RSL
Refrigerant Solutions Ltd

# RS-52 (R428A)

| COMPOSITION | % |
|---|---|
| **HFC 125** | 77.5 |
| **HFC 143a** | 20.0 |
| **R600a** | 1.9 |
| **R290** | 0.6 |
| | |
| **HCFC replacement** | R22, 502 & interim blends |
| **Temperature glide** | Approximately 0.8°C |
| **Drop-in or long term** | Both |
| **Lubricant** | MO/AB/POE |
| **ODP** | Zero |
| **Atmospheric lifetime** | 37 years |
| **GWP 100 year ITH** | 3600 |

## RS-52: PHYSICAL PROPERTIES

| | | RS-52 | R502 |
|---|---|---|---|
| Molecular weight | | 107.5 | 111.6 |
| Temperature glide °C | | 0.5 | 0.2 |
| Boiling point (1 atm) | °C<br>°F | -46.7(1)<br>-52.1(1) | -45.4<br>-49.7 |
| Critical temperature | °C<br>°F | 70.8<br>159.5 | 82.2<br>180.0 |
| Critical pressure | bara<br>psia | 38.1<br>552 | 40.7<br>59.1 |
| Liquid density at 25°C | kg/m$^3$ | 1053 | 1217 |
| Density of saturated vapour at 25°C | kg/m$^3$ | 70.2 | 62.2 |
| Specific heat of liquid at 25°C | kJ/kg°C | 1.52 | 1.25 |
| Specific heat of vapour at 1 atm & 25 °C | kJ/kg°C | | 0.706 |
| Vapour pressure at 25°C | bara<br>psia | 12.68(1)<br>183.9(1) | 11.5<br>167 |
| Latent heat of vaporisation at boiling point | kJ/kg | 189.2 (1) | 173 |
| Ozone Depletion Potential | ODP | 0 | 0.33 |
| 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-52 is a non flammable near azeotropic refrigerant which has a zero ODP and is also compatible with both traditional and synthetic lubricants so that a retrofit is not required.

RS-52 can be used as a "Drop-in" replacement for R22, R502 and interim blends containing HCFCs which are now subject to a phase out timetable. The use of RS-52 avoids the need for an expensive and often technically unsatisfactory retrofit involving a change of lubricant and alterations to some of the hardware in the system.

## APPLICATIONS

RS-52 can be used in most applications where R502 and interim replacement blends are currently used including but not restricted to supermarket display cases, ice machines, cold storage, transportation of foodstuffs etc.. RS-52 can also replace R22 in systems which are rated for R502. Conversion to RS-52 is a simple and straight forward process (as shown below). RS-52 provides a long term solution at low cost to the problem of replacing Ozone Depleting Substances.

## SERVICE WORK

Because it is a blend, it is recommended that RS-52 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-52 is straightforward to use as the procedure below outlines.

## LUBRICANTS

RS-52 is compatible with both mineral and alkylbenzene oils found in R502 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 may need to be added.

## MATERIALS COMPATIBILITY

RS-52 is compatible with all materials commonly used in refrigeration systems previously charged with R22 or R502.

In general, materials which are compatible with R22 and R502 can be used with RS-52. 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-52 which contains HFCs.

## ENVIRONMENTAL DATA

None of the components of RS-52 contains chlorine so that it has no ability to deplete the ozone layer.

As with all hydrofluorocarbons (HFCs), RS-52 does have a direct global warming potential (GWP), but this is counterbalanced by the lower Total Equivalent Warming Impact (TEWI) of the system.

## RETROFIT PROCEDURE

The retrofit procedure for replacing R22 or R502 and/or interim blends with RS-52 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 or R502 or interim blend to determine amount of RS-52 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 full vacuum, ***liquid charge*** with RS-52 using about 10% less charge than R22 or R502. Add more RS-52 as required. Systems equipped with a liquid line sight-glass should be charged until sight-glass shows full.

(8) Start the system and adjust the expansion device as required.

**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) Avoid overcharging the system.

(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.

(10) Check system thoroughly for leaks.

(11) Clearly label system RS-52 (R428A).

**NOTE: SYSTEMS WITH INHERENT POOR OIL RETURN, OFTEN WITH UNUSUALLY LONG SUCTION LINES AND/OR LOW TEMPERATURE SYSTEMS, MAY HAVE IMPROVED RS-52 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.

### Evaporator Vapour 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.