MATERIAL SAFETY DATA SHEE'I’

(REFRIGERANT GAS R134A)

1 PRODUCT AND COMPANY IDENTIFICATION

Product Name	REFRIGERANT GAS R134a
Product Synonym(s)	A list of applicable products can be found in Section 16
Chemical Family	Hydrofluorocarbon
Chemical Formula	CF3CH2F
Chemical Name	1,1,1,2-tetrafluoroethane (HFC - 134a)
EPA Reg Num	
Product Use	Refrigerant

2 COMPOSITION / INFORMATION ON INGREDIENTS

Ingredient Name	CAS RegistryNumber	Typical Wt. %	OSHA
1,1,1,2-Tetrafluoroethane (HFC-134a)	811-97-2	100%	Y

The substance(s) marked with a "Y" in the OSHA column, are identified as hazardous chemicals according to the criteria of the OSHA Communication Standard (29 CFR 1910.1200)

This material is classified as hazardous under Federal OSHA regulation.

The components of this product are all on the TSCA inventory list.

3 HAZARDS IDENTIFICATION

Emergency Overview

Clear, colorless liquefied gas with faint ethereal (ether like) odor.

WARNING!

LIQUID AND GAS UNDER PRESSURE, OVERHEATING AND OVERPRESSURIZING MAY CAUSE GAS RELEASE OR VIOLENT CYLINDER BURSTING. MAY DECOMPOSE ON CONTACT WITH FLAMES OR EXTREMELY HOT METAL SURFACES TO PRODUCE TOXIC AND CORROSIVE PRODUCTS. VAPOR REDUCES OXYGEN AVAILABLE FOR BREATHING AND IS HEAVIER THAN AIR. HARMFUL IF INHALED AND MAY CAUSE HEART IRREGULARITIES, UNCONSCIOUSNESS OR DEATH. LIQUID CONTACT WITH EYES OR SKIN MAY CAUSE FROSTBITE.

Potential Health Effects

Inhalation and skin contact are expected to be the primary routes of occupational exposure to this material. As with most liquified gases, contact with the rapidly volatilizing liquid or cold vapor can cause frostbite to any tissue. Highvapor concentrations are irritating to the eyes and respiratory tract and may result in central nervous system (CNS)effects such as headache, dizziness, anesthesia, drowsiness and, in severe exposure, loss of consciousness anddeath. The dense vapor of this material may reduce the available oxygen for breathing and produce symptoms such asheadache, dizziness, drowsiness, cyanosis and lack of muscle control followed by collapse. Prolonged exposure to anoxygen-deficient

atmosphere may be fatal. Inhalation of this material may cause an increase in the sensitivity of the
heart to adrenaline, which could result in irregular or rapid heartbeats and reduced heart function. Workers with heart disease or compromised heart function should limit exposure to this material.

4 FIRST AID MEASURES

IF IN EYES, immediately flush with plenty of water. Get medical attention if irritation persists.
IF ON SKIN, Flush exposed skin with lukewarm water (not hot), or use other means to warm skin slowly. Get medical attention if frostbitten by liquid or if irritation occures.
IF SWALLOWED, Not applicable - product is a gas at ambient temperatures.
IF INHALED, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention. Do not give adrenaline, epinephrin or similar drugs following exposure to thisproduct.

5 FIRE FIGHTING MEASURES

Fire and Explosive Properties

Auto-Ignition Temperature	743 C (1 bar)	
Flash Point	NA - GAS	Flash Point Method
Flammable Limits- Upper	NA	
Lower	NA	

Extinguishing Media

Use extinguishing media appropriate to surrounding fire conditions.

Fire Fighting Instructions

Stop the flow of gas if possible. Use water spray on person making shut-off. Fire fighters and others who maybe exposed to products of combustion should wear full fire fighting turn out gear (full Bunker Gear) and self-contained breathing apparatus (pressure demand NIOSH approved or equivalent). Fire fighting equipmentshould be thoroughly decontaminated after use.

Fire and Explosion Hazards

May decompose on contact with flames or extremely hot metal surfaces to produce toxic and corrosiveproducts. Liquid and gas under pressure, overheating or overpressurizing may cause gas release and/or violentcylinder bursting. Container may explode if heated due to resulting pressure rise. Some mixtures of HCFCsand/or HFCs, and air or oxygen may be combustible if pressurized and exposed to extreme heat or flame.

6 ACCIDENTAL RELEASE MEASURES

In Case of Spill or Leak

Use Halogen leak detector or other suitable means to locate leaks or check atmosphere. Keep upwind.Evacuate enclosed spaces and disperse gas with floor-level forced-air ventilation. Exhaust vapors outdoors.Do not smoke or operate internal combustion engines. Remove flames and heating elements.

7 HANDLING AND STORAGE

Handling

Avoid breathing gas. Avoid contact with eyes, skin and clothing. Keep container closed. Use only withadequate ventilation. Do not enter confined spaces unless adequately ventilated.

Storage

Do not apply direct flame to cylinder. Do not store cylinder in direct sun or expose it to heat above 120 F. Do not drop or refill this cylinder. Keep away from heat, sparks and flames.

8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering Controls

Investigate engineering techniques to reduce exposures below airborne exposure limits. Provide ventilation if necessary to control exposure levels below airborne exposure limits (see below). If practical, use localmechanical exhaust ventilation at sources of air contamination such as open process equipment.

Eye / Face Protection

Where there is potential for eye contact, wear chemical goggles and have eye flushing equipment available.

Skin Protection

Wear appropriate chemical resistant protective clothing and chemical resistant gloves to prevent skin contact.Consult glove manufacturer to determine appropriate type glove material for given application. Rinse contaminated skin promptly. Wash contaminated clothing and clean protective equipment before reuse. Wash skin thoroughly after handling.

Respiratory Protection

Avoid breathing gas. When airborne exposure limits are exceeded (see below), use NIOSH approvedrespiratory protection equipment appropriate to the material and/or its components (full facepiecerecommended). Consult respirator manufacturer to determine appropriate type equipment for a givenapplication. Observe respirator use limitations specified by NIOSH or the manufacturer. For emergency andother conditions where exposure limit may be significantly exceeded, use an approved full face positive-pressure, self-contained breathing apparatus or positive-pressure airline with auxiliary self-contained air supply.
Respiratory protection programs must comply with 29 CFR ¡ì 1910.134.

Airborne Exposure Guidelines for Ingredients

Exposure Limit	Value
1,1,1,2-Tetrafluoroethane (HFC-134a)	
WEEL TWA	1000 ppm 4240 mg/m3

-Only those components with exposure limits are printed in this section.

-Skin contact limits designated with a "Y" above have skin contact effect. Air sampling alone is insufficient to accurately quantitative exposure. Measures to prevent significant coetaneous absorption may be required.

-ACGIH Sensitizer designator with a value of "Y" above means that exposure to this material may cause allergic reactions.

-WEEL-AIHA Sensitizer designator with a value of "Y" above means that exposure to this

material may cause allergic skin reactions.

9 PHYSICAL AND CHEMICAL PROPERTIES

Appearance/Odor	Clear, colorless liquified gas with faint etheral (ether like) odor.
pH	NA
Specific Gravity	1.21 @ 4 C
Vapor Pressure	0.665 MPa (6.66 bar) (25 C)
Vapor Density	3.25
Melting Point	NE
Freezing Point	-101 C (-149.8 F)
Boiling Point	-26.4 C/ -15.5 F
Solubility In Water	(25 C): 0.9 g/lMolecular Weight 102.03
Bulk Density	1.21 @ 25 C (g/cm3)
n-Octanol/Water Partition Coefficient	log Pow: 1.06
Other Physical Data	Decomposition temperature: >370 C (700 F) Critical temperature: 101 C Critical pressure: 4.07 MPa (40.7 bar)

10 STABILITY AND REACTIVITY

Stability

This material is chemically stable under specified conditions or storage, shipment and/or use. See
HANDLING AND STORAGE section of this MSDS for specified conditions.

Incompatibility

Avoid contact with strong alkalis or alkaline earth metals, finely powdered metals such as aluminum, magnesiumor zinc and strong oxidizers, since they may react or accelerate decomposition.

Hazardous Decomposition Products

Thermal decomposition products include hydrogen fluoride, hydrogen chloride,
carbon monoxide, carbon dioxide and chlorine.

11 TOXICOLOGICAL INFORMATION

Toxicological Information

1,1,1,2-Tetrafluoroethane (HFC-134a)

No skin allergy was observed in guinea pigs following repeated exposure. Acute inhalation exposure producedanesthetic effects in mice, dogs, cats and monkeys. Repeated inhalation exposure produced no adverseeffects in rats. Inhalation of this material, followed by intravenous injection of epinephrine to simulate stressreactions, resulted in cardiac sensitization in dogs. Following long-term inhalation studies in rats, an increasedincidence of benign tumors (at high concentrations) in the testes were the only tumors observed. No birth defects were noted in the offspring of rats exposed to this material by inhalation during pregnancy, even atdosages which produced significant adverse effects in the mother. This material produced no genetic changesin standard tests using bacterial or animal cells and

whole animals. Single exposure (acute) studies indicate:Inhalation - Practically Non-toxic to Rats (4-hr LC50 >500,000 ppm; 30-min LC50 ~750,000 ppm)
Eye Irritation - Slightly Irritating to RabbitsSkin Irritation - Slightly Irritating to Rabbits (24-hr exposure)

12 ECOLOGICAL INFORMATION

Ecotoxicological Information

Based on its low n-octanol/water partition coefficient (log Pow of 1.06), bioaccumulation of this material isconsidered unlikely.

Chemical Fate Information

Based on its low n-octanol/water partition coefficient (log Pow 1.06), bioaccumulation of this material isconsidered unlikely. When evaluated in a 28 day activated sludge test, 3% degradation of this material wasobserved.

13 DISPOSAL CONSIDERATIONS

Waste Disposal

Recover, reclaim or recycle when practical. Dispose of in accordance with federal, state and local regulations.Note: Chemical additions to, processing of, or otherwise altering this material may make this wastemanagement information incomplete, inaccurate, or otherwise inappropriate. Furthermore, state and local waste disposal requirements may be more restrictive or otherwise different from federal laws and regulations.

14 TRANSPORT INFORMATION

IMO Name	1,1,1,2-tetrafluoroethane
IMO Technical Name	
IMO Hazard Class	2.2
UN Number	UN 3159
IMO Packing Group	PG NA
RQ	

15 REGULATORY INFORMATION

Hazard Categories Under Criteria of SARA Title III Rules (40 CFR Part 370)

Immediate (Acute) Health	Y	Fire	N
Delayed (Chronic) Health	N	Reactive	N
		Sudden Release of Pressure	Y

The components of this product are all on the TSCA inventory list.

Ingredient Related Regulatory Information:

SARA Reportable Quantities	CERCLA RQ	SARA TPQ
1,1,1,2-Tetrafluoroethane (HFC-134a)	NE	

16 OTHER INFORMATION

Revision Information

Revision Date
Supercedes Revision Dated
Revised section 9.
Revision Summary
20 SEP 2001
13-JUL-2000
Revision Number 6

Key

NE= Not Established NA= Not Applicable (R) = Registered Trademark

Miscellaneous

This MSDS applies to the following grades:

Forane 134a - Appliance Grade

Forane 134a

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