

Refrigerants

Forane[®] 427A



Forane® 427A



The world is our inspiration

R-22 has been used for decades mostly in air-conditioning applications due to its excellent thermodynamic properties; however, like all HCFCs (hydrochlorofluorocarbons), R-22 is subject to the regulations of the Montreal Protocol and its subsequent amendments. In Europe in particular R-22 is due to be phased out by 2010. In these countries therefore, the industry is looking for a zero-ODP* solution to replace R-22 in existing equipment.



A non-toxic, non-flammable and zero-ODP refrigerant, Forane® 427A requires just one drainage of the system's oil followed by its replacement by a POE lubricant. Optimum performance similar to R-22 can be achieved without the need for a long and costly rinse of the circuit thanks to high tolerance to the residual original oil (mineral or alkylbenzene). No modification of the installation is required.

Forane® 427A is a simplified retrofit solution for existing R-22 direct expansion installations in a large range of applications.

Forane® 427A can be used to retrofit low temperature refrigeration equipment as well as air-conditioning installations.

Safety

Forane® 427A is non-toxic and non-flammable. All required toxicity and flammability tests have been performed in-house, and show that the product complies with the requirements of the A1 classification (non-toxic, non-flammable).

Material Compatibility

Forane® 427A is a 100% HFC blend. It is consequently compatible with elastomers or with plastics normally compatible with R-407C and R-404A.

Lubricants

Forane® 427A is a 100% HFC blend. It is consequently compatible with PolyOilEster (POE) lubricants. However, one specificity of Forane® 427A is its ability to tolerate a high residual amount of original oil in the POE lubricant (good oil return up to 10-15% residual AB or mineral oil) which makes for a simplified retrofit procedure.

Retrofit Procedure

- 1 Recovery of the whole R-22 charge.
- 2 Drainage of the original oil from the system**
 - An analysis of the original oil is recommended to ensure the R-22 installation is in a good state of repair.
- 3 POE lubricant charge
 - In most cases, no rinsing process is required. Only one oil drainage required.
- 4 Change of the filter drier.
- 5 Vacuum pumping of the installation and recharge with Forane® 427A. Afrox recommends to first fill the installation with a Forane® 427A charge, equal to 95% wt of the nominal R-22 charge, and top up to 100% if necessary.

* Ozone Depleting Potential

**Arox does not recommend mixing Forane® 427A with R-22

Physical Properties of Forane® 427A

Properties	Units	R-427A	R-22
Molecular Weight	g/mol	90,4	86,5
Bubble Point (at 1,013 bar)	°C	-42,7	-40,7
Temperature Glide (at 1,013 bar)	K	7,1	-
Critical Temperature	°C	86,8	96
Critical Pressure	bar	44,0	49,8
Bubble Pressure (at 25°C)	bar	11,2	10,4
Bubble Pressure (at 50°C)	bar	20,8	19,7
Saturated Liquid Density (at 25°C)	kg/dm ³	1,151	1,194
Density Of Saturated Vapour (at 1,013 bar)	kg/m ³	4,78	4,70
Liquid Thermal Conductivity (at 25°C)	W/(m.K)	0,081	0,083
Vapour Thermal Conductivity (at 25°C and 1,013 bar)	W/(m.K)	0,014	0,012
Surface Tension (at 25°C)	mN/m	6,9	8,1
Liquid Viscosity (at 25°C)	mPa.s	0,15	0,17
Vapour Viscosity (at 25°C and 1,013 bar)	mPa.s	0,013	0,013
Liquid Specific Heat	kJ/(kg.K)	1,58	1,26
Vapour Specific Heat (at 25°C and 1,013 bar)	kJ/(kg.K)	0,842	0,662
ODP*		0	0,055
GWP**		2 000	1 700

* Ozone Depleting Potential **Global Warming Potential

Results of Field Tests

Forane® 427A has successfully been tested on several kinds of commercial equipment - including the conversion of:

- Air-cooled centralised refrigeration units in a supermarket in Italy
- Water-cooled water chiller installation in France
- A twin-stage compression water-cooled liquid chiller in France.

Comparative Data of the Field Tests

	Air-Cooled Centralised Refrigeration Unit for Supermarket Cold Rooms and Display Cabinets		Water-Cooled Water Chiller	Twin-Stage Compression Water-Cooled Liquid Chiller
Nominal Cooling Power	9 kW	6 kW	400 kW	50 kW
Temperature Set Point	0 – 8°C	-20 – -23°C	6°C	-20°C
Forane® 427A Charge	76 kg	36 kg	75 kg	20 kg
Oil Return	Satisfactory with 14,7% residual MO*	Satisfactory with 5,2% residual MO*	Satisfactory with 11,4% residual MO*	Satisfactory with 2,1% residual AB**oil
Power Consumption vs. R-22	Same power consumption as R-22			

* Mineral Oil **Alkylbenzene

Highly satisfactory operating conditions were reached immediately during the field tests, and several months later, still fulfill the customers' requirements:

- Discharge temperatures can be up to 10° lower than with Forane® 427A which improves equipment lifetime
- Required temperature levels are reached easily and remain stable
- Oil return is good despite a high level of residual mineral or alkylbenzene oil
- Energy consumption is equivalent or lower.

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