RSL
Refrigerant Solutions Limited

RS-45 (R434A)

DESCRIPTION	
Type	HFC blend
HCFC replacement	R22
Temperature glide	Approximately 1.5°C
Drop-in or long term	Both
Lubricant	MO/AB/POE
ODP	Zero
Atmospheric lifetime	32 years
GWP 100 year ITH	3238

RS-45 (R434A): PHYSICAL PROPERTIES

		RS-45	R22
Molecular weight		105.3	86.5
Boiling point (1 atm)	°C °F	-44.9(1) -48.8(1)	-40.8 -41.4
Temperature glide	°C	1.5	0
Critical temperature	°C °F	77.8 172.1	96.1 204.8
Critical pressure	bara psia	39.3 570	49.9 724
Liquid density at 25°C	kg/m^3	1096	1191
Density of saturated vapour at 25°C	kg/m^3	53.1	44.2
Specific heat of liquid at 25°C	kJ/kg°C	1.50	1.26
Specific heat of vapour at 1 atm & 25 °C	kJ/kg°C	1.11	1.18
Vapour pressure at 25°C	bara psia	11.8(1) 163(1)	10.4 151
Latent heat of vaporisation at boiling point	kJ/kg	190(1)	234
Ozone Depletion Potential	ODP	0	0.055
Flammability limit in air (1 atm)	vol%	None	None
Inhalation exposure (8 hr day & 40 hr week)	ppm	1000	1000

(1) Bubble point

TYPE AND DESCRIPTION

RS-45 (R434A) is a non flammable blend which has a zero ODP and is also compatible with both traditional and synthetic lubricants so that a full retrofit is not required. RS-45 (R434A) is a suitable replacement for R22 in both refrigeration & air conditioning applications, at low & high temperatures. With its low glide (one third that of R407C), RS-45 (R434A) is suitable for use in a wide range of applications.

RS-45 (R434A) is an easy to use replacement for R22 in systems which contain an adjustable expansion device. Because of its different molecular structure to R22, it is necessary to adjust the expansion device to accommodate the larger molecules and, depending upon the system, replace it with a valve suitable for use with R404A. RS-45 (R434A) is not recommended for use in many fixed orifice systems operating on R22, where RS-44 (R434A) should be used in medium and high temperature applications. Because there is no need to use expensive and hygroscopic synthetic lubricants, the risk of moisture ingress into a refrigeration system is completely avoided. RS-45 (R434A) has significantly lower discharge temperatures than R22 which removes the problem of oil decomposition.

RS-45 (R434A) is suitable for use by Original Equipment Manufacturers (OEMs) with its high cooling capacity, low compression ratio, similar Coefficient of Performance, low discharge temperature & compatibility with traditional & synthetic lubricants.

APPLICATIONS

RS-45 (R434A) is suitable for use in the main applications currently satisfied by R22 including commercial air conditioning, cold stores, supermarkets, dairy chillers, refrigerated transport, cellar cooling and others. RS-45 (R434A) is equally suitable to replace R22 in low & high temperature applications.

SERVICE WORK

During service work, it is not necessary to remove the existing refrigerant charge so that RS-45 (R434A) can be safely added to the system. But in a critically charged system, the entire refrigerant charge should be replaced with fresh RS-45 (R434A).

Because it is a blend, it is recommended that RS-45 (R434A) be charged into systems in the ***liquid*** as opposed to the gaseous phase.

Since in most cases there is no need to change the existing lubricant, RS-45 (R434A) is straightforward to use as the procedure below outlines.

LUBRICANTS

RS-45 (R434A) is compatible with both mineral and alkylbenzene oils found in R22 systems, and also with the polyol ester lubricants (POE). Therefore, in most cases there is no need to change the lubricant although compressor manufacturers' recommendations regarding lubricity should be followed. However, in systems with extensive & complex piping configurations, or a large volume of liquid in the receiver, POE may need to be added.

MATERIALS COMPATIBILITY

RS-45 (R434A) is compatible with materials commonly used in refrigeration systems previously charged with R22.

In general, materials which are compatible with R22 can be used with RS-45 (R434A). It is recommended to check equipment manufacturer's retrofit literature and obtain recommendations from equipment manufacturers with regard to materials' compatibility. In older systems which have been operating on R22 for many years, replacement of some seals may be required due to the different composition of RS-45 (R434A) which contains HFCs

ENVIRONMENTAL DATA

None of the components of RS-45 (R434A) contains chlorine so that it has no ability to deplete the ozone layer.

As with all hydrofluorocarbons (HFCs), RS-45 (R434A) does have a direct global warming potential (GWP), but this is counterbalanced by the low Total Equivalent Warming Impact (TEWI) of the system.

RETROFIT PROCEDURE

The retrofit procedure for replacing R22 with RS-45 (R434A) is as follows:

(1) Ensure the right equipment is available, eg recovery unit and cylinders, container for recovered lubricant, vacuum pump, weighing scales, replacement drier etc.

(2) Record baseline data to establish the normal operating conditions for the equipment.

(3) Weigh recovered amount of R22 to determine amount of RS-45 (R434A) to add.

(4) Record the amount of oil removed from the compressor since this quantity will need to be recharged.

(5) Charge the compressor with lubricant. If in doubt, consult the compressor manufacturer.

(6) Replace the filter/drier.

(7) Having evacuated the system to a vacuum, ***liquid charge*** with RS-45 (R434A) with approximately 10% lower charge than R22.

(8) If the system is fitted with a liquid line sight glass, charge until the glass shows full. Be careful not to overcharge, and the correct charge will be determined by operating conditions, eg superheat, suction line temperature, discharge pressure etc.

(9) The mass flow of RS-45 (R434A) is greater than R22 so that the expansion device will need adjusting. If necessary, change to a valve suitable for R404A.

(10) Start the system and adjust the expansion device superheat setting (see below) as required.

(11) Additional RS-45 (R434A) may be required but avoid overcharging. If a liquid line sight-glass is fitted, charge to a full glass (small amounts of bubbles in the glass may be normal with refrigerant blends). If the equipment manufacturer recommends charging R22 by evaporator superheat or liquid sub-cooling, use the same amount of superheat or sub-cooling for RS-45 (R434A).

(12) Carefully monitor the oil level in the compressor & add more oil if required to maintain the correct level. If the oil level does not stabilise & is erratic, some of the oil should be removed from the system & replaced with POE. Adopt the procedure in 13 below.

(13) In systems where oil return could be an area of potential concern, eg containing a liquid receiver, flooded evaporators or long & complex pipelines, the replacement of up to 25% of the oil charge with a POE is recommended starting with an initial 10% followed by increments of 5% until the oil level stabilises & returns to normal.

(14) Check system thoroughly for leaks.

(15) Clearly label system RS-45 (R434A).

NOTE: SYSTEMS WITH INHERENT POOR OIL RETURN, OFTEN WITH UNUSUALLY LONG SUCTION LINES AND/OR LOW TEMPERATURE SYSTEMS, MAY HAVE IMPROVED RS-45 (R434A) OIL RETURN CAPABILITIES WITH ALKYLBENZENE OR POLYOL ESTER OILS

RS SERIES OF REFRIGERANTS PRESSURE/TEMPERATURE CHARTS

RS Series Pressure/Temperature charts indicate both liquid bubble point and vapour dew point of the RS Series Refrigerant.

Liquid Bubble Point: this is the temperature which the liquid refrigerant will begin to vaporize at the given pressure. Below this temperature the liquid refrigerant will be sub-cooled.

Vapour Dew Point: this is the temperature at which refrigerant vapour will begin to condense at the given pressure. Above this temperature the refrigerant vapour will be superheated.

EvaporatorVapour Superheat:

To determine evaporator superheat, measure the suction line temperature at the outlet pipe of the evaporator and measure the suction pressure at the outlet pipe of the evaporator. Using the Pressure/Temperature chart, determine the vapour dew point for the measured suction pressure. Subtract the determined dew point from the actual temperature and this difference is the evaporator superheat.

Condenser Liquid Sub-Cooling:

To determine condenser sub-cooling, measure the temperature of the outlet pipe of the condenser and measure the condenser pressure at the outlet pipe of the condenser. Using the Pressure/Temperature chart, determine the liquid bubble point for the measured condenser pressure. Subtract the measured temperature from the determined bubble point and this difference is the condenser liquid sub-cooling.

Note: with the RS Series of low glide blends, the average evaporating and condenser temperatures will be mid point between the bubble and dew point temperature.