



GERMANIUM TETRAFLUORIDE

Material Safety Data Sheet

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name **GERMANIUM TETRAFLUORIDE**

Product Code(s) **G-37**

UN-No **UN3304**

Recommended Use **Compressed gas.**

Synonyms **Tetrafluoro-germane**

Supplier Address
 Linde LLC
 575 Mountain Ave.
 Murray Hill, NJ 07974
 Phone: 908-464-8100
 www.lindeus.com

Linde Gas Puerto Rico, Inc.
 Las Palmas Village
 Road No. 869, Street No. 7
 Catano, Puerto Rico 00962
 Phone: 787-641-7445
 www.pr.lindegas.com

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

For additional product information contact your local customer service.

Chemical Emergency Phone Number **Chemtrec: 1-800-424-9300 for US/ 703-527-3887 outside US**

2. HAZARDS IDENTIFICATION

DANGER!

Emergency Overview

Corrosive
 Fatal if inhaled.

The product causes burns of eyes, skin and mucous membranes

Contents under pressure

Keep at temperatures below 52°C / 125°F

Appearance Colorless

Physical State Gas.

Odor Pungent, Garlic

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

Potential Health Effects

Principle Routes of Exposure	Eye contact. Skin contact. Inhalation.
Acute Toxicity	
Inhalation	Fatal if inhaled. Inhalation of corrosive fumes/gases may cause coughing, choking, headache, dizziness, and weakness for several hours. Pulmonary edema may occur with tightness in the chest, shortness of breath, bluish skin, decreased blood pressure, and increased heart rate. Chemical pneumonitis and pulmonary edema result from exposure to the lower respiratory tract and deep lung. Residual pulmonary malfunction might occur.
Eyes	Corrosive to the eyes and may cause severe damage including blindness. Risk of serious damage to eyes.
Skin	Causes burns. Symptoms may be delayed.
Skin Absorption Hazard	No known hazard by skin absorption.
Ingestion	Not an expected route of exposure. Ingestion causes burns of the upper digestive and respiratory tract.
Chronic Effects	Extended low level systemic absorption of fluorides may cause fluorosis, an abnormal calcification patten of the skeletal system.
Aggravated Medical Conditions	Pre-existing eye disorders. Skin disorders. Respiratory disorders.
Environmental Hazard	See Section 12 for additional Ecological Information.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS-No	Volume %	Chemical Formula
Germane, tetrafluoro-	7783-58-6	> 99	GeF ₄

4. FIRST AID MEASURES

General Advice	Immediate medical attention is required. Show this safety data sheet to the doctor in attendance.
Eye Contact	Immediate medical attention is required. In case of contact with substance, immediately flush eyes with running water for at least 30 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing.
Skin Contact	Immediate medical attention is required. Wash off immediately with soap and plenty of water for at least 30 minutes while removing all contaminated clothing and shoes. Dermal burns may be treated with calcium gluconate gel or slurry in water or glycerine. This compound binds the active fluorides in an insoluble form and limits burn extension and pain.
Inhalation	PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF INHALATION OVEREXPOSURE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS. Conscious inhalation victims should be assisted to an uncontaminated area and inhale fresh air. If breathing is difficult, administer oxygen. Unconscious persons should be moved to an uncontaminated area and, as necessary, given artificial resuscitation and supplemental oxygen. Treatment should be symptomatic and supportive.
Ingestion	Not an expected route of exposure. Immediate medical attention is required. Do NOT induce vomiting. Drink plenty of water. Never give anything by mouth to an unconscious person. Call a physician or Poison Control Center immediately.

Notes to Physician	For dermal exposure, the use of 2.5-33% calcium gluconate or carbonate gel or slurry has been recommended. The gel is either placed into a surgical glove into which the affected extremity is then placed or applied directly on the burn. This compound binds with the active fluorides in an insoluble form and limits burn extension and pain. Calcium chloride should not be used.
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Protection of First-aiders	Use personal protective equipment. Avoid contact with skin, eyes and clothing.
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5. FIRE-FIGHTING MEASURES

Flammable Properties	Not flammable.
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Suitable Extinguishing Media	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
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Explosion Data

Sensitivity to Mechanical Impact	None
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Sensitivity to Static Discharge	None
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Specific Hazards Arising from the Chemical	Contact with water will cause hydrolysis to Hydrofluoric acid. The product causes burns of eyes, skin and mucous membranes. In the event of fire and/or explosion do not breathe fumes. Do not allow runoff from fire fighting to enter drains or water courses. Runoff may pollute waterways. Cylinders may rupture under extreme heat. Continue to cool fire exposed cylinders until flames are extinguished. Damaged cylinders should be handled only by specialists.
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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. Corrosive hazard. Wear protective gloves/clothing and eye/face protection.
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6. ACCIDENTAL RELEASE MEASURES

Personal Precautions	Evacuate personnel to safe areas. Use personal protective equipment. Keep people away from and upwind of spill/leak. Do not get in eyes, on skin, or on clothing. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
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Environmental Precautions	Do not allow material to contaminate ground water system. Should not be released into the environment. Prevent further leakage or spillage if safe to do so. Prevent product from entering drains.
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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.
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Methods for Cleaning Up	Return cylinder to Linde or an authorized distributor.
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Other Information	Refer to protective measures listed in Sections 7 and 8.
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7. HANDLING AND STORAGE

Handling	Carbon steel (without non-metallic inclusions) is the preferred material for handling Germanium Tetrafluoride up to approximately 150°F (65°C). For high temperatures, Monel®, Inconel®, nickel or copper should be used. Cast iron and malleable fittings should not be used. Polyethylene, copper (soft), Kel-F® or Teflon® are the preferred gasket or "packing" material. Most metals form a passive fluoride film which protects the metal further from corrosion. Equipment used in handling Germanium Tetrafluoride should be kept scrupulously dry.
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Wear personal protective equipment. Avoid contact with skin, eyes and clothing. "NO SMOKING" signs should be posted in storage and use areas.

Use only in ventilated areas. Never attempt to lift a cylinder by its valve protection cap. Protect cylinders from physical damage; do not drag, roll, slide or drop. Use equipment rated for cylinder pressure. Use backflow preventive device in piping. 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. Close valve after each use and when empty. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier.

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.

Storage

Protect from physical damage. Cylinders should be stored upright with valve protection cap in place and firmly secured to prevent falling. Store in a cool, dry area away from potential sources of heat, open flames, sunlight or other chemicals. Keep at temperatures below 52°C / 125°F. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders from being stored for excessive periods of time. Always store and handle compressed gas cylinders in accordance with Compressed Gas Association, pamphlet CGA-P1, Safe Handling of Compressed Gases in Containers.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines

Chemical Name	ACGIH TLV	OSHA PEL	NIOSH IDLH
Germane, tetrafluoro- 7783-58-6	2.5 mg/m ³ as F	2.5 mg/m ³ as F	-

Engineering Measures

Showers. Eyewash stations. Ventilation systems. Exhaust gas should be vented to a gas treatment system.

Ventilation

Use ventilation adequate to keep exposures below recommended exposure limits.

Personal Protective Equipment

Eye/Face Protection

Tightly fitting safety goggles. Face-shield.

Skin and Body Protection

Appropriate protective and chemical resistant gloves, clothing and splash protection, or fully encapsulating vapor protective clothing to prevent exposure. For materials of construction consult protective clothing manufacturer's specifications.

Respiratory Protection

General Use

If exposure limits are exceeded or irritation is experienced, NIOSH/MSHA approved respiratory protection should be worn. Positive-pressure supplied air respirators may be required for high airborne contaminant concentrations. Respiratory protection must be provided in accordance with current local regulations.

Emergency Use

Use positive pressure air line respirator or self-contained breathing apparatus for exposure over exposure limits or emergency use.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Colorless.	Odor	Pungent, Garlic.
Odor Threshold	No information available.	Physical State	Gas
Flash Point	No information available.	Autoignition Temperature	No information available
Decomposition Temperature	No information available	Boiling Point/Range	-37°C / -34.6°F
Freezing Point	No information available	Molecular Weight	148.6
Water Solubility	Hydrolyzes	Evaporation Rate	No information available
Vapor Pressure	235 PSIA @ 70°F	Vapor Density	1 (air = 1)
VOC Content (%)	Not applicable	Flammability Limits in Air	
		Upper	Not applicable
		Lower	Not applicable

10. STABILITY AND REACTIVITY

Stability	Stable under recommended storage conditions.
Incompatible Products	Water.
Conditions to Avoid	Rapidly reacts with water or water vapor to form hydrofluoric acid which reacts with most metals and organic materials resulting in evolution of heat and hydrogen gas.
Hazardous Decomposition Products	Hydrogen fluoride. Germanium compounds.
Hazardous Polymerization	Hazardous polymerization does not occur.

11. TOXICOLOGICAL INFORMATION

Acute Toxicity

LD50 Oral:	No information available.
LD50 Dermal:	No information available.
LC50 Inhalation:	No information available.
Repeated Dose Toxicity	No information available.

Chronic Toxicity

Chronic Toxicity	Extended low level systemic absorption of fluorides may cause fluorosis, an abnormal calcification patten of the skeletal system.
Carcinogenicity	Contains no ingredient listed as a carcinogen.
Irritation	No information available.
Sensitization	No information available.
Reproductive Toxicity	No information available.
Developmental Toxicity	No information available.

Synergistic Materials	None known.
Target Organ Effects	Respiratory system. Skin. Eyes. Bone.

12. ECOLOGICAL INFORMATION

Ecotoxicity

The environmental impact of this product has not been fully investigated.

Ozone depletion potential; ODP; (R-11 = 1): Does not contain ozone depleting chemical (40 CFR Part 82).

13. DISPOSAL CONSIDERATIONS

Waste Disposal Methods	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.
Contaminated Packaging	Do not re-use empty containers.

14. TRANSPORT INFORMATION

DOT

Proper Shipping Name	Compressed gas, toxic, corrosive, n.o.s.
Hazard Class	2.3
Subsidiary Class	8
UN-No	UN3304
Description	UN3304, Compressed gas, toxic, corrosive, n.o.s. (Germanium Tetrafluoride), 2.3, (8)
Emergency Response Guide Number	123

TDG

Proper Shipping Name	Compressed gas, toxic, corrosive, n.o.s.
Hazard Class	2.3
Subsidiary Class	(8)
UN-No	UN3304
Description	UN3304, COMPRESSED GAS, TOXIC, CORROSIVE, N.O.S., 2.3(8)

MEX

Proper Shipping Name	Compressed gas, toxic, corrosive, n.o.s.
Hazard Class	2.3
Subsidiary Class	8
UN-No	UN3304
Description	UN3304 Compressed gas, toxic, corrosive, n.o.s. (Germanium Tetrafluoride), 2.3 (8)

IATA

UN-No	UN3304
Proper Shipping Name	Compressed gas, toxic, corrosive, n.o.s.
Hazard Class	2.3
Subsidiary Class	8

ERG Code	2CP
Description	UN3304, Compressed gas, toxic, corrosive, n.o.s. (Germanium Tetrafluoride), 2.3(8)
Maximum Quantity for Passenger	Forbidden
Maximum Quantity for Cargo Only	Forbidden
Limited Quantity	No information available.

IMDG/IMO

Proper Shipping Name	Compressed gas, toxic, corrosive, n.o.s.
Hazard Class	2.3
Subsidiary Class	8
UN-No	UN3304
EmS No.	F-C, S-U
Description	UN3304, Compressed gas, toxic, corrosive, n.o.s. (Germanium Tetrafluoride), 2.3(8)

ADR

Proper Shipping Name	Compressed gas, toxic, corrosive, n.o.s.
Hazard Class	2.3
UN-No	UN3304
Classification Code	1TC
Description	UN3304 Compressed gas, toxic, corrosive, n.o.s. (Germanium Tetrafluoride), 2.3,
ADR/RID-Labels	8

15. REGULATORY INFORMATIONInternational Inventories

TSCA	Complies
DSL	Does not Comply
NDSL	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 Commercial Chemical Substances/EU List of Notified Chemical Substances

U.S. Federal RegulationsSARA 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	Yes
Fire Hazard	No
Sudden Release of Pressure Hazard	Yes
Reactive Hazard	No

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.

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.

CERCLA/SARA

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.

U.S. State Regulations

California Proposition 65

This product does not contain any Proposition 65 chemicals.

U.S. State Right-to-Know Regulations

This product does not contain any substances regulated by state right-to-know regulations.

International Regulations

Canada

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Hazard Class

A Compressed gases
D1A Very toxic materials
E Corrosive material



16. OTHER INFORMATION

Prepared By	Product Stewardship 23 British American Blvd. Latham, NY 12110 1-800-572-6501
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Issuing Date	01-Jul-2010
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Revision Date	
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Revision Number	0
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Revision Note Initial Release.

<u>NFPA</u>	Health Hazard 4	Flammability 0	Stability 2	Physical and Chemical Hazards -
<u>HMIS</u>	Health Hazard 3*	Flammability 0	Physical Hazard 3	Personal Protection -

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.

General Disclaimer

For terms and conditions, including limitation of liability, please refer to the purchase agreement in effect between Linde LLC, Linde Merchant Production, Inc. or Linde Gas North America LLC (or any of their affiliates and subsidiaries) and the purchaser.

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES

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End of Safety Data Sheet