RSL
Refrigerant Solutions Limited

RS-44 (R424A)

COMPOSITION	%
HFC 134a	47
HFC 125	50.5
iso-pentane	0.6
n-butane	1
Isobutane	0.9
Chemical name	1,1,1,2-tetrafluoroethane/ pentafluoroethane/ iso-pentane n-butane
Type	HFC blend
HCFC replacement	R22
Temperature glide	Approximately 3°C
Drop-in or long term	Both
Lubricant	MO/AB/POE
ODP	Zero
Atmospheric lifetime	23 years
GWP 100 year ITH	2440

RS-44: PHYSICAL PROPERTIES

		RS-44	R22
Molecular weight		108.1	86.5
Boiling point (1 atm)	°C °F	-38.7(1) -37.6(1)	-40.8 -41.4
Critical temperature	°C °F	88.8 191.8	96.1 204.8
Critical pressure	bara psia	40.4 586	49.9 724
Liquid density at 25°C	kg/m^3	1169	1191
Density of saturated vapour at 25°C	kg/m^3	43.6	44.2
Specific heat of liquid at 25°C	kJ/kg°C	1.43	1.26
Specific heat of vapour at 1 atm & 25 °C	kJ/kg°C		
Vapour pressure at 25°C	bara psia	9.67(1) 140.2(1)	10.4 151
Latent heat of vaporisation at boiling point	kJ/kg	196(1)	234
Ozone Depletion Potential	ODP	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-44 is a non flammable blend of HFC 134a, HFC 125, iso-pentane, butane & isobutane which has a zero ODP and is also compatible with both traditional and synthetic lubricants so that a retrofit is not required.

RS-44 is a "Drop-in" replacement for R22 providing an easy and at the same time a long term solution. 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-44 has significantly lower discharge temperatures and pressures than R22 which removes the problem of oil decomposition.

APPLICATIONS

RS-44 is suitable for use as a replacement at medium and high temperatures including but not restricted to commercial air conditioning, appliances and refrigeration systems.

SERVICE WORK

Because it is a blend, it is recommended that RS-44 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-44 is straightforward to use as the procedure below outlines.

LUBRICANTS

RS-44 is compatible with both mineral & alkylbenzene oils found in R22 systems, and also with the polyol ester lubricants. 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 oil may need to be added.

MATERIALS COMPATIBILITY

RS-44 is compatible with all materials commonly used in refrigeration systems previously charged with R22.

In general, materials which are compatible with R22 can be used with RS-44. 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-44 which contains HFCs.

ENVIRONMENTAL DATA

None of the components of RS-44 contains chlorine so that it has no ability to deplete the ozone layer.

As with all hydrofluorocarbons (HFCs), RS-44 does have a direct global warming potential (GWP), but this is counterbalanced by thes lower Total Equivalent Warming Impact (TEWI) of the system. Tests have shown that RS-44 has a higher Coefficient of Performance (COP) than R22 in a range of applications including window air conditioners, chilled food and heat pumps both in the heating and cooling mode.

RETROFIT PROCEDURE

The retrofit procedure for replacing R22 with RS-44 (R424A) 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) Recover R22 charge and weigh recovered amount of R22 to determine amount of RS-44 to be charged.

(4) RS-44 is compatible with MO/AB and POE. If, however, the oil in the system is being changed to a different type, it is not necessary to remove all of the existing oil in the system.

(5) Replace the filter/drier.

(6) Evacuate the system and ***liquid charge*** with RS-44, an amount equal to the original charge of R22.

(7) Start the system and check baseline data, adjust the expansion device if required. If a low pressure control functions as a temperature control, check space temperature and adjust if necessary.

Warning: It is highly recommended that the thermostatic expansion valve be checked and adjusted to compensate for small differences in the pressure temperature relationship of the replacement refrigerant when compared to the original refrigerant. Failure to check and adjust the valve could allow liquid refrigerant to enter the compressor and damage bearings and other compressor components.

(8) If the system is fitted with a refrigerant sight-glass and the sight-glass is not indicating a full charge, additional RS-44 may be added. .

(9) 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 10 below.

(10) 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.

(11) Avoid overcharging the system.

(12) Check system thoroughly for leaks.

(13) Clearly label system as charged withRS-44 and type of oil used..

(14) On larger systems with an oil sight glass, check oil level after several hours of operation and add oil if necessary.

NOTE: SYSTEMS WITH INHERENT POOR OIL RETURN, OFTEN WITH UNUSUALLY LONG SUCTION LINES AND/OR LOW TEMPERATURE SYSTEMS, MAY HAVE IMPROVED RS-44 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.