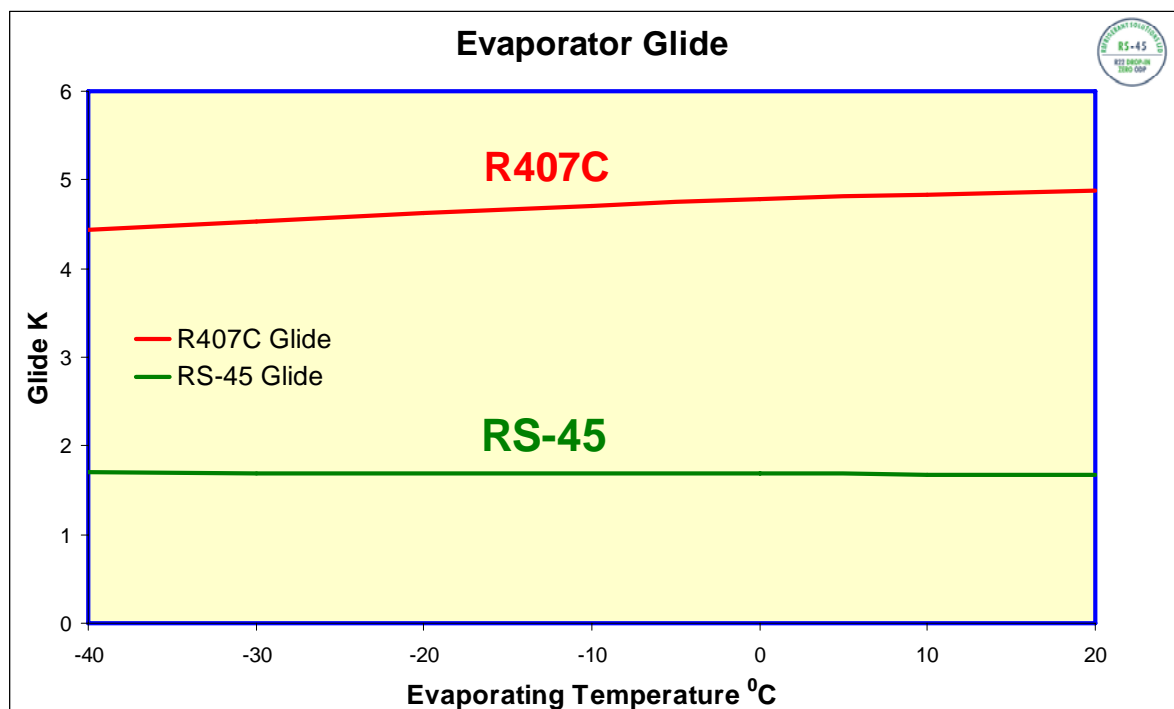
OZONE DEPLETION POTENTIAL

RS-45 has no ability to deplete ozone with a zero ODP

GLIDE

RS-45 is a near azeotropic blend with a glide of 1.5⁰C, one third that of R407C which facilitates its use across a wide temperature range.

Chart 3: RS-45 Glide



DISCHARGE PRESSURE

RS-45 has similar discharge pressures to R22 & over 40% lower than R410A.

EQUIPMENT MODIFICATIONS

For the same duty RS-45 has a higher volume flow rate than R22 which may require OEMs to increase appropriately the sizes of liquid lines to optimize performance, notably the following:

- (1) Capillary tube: the length may need to be decreased, the diameter increased or a combination of both.
- (2) Expansion valve: recommendation is to that the TX valve is sized to accommodate a mass flow 40% greater than R22. The bulb in a TXV typically used in a R502 system should be used.
- (3) Liquid line: the diameter may need to be increased. On large systems with remote air-cooled condensers the liquid return line from the outlet of the condenser to the inlet of the receiver may also need to be modified.

However, OEMs should also note that the liquid viscosity of RS-45 is significantly lower that of R22 (see physical properties table) so that only modest changes to the liquid lines and expansion devices may be required.

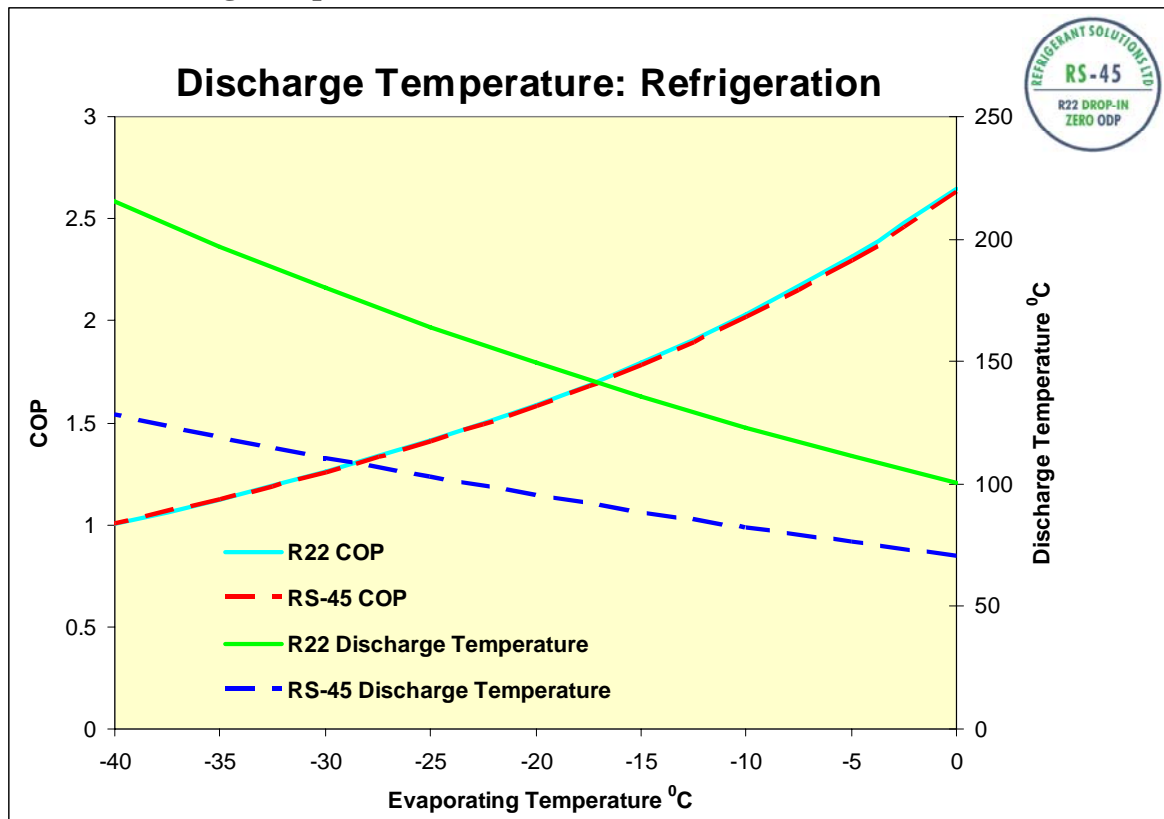
Pipe sizing tables are available for OEMs to calculate the appropriate sizing of pipes in their equipment required to accommodate the higher flow rate of RS-45.

To optimize system performance with RS-45, evaporator and/or condenser capacities may need to be altered in some cases. The addition of a liquid/suction heat exchanger may also improve overall performance.

DISCHARGE TEMPERATURE

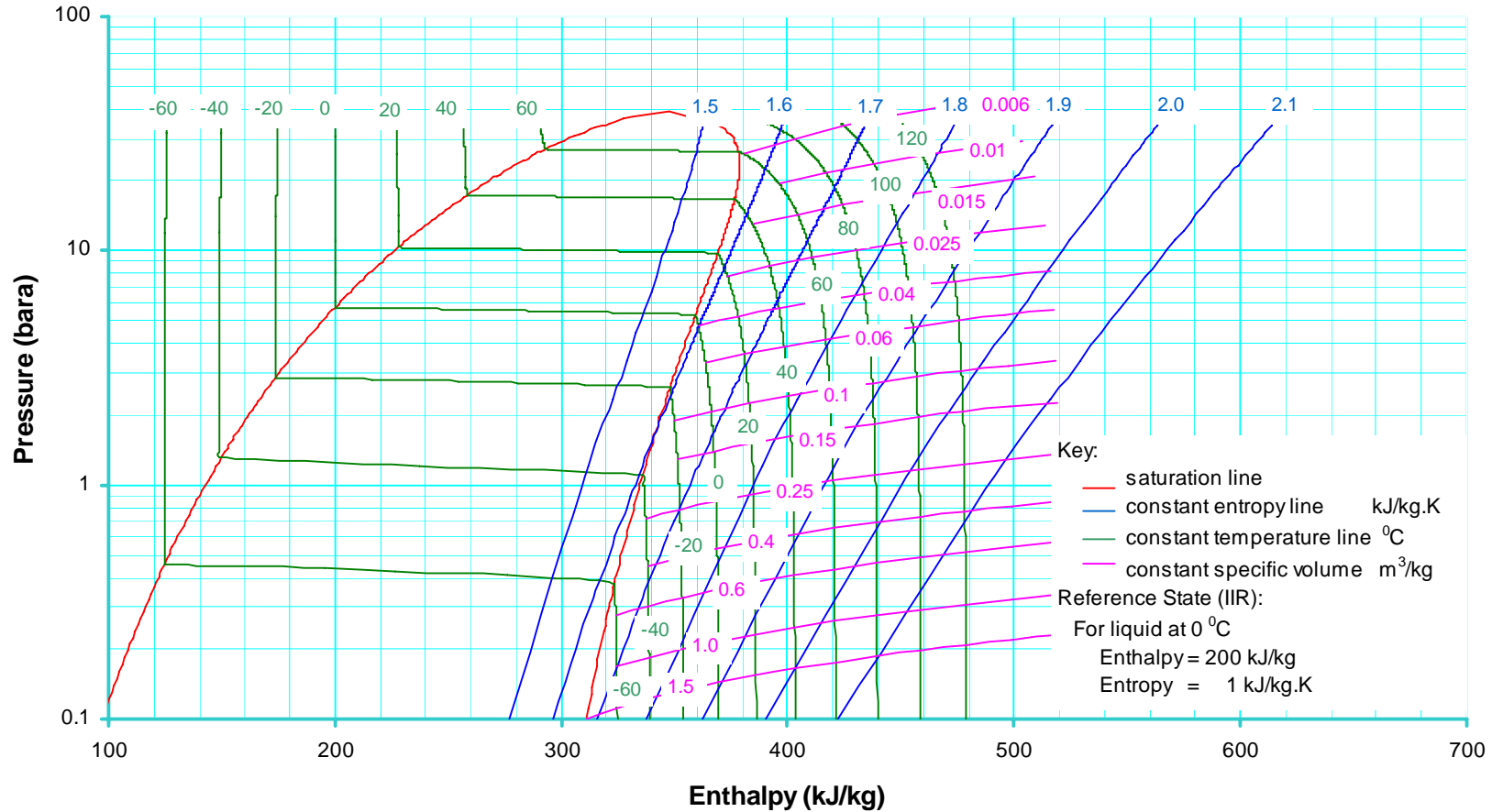
RS-45 has a considerably lower discharge temperature than R22 which provides significant operating benefits including a much lower risk of oil degradation.

Chart 4 Discharge temperature



RS-45 also has a discharge temperature which is 20% lower than R407C and over 25% below R410A. The life of the equipment is extended and potential warranty claims are reduced when systems operate at high ambient conditions.

RS-45 Pressure-Enthalpy Chart



RS-45 PHYSICAL PROPERTIES

PROPERTY		RS-45	R22
Molecular Weight		105.3	86.5
Boiling point (1 atm)	^o C	-44.9 ⁽¹⁾	-40.8
	^o F	-48.8 ⁽¹⁾	-41.4
Temperature Glide	K	1.5	0
Critical Temperature	^o C	77.83	96.1
	^o F	172.1	204.8
Critical Pressure	bara	39.31	49.9
	psia	570.2	724
Liquid Density (25 ^o C)	kg/m ³	1096	1191
Density of saturated vapour (25 ^o C)	kg/m ³	53.1	44.2
Latent Heat of Vaporisation at boiling point	kJ/kg	190 ⁽¹⁾	234
Cv (25 ^o C & 1bara)	kJ/kg.K	0.775	0.559
Cp (25 ^o C & 1bara)	kJ/kg.K	0.861	0.662
Cp/Cv (25 ^o C & 1 bara)		1.111	1.185
Vapour Pressure (25 ^o C)	bara	11.8 ⁽¹⁾	10.4
	psia	163 ⁽¹⁾	151
Vapour Viscosity (25 ^o C & 1 bara)	cP	0.0128	0.0126
Liquid Viscosity (25 ^o C)	cP	0.140	0.166
Liquid Thermal Conductivity (25 ^o C)	W/m.K	0.0665	0.0837
Surface Tension (25 ^o C)	N/m	0.00528	0.00808
Specific heat of liquid (25 ^o C)	kJ/kg.K	1.50	1.26
Ozone Depletion Potential	ODP	0	0.055
Flammability limit in air (1 atm)	vol%	none	none
Inhalation exposure (8 hour day & 40 hour week)	ppm	1000	1000

⁽¹⁾ Bubble Point

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