

SECTION I – CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name in English:	Refrigerants Gas R404A
Synonyms:	HFC 404A
Formula:	CHF ₂ CF ₃ , CH ₃ CF ₃ , CH ₂ FCF ₃
Supplier:	Global Refrigerants (S) Pte Ltd
Address:	No.9 TUAS LINK 1, SINGAPORE 638587
Representative in Georgia:	Nemera Ltd
Status:	Exclusive Distributor in Caucasus Region, Trademark Owner
Address:	0159, 115A Tsereteli Ave., Tbilisi, Georgia
Phone:	+995322350385, +995577452960
E-mail:	anri@nemera.ge
Web:	www.nemera.ge



SECTION II- COMPOSITION/ INFORMATION ON INGREDIENTS

INGREDIENT NAME	CAS NUMBER	WEIGHT %
Pentafluoroethane (HFC – 125)	354-33-6	44
1,1,1 – Trifluoroethane (HFC – 143a)	420-46-2	52
1,1,1,2 – Tetrafluoroethane (HFC – 134a)	811-97-2	4

SECTION III – HAZARDS IDENTIFICATION

Hazardous Classification: Class 2.2 Compressed Gas and Non-combustible Gas

Primary Routes of Entry: Inhalation, Dermal, Eyes

Emergency Overview: Inhalation of high concentrations of vapour is harmful and may cause heart irregularities, unconsciousness, or death. Intentional misuse or deliberate inhalation may cause death without warning. Vapor reduces oxygen available for breathing and is heavier than air. Liquid contact can cause frostbite.

Potential Health Hazards:

Skin: Skin contact may cause frostbite from exposure to the liquid.

Eyes: Irritant. Liquid contact will irritate and may cause conjunctivitis.

Inhalation: Inhalation may include nonspecific discomfort, such as nausea, headache, or weakness; or temporary nervous system depression with anesthetic effects such as dizziness, headache, confusion, incoordination, and loss of consciousness.

Ingestion: Discomfort due to volatility would be expected.

SECTION IV – FIRST AID MEASURES

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

Skin: Promptly flush skin with water until all chemical is removed. 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.

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

Ingestion: Ingestion is unlikely because of the physical properties and is not expected to be hazardous. DO NOT induce vomiting unless instructed to do so by a physician.

Advice to Physician: Because of the possible disturbances 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.

SECTION V – FIRE FIGHTING MEASURES

Fire and Explosion Hazards: R-404A is not flammable in air at temperatures up to 100° C at atmospheric pressure. However, mixtures of these products with high concentrations of air at elevated pressure and/or temperature can become combustible in the presence of an ignition source. These products can also become combustible in an oxygen enriched environment. Cylinders may rupture under fire conditions. Decompositions may occur. Contact of welding or soldering torch flame with high concentrations of refrigerant can result in visible changes in the size and color of torch flames. This flame effect will only occur in concentrations of product well above the recommended exposure limit, therefore stop all work and ventilate to disperse refrigerant vapors from the work area before using any open flames.

Fire fighting Instructions: Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. Cool containers/ tanks with water spray. In the event of fire, wear self-contained breathing apparatus.

SECTION VI – ACCIDENTAL RELEASE MEASURES

Personal Precautions: Immediately contact emergency personnel. Use suitable protective equipment. Shut off gas supply if this can be done safely. Isolate area until gas has dispersed.

Environmental Precautions: Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

In Case of Spill or Other Release: (Always wear recommended personal protective equipment.) Evacuate unprotected personnel. Protected personnel should remove ignition sources and shut off leak, if without risk, and provide ventilation. Unprotected personnel should not return until air has been tested and determined safe, including low-lying areas.

SECTION VII – HANDLING AND STORAGE

Handling: Avoid breathing vapors and liquid contact with eyes, skin or clothing. Do not puncture or drop cylinders, expose them to open flame or excessive heat. Use authorized cylinders. Follow standard safety precautions for handling and use of compressed gas cylinders. R404A should not mix with air above atmospheric pressure for leak testing or any other purpose.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52° C.

SECTION VIII – EXPOSURE CONTROLS / PERSONAL PROTECTION

Authorized Limit Values:

INGREDIENT NAME	ACGIH TLV	OSHA PEL	OTHER LIMIT
Pentafluoroethane	None	None	*1000 ppm TWA (8hr)
1,1,1 – Trifluoroethane	None	None	*1000 ppm TWA (8hr)
1,1,1,2– Tetrafluoroethane	None	None	*1000 ppm TWA (8hr)

*= Workplace Environmental Exposure Level (AIHA)

Engineering Controls: Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits.

Respiratory Protection: Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hand Protection: Chemical-resistant, impervious gloves or gauntlets complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Eye Protection: Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.

Skin Protection: Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling.

SECTION IX – PHYSICAL & CHEMICAL PROPERTIES

Appearance: Gas at ambient temperatures

Color/Colour: Colorless/colourless

Odor/Odour: Slight, ether-like

Molecular Weight: 120

Boiling Point (1012 mbars): -46.7°C

pH: Neutral

Vapor Pressure: 182.1 psia (25°C)

Vapor Density (air=1): 3.43 (25°C)

Specific Gravity (water = 1.0): 1.05(25°C)

Solubility: Not determined

Application: Refrigerant.

SECTION X – Stability AND REACTIVITY

Stability: The product is stable. Do not mix with oxygen or air above atmospheric pressure. Any source high temperatures, such as lighted cigarettes, flames, hot spots or welding may yield toxic and/or corrosive decomposition products.

Incompatibility With other Materials: Avoid contact with strong alkali or alkaline earth metals, finely powdered metals such as aluminum, magnesium or zinc and strong oxidizers since they may react with or accelerate decomposition of this material.

Hazardous Decomposition Products: Thermal decomposition products include hydrogen fluoride, hydrogen chloride, carbon monoxide, carbon dioxide and chlorine and possibly carbonyl halides. These materials are toxic and irritating. Contact should be avoided. Hazardous

Polymerization: Will not occur.

SECTION XI - TOXICOLOGICAL INFORMATION

Immediate (Acute) Effects:

HFC-125: LC₅₀ : 4 hr. (rat) > 800,000 ppm / Cardiac Sensitization threshold (dog) 75,000 ppm HFC-143a: LC₅₀ : 4hr. (rat)> 540,000 ppm / Cardiac Sensitization threshold (dog)> 250,000 ppm HFC-134a: LC₅₀ : 4hr. (rat)> 500,000 ppm / Cardiac Sensitization threshold (dog)> 80,000 ppm

Delayed (Subchronic and Chronic) Effects: HFC-125: Teratogenic NOEL (rat and rabbit) – 50,000 ppm Subchronic inhalation (rat) NOEL - > 50,000 ppm / Chronic NOEL – 10,000 ppm HFC-143a: Teratogenic NOEL (rat and rabbit) - 50,000 ppm Subchronic inhalation (rat) NOEL - > 50,000 ppm HFC-134a: Teratogenic NOEL (rat and rabbit) - 40,000 ppm Subchronic inhalation (rat) NOEL - 50,000 ppm / Chronic NOEL - 10,000 ppm

Other Data:

HFC-125, HFC-134a: Not active in four genetic studies HFC-143a: Not active in two genetic studies
Toxicity to reproduction: Did not show mutagenic or teratogenic effects in animal experiments.

SECTION XIII – ECOLOGICAL INFORMATION

Aquatic Toxicity:

HFC 143a

96-hour LC₅₀, Rainbow trout: >40 mg/L HFC---134a

48-hour EC₅₀, Daphnia magna: 980 mg/L 96-hour LC₅₀, Rainbow trout: 450 mg/L Degradability (BOD):

R404A is a gas at room temperature; therefore, it is unlikely to remain in water.

Octanol Water Partition Coefficient: Unknown for mixture

SECTION XIII – DISPOSAL CONSIDERATIONS

Nature of the Waste: Not a RCRA hazardous waste.

Waste Treatment: Waste from residues / unused products: Can be used after re-conditioning.
Product removed from the cylinder must be disposed of in accordance with appropriate National and local regulation. Return cylinders with residual product to the supplier.

SECTION XIV – TRANSPORT INFORMATION

Proper Shipping Name: Refrigerant Gas R404A

Hazard Class: 2.2.

UN-NO.: 3337.

Marking: 5

Primary label: Nonflammable Gas

Packing group: III.

Packing Method: Tank Cars, Cylinders, Ton Tanks

SECTION XV – REGULATORY INFORMATION

*Common dangerous chemical classification and labeling (GB13690---92).

*Regulations on the Control over Safety of Dangerous Chemicals (State Council Decree 344 [2002])

*Regulations on the Safety Use of Chemicals in workplaces (Department of Labor, Reg. 423 [1996], are enacted to control the safe use, production, storage, transport, operation, trade and disposal of dangerous chemicals.

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