



SAFETY DATA SHEET

Refrigerant Gas R427A

1. Product and Company Identification

Product Name: Refrigerant Gas R427A

Distributor: National Refrigerants Ltd
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2. Hazard Identification

Colourless, volatile liquid with ethereal and faint sweet odour. Non-flammable material. Overexposure may cause dizziness and loss of concentration. At higher levels CNS depression and cardiac arrhythmia may result from exposure. Vapour displaces air and can cause asphyxiation in confined spaces. At higher temperatures (>250°C) decomposition products may include Hydrofluoric Acid (HF) and carbonyl halides.

Potential Health Hazard

Skin: Irritation would result from a defatting action on tissue. Liquid contact could cause frostbite.
Eyes: Liquid contact can cause sever irritation and frostbite.
Inhalation: When oxygen levels in air are reduced to 12 -14% by displacement, symptoms of asphyxiation, loss of coordination, increased pulse rate and deeper respiration will occur. At high levels cardiac arrhythmia may occur.

3. Composition/Information on Ingredients

Chemical Nature: Blend of halogenated alkanes

<u>Component</u>	<u>EC-No.</u>	<u>CAS No.</u>	<u>Weight %</u>
Difluoromethane (HFC32)	200-839-4	75-10-5	15
1,1,1-Trifluoroethane (HFC143a)	206-996-5	420-46-2	10
1,1,1,2-Tetrafluoroethane (HFC134a)	212-377-0	811-97-2	50
Pentafluoroethane (HFC125)	206-557-8	354-33-9	25

4. First Aid Measures

Skin: Promptly flush with water for at least 15 minutes. If there is evidence of frostbite, bathe (do not rub) with lukewarm (not hot) water. If water is not available, cover with a clean, soft cloth or similar covering. Get medical attention if symptoms persist.

Eyes: Immediately flush eyes with large amounts of water for at least 15 minutes (in case of frostbite water should be lukewarm, not hot) lifting eyelids occasionally to facilitate irrigation. Get medical attention.

Inhalation: Immediately remove to fresh air. If breathing has stopped, give artificial respiration. Use oxygen as required, provided a qualified operator is available. Get medical attention. Do not give epinephrine (adrenaline).

Ingestion: Hospitalise. Ingestion is unlikely because of the physical properties of the material.

Advice to Physician: Because of the possible disturbance of cardiac rhythm, catecholamine drugs, such as epinephrine, should be used with special caution and only in situations of emergency life support. Treatment of overexposure should be directed at the control of symptoms and the clinical conditions.

5. Fire Fighting Measures

Extinguishing Media: All extinguishing agents are suitable. Use any standard agent – chose the most appropriate for type of surrounding fire (the material itself is not flammable).

Specific Hazard: Pressurised container. On heating there is a risk of bursting due to internal pressure build-up.

At high temperatures thermal decomposition gives toxic vapours – Hydrofluoric Acid (HF) and carbon oxides.

Specific fire fighting methods: Stay upwind. Evacuate the personnel away from the fumes. Cool down the containers/equipment exposed to heat with water spray.

Protection of the fire fighters: Wear a self-contained breathing apparatus and a protective suit.

6. Accidental Release Measures

Personal Precautions: Avoid contact with skin and eyes. Do not breathe the gas. No naked flames. DO NOT smoke. In enclosed areas wear self contained breathing apparatus. (see Section 8, “Exposure controls/ personal protection”).

Vapour is heavier than air. Shut off low-level openings in the vicinity (ventilation shafts, drains etc.). Prevent the product from entering cellars, basements since the vapour may create a suffocating atmosphere. Stop the leak. Ventilate the spillage area. Ventilate enclosed areas, basements, pits etc.

7. Handling and Storage

Handling: Avoid breathing the vapour. Avoid liquid contact with the eyes, skin or clothing. Do not

puncture or drop the cylinders. Do not expose them to open flame or excessive heat. Follow standard precautions for handling and use of compressed gas cylinders.

Storage: Store in a cool, well-ventilated area of low fire risk and out of sunlight. Protect cylinders and fittings from physical damage. Storage in subsurface locations should be avoided. Close valve tightly after use and when empty.

Technical Measures: The vapour is heavier than air. Storage area should be equipped with low-level ventilation. High concentrations may be produced at low levels where general ventilation is poor. In such cases provide adequate ventilation or wear suitable respiratory equipment with positive air supply. For correct refrigerant composition system should be charged using the liquid phase not vapour phase. Liquid refrigerant transfers between containers and to and from system can result in static charge generation. Ensure adequate earthing.

Packaging Material: Recommended: Steel

To be Avoided: Alloys containing more than 2% magnesium.
Plastic materials.

8. Exposure Controls & Personal Protection

Engineering Control: Provide local ventilation at filling zones and areas where leakage is probable. Mechanical (general) ventilation may be adequate for other operating and storage areas.

Personal Protective Equipment

Skin Protection: Skin contact with refrigerant may cause frostbite. General work clothing and gloves (leather) should provide adequate protection. If prolonged contact with the liquid or gas is anticipated, insulated gloves constructed of PVA, neoprene or butyl rubber should be used. Any contaminated clothing should be promptly removed and washed before reuse.

Eye Protection: For normal conditions wear safety glasses. Where there is a reasonable probability of liquid contact wear chemical safety goggles.

Respiratory Protection: None generally required for adequately ventilated work situations. For accidental release or non-ventilated situations, or release in confined space, where the concentration is above 1000 ppm use self-contained approved breathing apparatus or suitable respirator.

Hygiene measures: Do not smoke when charging or reclaiming refrigerant. Avoid contact with skin and eyes. Avoid inhaling the vapour.

Occupational Exposure Limits:

Component	TWA
Difluoromethane	1000 ppm (2200 mg/m ³)
1,1,1-Trifluoroethane	1000 ppm (2130 mg/m ³)
1,1,1,2-Tetrafluoroethane	1000 ppm (4240 mg/m ³)
Pentafluoroethane	1000 ppm (4900 mg/m ³)

9. Physical and Chemical Properties

Appearance: Clear, colourless liquid and vapour.

Physical State: Gas at ambient pressure and temperature.

Chemical Formula: Difluoromethane CH₂F₂
1, 1, 1-Trifluoroethane CF₃-CH₃

	1, 1, 1, 2-Tetrafluoroethane	CF ₃ -CH ₂ F
	Pentafluoroethane	CF ₃ -CHF ₂
<i>Odour:</i>	Faint ethereal odour.	
<i>Density:</i>	1.172 kg/m ³ at 20°C	
<i>pH</i>	Not Applicable	
<i>Boiling Point/Range:</i>	-42.7 - -35.5°C	
<i>Vapour Pressure:</i>	0.97 MPa at 20°C 2.08 MPa at 50 °C	
<i>Vapour Density:</i>	1.172 kg/m ³ at 20°C	
<i>Solubility in Water:</i>	Does not dissolve in water	
<i>Partition coefficient: n-octanol/water</i>		
	1,1,1,2 Tetrafluoroethane	log K _{ow} : 1.06
	Difluoromethane	log K _{ow} : 0.21
	Pentafluoroethane	log K _{ow} : 1.48
	1,1,1-Trifluoroethane	log K _{ow} : 1.49
<i>Henry Constant:</i>		
	1,1,1,2 Tetrafluoroethane	506.0E+01 Pa.m ³ /mol
	Difluoromethane	296.00E+02 Pa.m ³ /mol
	Pentafluoroethane	309.00E+02 Pa.m ³ /mol
	1,1,1-Trifluoroethane	780.00E+02 Pa.m ³ /mol
<i>Critical Point:</i>	Critical pressure:	4.39 MPa
	Critical temperature	85.3°C

10. Stability and Reactivity

Stability: Stable at ambient temperature and under normal conditions of use.

Conditions to avoid: Keep away from heat and sources of ignition. Avoid contact with flames and red hot metallic surfaces.

Hazardous decomposition products: On contact with very hot surfaces, or flames, thermal decomposition (Pyrolysis) releases toxic gasses (hydrofluoric acid and possibly carbonyl halides).

Further Information: The gaseous product in the presence of air can form, under certain conditions of temperature and pressure, a flammable mixture.

11. Toxicological Information

Acute toxicity

Inhalation: The effects of breathing high concentrations of the vapour can be headache, drowsiness and dizziness.

As with other volatile aliphatic halogenated compounds, through vapour accumulation and/or inhalation of large quantities, the product can cause loss of consciousness and cardiac disorders aggravated by stress and lack of oxygen, risk of mortality.

Experimental effects on animals show practically not harmful by inhalation.

LC₅₀/4h/rat: 500000 ppm

Local effects

Skin contact: Contact with liquefied gas can cause frostbite.

Eye contact: Contact with liquefied gas will cause frostbite.

Sensitisation

1,1,1,2-Tetrafluoroethane not a skin sensitizer – guinea pig.

Repeated dose toxicity: Studies of prolonged inhalation in animals have not shown sub chronic toxic effects.

Difluoromethane: Inhalation: 3months/rat. No Observed Adverse Effect Level (NOAEL): 50000 ppm

1,1,1-Trifluoroethane: Inhalation: 3 month/rat. NOAEL: 40000 ppm

Pentafluoromethane: 3 month/rat. NOAEL: 50000 ppm

Specific effects

Genotoxicity:

According to available experimental data has no genotoxic effect.

Carcinogenicity:

1,1,1,2-Tetrafluoroethane: inhalation/rat: experimentation on animals has not shown clear evidence of carcinogenic effect.

1,1,1-Trifluoroethane: According to available experimental data absence of carcinogenic effects by oral route.

Toxicity to reproduction

Fertility 1,1,1,2 tetrafluoroethane: According to limited data in animals there is an absence of toxic effects on fertility on inhalation in mice.

Foetal development: According to experimental data there is an absence of congenital malformations and embryo toxic effects in rodents at non-toxic doses for the mothers (rabbit & rat) by inhalation.

Aquatic toxicity

1,1,1,2 Tetrafluoroethane is slightly harmful to fish. LC₅₀ : 96 hours (450 mg/l, rainbow trout). It is practically not harmful to daphnia (aquatic invertebrate) EC(1) 50 48hours 980 mg/l. Affect on micro-organisms EC10, 6 hour (Pseudomonas putida): > 730 mg/l

1,1,1 Trifluoroethane is slightly harmful to fish. LC₅₀ : 96 hours (450 mg/l, rainbow trout). It is slightly harmful to daphnia EC(1)50 48 hours 300 mg/l.

12. Ecological Information

According to its composition it is not readily biodegradable.

Mobility

For Henry constants see section 9.

Difluoromethane is very slightly adsorbed into soils and sediments.

Pentafluoroethane is slightly adsorbed in soils and sediments. In aqueous environment the volatilization half life time is 3.2 hours (estimation).

1,1,1,2 tetrafluoroethane is slightly adsorbed in soil and sediments.

Persistence and degradability in water

Difluoromethane is not readily biodegradable – 5% after 28 days (OECD Guideline 301 D).

Pentafluoroethane is not readily biodegradable – 5% after 28 days (OECD Guideline 301 D)

1,1,1,2 Tetrafluoroethane is not readily biodegradable 3% after 28 days (OECD Guideline 301 D)

Persistence and degradability in Air

Difluoromethane is degraded by OH⁻ radicals. Half life degradation by direct photolysis is 1472 days.

Pentafluoroethane is degraded in the troposphere, estimated half life is 28.3 years.

1,1,1,2 Tetrafluoroethane is degraded by direct photolysis. Overall half life time is 8.6 to 16.7 years.

1,1,1 Trifluoroethane has an overall half life time of 36 years.

Global Warming Potential: 1912 (CO₂ = 1)

Ozone Depletion Potential: 0.0 (R11 = 1)

Bioaccumulation: Practically not bio-accumulable. For log K_{ow} see section 9.
Aquatic toxicity: See section 11

13. Disposal Considerations

Prohibition: Do not allow the product to be released to the environment.
Destruction/Disposal: Consult the manufacturer or supplier for information regarding recovery and recycling of the product. If recovery is not possible incinerate at a licensed installation.
Contaminated Packaging:
Decontamination/Cleaning: Degas.
Destruction/Cleaning: Containers to be returned to the supplier.

14. Transport Information

Air Transport (ICAO/IATA)

UN Number	1078
Proper Shipping Name	REFRIGERANT GAS N.O.S. (PENTAFLUOROETHANE, 1,1,1,2-TETRAFLUOROETHANR)
Class	2.2
Label	2.2

Sea Transport (IMDG)

UN Number	1078
Proper Shipping Name	REFRIGERANT GAS (PENTAFLUOROETHANE, 1,1,1,2-TETRAFLUOROETHANE)
Class	2.2
Label	2.2
EmS Number	F-C, S-V
Marine Polutant	No

Road Transport

UN Number	1078
Proper Shipping Name	FEFRIGERANT GAS N.O.S. (PENTAFLUOROETHANE, 1,1,1,2-TETRAFLUOROETHANE, TRIFLUOROETHANE, DIFLROROMETHANE 25/50/10/15)
Class	2
Classification Code	2A
Hazard Identification	20
Label	2.2

15. Regulatory Information

Risk Phrases: No risk phrases.

Safety Phrases:

S47: Keep at temperature not exceeding 45°C.
S41: In case of fire and/or explosion do not breathe fumes.

S24/25: Avoid contact with skin and eyes.

United Kingdom: Handle in accordance with relevant British Legislation e.g. Health and Safety at Work Act 1974, Environment Protection Act 1990, EU Directive 2006/4/E, UE Regulation 842/2006 (F Gas Regulations).

Note: The regulatory information given above only indicates the principal regulations specifically applicable to the product described in the Safety Data Sheet. The user's attention is drawn to the possible existence of additional provisions, which complete these regulations. Refer to all applicable National, International and Local regulations or provisions.

16. Other Information

Uses: Refrigerant.

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