TETRAFLUOROETHANE (R134a)
Safety Data Sheet

1. IDENTIFICATION

Product identifier
Product Name TETRAFLUOROETHANE (R134a)

Other means of identification
Safety data sheet number LIND-P113
UN / ID no. UN3159

Recommended use of the chemical and restrictions on use
Recommended Use Industrial and professional use.
Uses advised against Consumer use

Details of the supplier of the safety data sheet
Linde Gas North America LLC - Linde Merchant Production Inc. - Linde LLC
575 Mountain Ave.
Murray Hill, NJ 07974
Phone: 908-464-8100
www.lindeus.com

Linde Gas Puerto Rico, Inc.
Road 869, Km 1.8
Barrio Palmas, Catano, PR 00962
Phone: 787-641-7445
www.pr.lindegas.com

Linde Canada Limited
5860 Chedworth Way
Mississauga, Ontario L5R 0A2
Phone: 905-501-1700
www.lindecanada.com

* May include subsidiaries or affiliate companies / divisions.

For additional product information contact your local customer service.

Emergency telephone number
Company Phone Number 800-232-4726 (Linde National Operations Center, US)
905-501-0802 (Canada)
CHEMTREC: 1-800-424-9300 (North America) +1-703-527-3887 (International)

2. HAZARDS IDENTIFICATION

Classification

OSHA Regulatory Status
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200).

Gases under pressure	Liquefied gas
Simple asphyxiants	Yes

Label elements

Signal word Warning

Hazard Statements

Contains gas under pressure; may explode if heated
May displace oxygen and cause rapid suffocation
May cause frostbite

Precautionary Statements - Prevention
Do not handle until all safety precautions have been read and understood
Do not get in eyes, on skin, or on clothing
Use and store only outdoors or in a well ventilated place
Use backflow preventive device in piping
Close valve after each use and when empty

Precautionary Statements - Response
IF INHALED: Remove person to fresh air and keep comfortable for breathing. Get medical attention / advice.
IF ON SKIN:. Thaw frosted parts with lukewarm water. Do not rub affected area. Get immediate medical advice / attention.

Precautionary Statements - Storage
Protect from sunlight when ambient temperature exceeds 52°C / 125°F

Hazards not otherwise classified (HNOC)
Not applicable

Other Information

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS No.	Volume %	Chemical Formula
1,1,1,2-Tetrafluoroethane	811-97-2	100	$C_2H_2F_4$

4. FIRST AID MEASURES

Description of first aid measures

General advice Show this safety data sheet to the doctor in attendance.

Inhalation	Remove to fresh air and keep comfortable for breathing. If breathing is difficult, give oxygen. If breathing has stopped, give artificial respiration. Get medical attention immediately.
Skin contact	For dermal contact or suspected frostbite, remove contaminated clothing and flush affected areas with lukewarm water. DO NOT USE HOT WATER. A physican should see the patient promptly if contact with the product has resulted in blistering of the dermal surface or in deep tissue freezing.
Eye contact	If frostbite is suspected, flush eyes with cool water for 15 minutes and obtain immediate medical attention.
Ingestion	Not an expected route of exposure.
Self-protection of the first aider	RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS.

Most important symptoms and effects, both acute and delayed

Symptoms	High concentrations may cause asphyxia from lack of oxygen or act as a narcotic causing central nervous system depression. May cause nausea, dizziness, headaches, shortness of breath, lethargy, narcosis, unconsciousness and possibly cardiac arrhythmias. Contact with liquid may cause cold burns / frostbite.

Indication of any immediate medical attention and special treatment needed

Note to physicians	A patient adversely affected by exposure to this product should not be given adrenaline (epinephrine) or similar heart stimulant since these would increase the risk of cardiac arrhythmias.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Specific extinguishing methods
Continue to cool fire exposed cylinders until flames are extinguished. Damaged cylinders should be handled only by specialists.

Specific hazards arising from the chemical
Non-flammable gas. Cylinders may rupture under extreme heat.

Hazardous combustion products	Hydrogen fluoride. Carbonyl fluoride.

Protective equipment and precautions for firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA / NIOSH (approved or equivalent) and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions	Evacuate personnel to safe areas. Ensure adequate ventilation, especially in confined areas. Monitor oxygen level. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe.

Environmental precautions

Environmental precautions	Prevent spreading of vapors through sewers, ventilation systems and confined areas.

Methods and material for containment and cleaning up

Methods for containment	Stop the flow of gas or remove cylinder to outdoor location if this can be done without risk. If leak is in container or container valve, contact the appropriate emergency telephone number in Section 1 or call your closest Linde location.
Methods for cleaning up	Return cylinder to Linde or an authorized distributor.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling	Product is non-corrosive and may be used with any common structural material. Silver and carbon bearing alloys can act as catalysts for decomposing the product at high temperatures. Alloys containing more than 2% magnesium should not be used if water is present. Protect cylinders from physical damage; do not drag, roll, slide or drop. When moving cylinders, even for short distance, use a cart designed to transport cylinders. Never attempt to lift a cylinder by its valve protection cap. Never insert an object (e.g. wrench, screwdriver, pry bar,etc.) into valve cap openings. Doing so may damage valve, causing leak to occur. Use an adjustable strap wrench to remove over-tight or rusted caps. Use only with adequate ventilation. Use backflow preventive device in piping. Use only with equipment rated for cylinder pressure. Close valve after each use and when empty. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier. Ensure the complete gas system has been checked for leaks before use. Never put cylinders into trunks of cars or unventilated areas of passenger vehicles. Never attempt to refill a compressed gas cylinder without the owner's written consent. Never strike an arc on a compressed gas cylinder or make a cylinder a part of an electrical circuit. Only experienced and properly instructed persons should handle gases under pressure. Always store and handle compressed gas cylinders in accordance with Compressed Gas Association, pamphlet CGA-P1, Safe Handling of Compressed Gases in Containers. For additional recommendations consult Compressed Gas Association's (CGA) Safety Bulletin SB-2, Oxygen-Deficient Atmospheres.

Conditions for safe storage, including any incompatibilities

Storage Conditions	Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Cylinders should be stored upright with valve protection cap in place and firmly secured to prevent falling. Keep at temperatures below 52°C / 125°F. Full and empty cylinders should be segregrated. Use a "first in-first out" inventory system to prevent full cylinders from being stored for excessive periods of time. Stored containers should be periodically checked for general condition and leakage.
Incompatible materials	May produce highly toxic fumes on contact with acids or acid fumes.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines	This product does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.

Appropriate engineering controls

Engineering Controls	Ventilation systems. Local exhaust ventilation to prevent accumulation of high concentrations and maintain air-oxygen levels at or above 19.5%. Oxygen detectors should be used when asphyxiating gases may be released. Systems under pressure should be regularly checked for leakages. Showers. Eyewash stations.

Individual protection measures, such as personal protective equipment

Eye / face protection	Wear safety glasses with side shields (or goggles). If splashes are likely to occur, wear:. Goggles. Face-shield.
Skin and body protection	Work gloves and safety shoes are recommended when handling cylinders. Wear cold insulating gloves when handling liquid.
Respiratory protection	Use positive pressure airline respirator with escape cylinder or self contained breathing apparatus for oxygen-deficient atmospheres (<19.5%).
General Hygiene Considerations	Handle in accordance with good industrial hygiene and safety practice. Do not get in eyes, on skin, or on clothing.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state	Compressed gas
Appearance	Colorless.
Odor	Slight ethereal.
Odor threshold	No information available
pH	No data available
Melting point	-101 °C / -149.8 °F
Evaporation rate	Not applicable
Lower flammability limit:	Not applicable
Upper flammability limit:	Not applicable
Flash point	Not applicable
Autoignition temperature	No data available
Decomposition temperature	No data available
Water solubility	67 mg/L @ 25°C
Partition coefficient	No data available
Kinematic viscosity	Not applicable

Chemical Name	Molecular weight	Boiling point	Vapor Pressure	Vapor density (air =1)	Gas Density Kg/m^3@20°C	Critical Temperature
1,1,1,2-Tetrafluoroethane	102.03	-26.55 °C	5.71 bar @ 20 °C	3.3	4.326	101 °C

10. STABILITY AND REACTIVITY

Reactivity
Not reactive under normal conditions.

Chemical stability
Stable under normal conditions.

Explosion data

Sensitivity to Mechanical Impact	None.
Sensitivity to Static Discharge	None.

Possibility of Hazardous Reactions
None under normal processing.

Conditions to avoid
Heat, flames and sparks.

Incompatible materials
May produce highly toxic fumes on contact with acids or acid fumes.

Hazardous Decomposition Products
Hydrogen fluoride. Carbonyl fluoride.

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Inhalation	High concentrations may cause ventricular fibrillation and CNS effects. The No-Observable-Effect Level (NOEL) for cardiac sensitization was 50,000 ppm in dogs.
Skin contact	May cause irritation. Contact with liquid may cause cold burns / frostbite.
Eye contact	May cause slight irritation. Slight eye irritation in rabbits resulted from a 5-second and a 15-second spray from a distance of 10 centimeters. Slight irritation was also seen after occlusive application of 0.5 mL (24 H). Contact with liquid may cause cold burns / frostbite.
Ingestion	Not an expected route of exposure.

Information on toxicological effects

Symptoms	High concentrations may cause asphyxia from lack of oxygen or act as a narcotic causing central nervous system depression. May cause nausea, dizziness, headaches, shortness of breath, lethargy, narcosis, unconsciousness and possibly cardiac arrhythmias.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation	Not classified.
Sensitization	Not classified.
Germ cell mutagenicity	Not classified.
Carcinogenicity	This product does not contain any carcinogens or potential carcinogens listed by OSHA, IARC or NTP.
Reproductive toxicity	Not classified.
Developmental Toxicity	Reductions in maternal weight gains were seen in rabbits exposed to 40,000 ppm and signs of delayed fetal development was seen in rats following materinal exposure to 50,000 ppm.
STOT - single exposure	Not classified.
STOT - repeated exposure	No signs of toxicity were observed in rats exposed to levels of 0, or 100,000 ppm Halocarbon 134a for 6 H / day, 5 days / week for 2 weeks; however, there was a slight increase in urinary fluoride levels at 100,000 ppm. Clinical observations, hematology, blood chemistry, and body weight gains were all normal in rats exposed to 0, 1000, 10,000 and 50,000 ppm HCF 134a for 6 H / day, 5 days / week for 4 weeks. Rats exposed to levels of 0, 2500, 10,000 or 50,000 ppm, 6 H / day, 5 days / week for 18 months have exhibitied no significant signs of toxicity.
Chronic toxicity	Possible risks of irreversible effects.
Target Organ Effects	Heart, Central nervous system (CNS).
Aspiration hazard	Not applicable.

Numerical measures of toxicity

Chemical Name	Oral LD50	Dermal LD50	Inhalation LC50	Inhalation LC50 (CGA P-20)
1,1,1,2-Tetrafluoroethane 811-97-2	-	-	= 1500 g / m³ (Rat) 4 h	-

Product Information

Oral LD50	No information available
Dermal LD50	No information available
Inhalation LC50	No information available
Inhalation LC50	> 500,000 ppm (4-hr) (rat)

The following values are calculated based on chapter 3.1 of the GHS document .

ATEmix (inhalation-gas) 50000 mg/L

12. ECOLOGICAL INFORMATION

Ecotoxicity
No known acute aquatic toxicity.

Persistence and degradability
No information available.

Bioaccumulation
Will not bioconcentrate.

Other adverse effects
Contains fluorinated greenhouse gas.

Global warming potential (GWP) 1430

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Disposal of wastes Do not attempt to dispose of residual waste or unused quantities. Return in the shipping container PROPERLY LABELED WITH ANY VALVE OUTLET PLUGS OR CAPS SECURED AND VALVE PROTECTION CAP IN PLACE to Linde for proper disposal.

14. TRANSPORT INFORMATION

DOT

UN / ID no.	UN3159
Proper shipping name	1,1,1,2-Tetrafluoroethane
Hazard Class	2.2
Special Provisions	T50
Description	UN3159, 1,1,1,2-Tetrafluoroethane, 2.2
Emergency Response Guide Number	126

TDG

UN / ID no.	UN3159
Proper shipping name	Refrigerant gas R 134a
Hazard Class	2.2
Description	UN3159, Refrigerant gas R 134a, 2.2

MEX

UN / ID no.	UN3159
Proper shipping name	1,1,1,2-Tetrafluoroethane
Hazard Class	2.2
Description	UN3159, 1,1,1,2-Tetrafluoroethane, 2.2

IATA

UN / ID no.	UN3159
Proper shipping name	1,1,1,2-Tetrafluoroethane
Hazard Class	2.2
ERG Code	2L
Description	UN3159, 1,1,1,2-Tetrafluoroethane, 2.2

IMDG

UN / ID no.	UN3159
Proper shipping name	1,1,1,2-Tetrafluoroethane
Hazard Class	2.2
EmS-No.	F-C, S-V
Description	UN3159, 1,1,1,2-Tetrafluoroethane, 2.2

ADR

UN / ID no.	UN3159
Proper shipping name	1,1,1,2-Tetrafluoroethane
Hazard Class	2.2
Classification code	2A
Tunnel restriction code	(C / E)
Description	UN3159, 1,1,1,2-Tetrafluoroethane, 2.2, (C / E)

15. REGULATORY INFORMATION

International Inventories

TSCA	Complies
DSL	Complies
EINECS / ELINCS	Complies

Legend:

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL / NDSL - Canadian Domestic Substances List / Non-Domestic Substances List
EINECS / ELINCS - European Inventory of Existing Chemical Substances / European List of Notified Chemical Substances

US Federal Regulations

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

SARA 311 / 312 Hazard Categories

Acute Health Hazard	Yes
Chronic Health Hazard	No
Fire Hazard	No
Sudden release of pressure hazard	Yes
Reactive Hazard	No

CERCLA

This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material

Clean Air Act, Section 112 Hazardous Air Pollutants (HAPs) (see 40 CFR 61)

This product does not contain any substances regulated as hazardous air pollutants (HAPS) under Section 112 of the Clean Air Act Amendments of 1990.

CWA (Clean Water Act)

This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

Risk and Process Safety Management Programs

This material, as supplied, does not contain any regulated substances with specified thresholds under 40 CFR Part 68.
This product does not contain any substances regulated as Highly Hazardous Chemicals pursuant to the 29 CFR Part 1910.110.

US State Regulations

California Proposition 65
This product does not contain any Proposition 65 chemicals

U.S. State Right-to-Know Regulations

Chemical Name	New Jersey	Massachusetts	Pennsylvania
1,1,1,2-Tetrafluoroethane 811-97-2	X	-	-

Canada

16. OTHER INFORMATION

NFPA Health hazards 0 Flammability 0 Instability 0 Physical and Chemical Properties *

Note: Ratings were assigned in accordance with Compressed Gas Association (CGA) guidelines as published in CGA Pamphlet P-19-2009, CGA Recommended Hazard Ratings for Compressed Gases, 3rd Edition.

Issue Date	17-Feb-2015
Revision Date	17-Feb-2015
Revision Note	Initial Release.

General Disclaimer
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End of Safety Data Sheet