



SILICON TETRACHLORIDE

Material Safety Data Sheet

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name	SILICON TETRACHLORIDE
Product Code(s)	G-76
UN-Number	UN1818
Recommended Use	Compressed gas.
Synonyms	Silicon Chloride, Tetrachlorosilane
Supplier Address*	<p>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</p> <p>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</p> <p>Linde Canada Limited 5860 Chedworth Way Mississauga, Ontario L5R 0A2 Phone: 905-501-1700 www.lindecana.com</p>

* May include subsidiaries or affiliate companies/divisions.

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 Water reactive	
		The product causes burns of eyes, skin and mucous membranes.	
Appearance	Colorless	Physical State	Liquid.
		Odor Sharp, Acidic	

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	Inhalation. Eye contact. Skin contact.
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.
Skin	Contact causes severe skin irritation and possible burns.
Skin Absorption Hazard	No known hazard by skin absorption.
Ingestion	Ingestion causes burns of the upper digestive and respiratory tract.
Chronic Effects	Chronic exposure to corrosive fumes/gases may cause erosion of the teeth followed by jaw necrosis. Bronchial irritation with chronic cough and frequent attacks of pneumonia are common. Gastrointestinal disturbances may also be seen
Aggravated Medical Conditions	Skin disorders. Respiratory disorders. Pre-existing eye disorders.
Environmental Hazard	See Section 12 for additional Ecological Information.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS-No	Volume %	Chemical Formula
Silicon tetrachloride	10026-04-7	95-99.6	Cl ₄ Si
Trichlorosilane	10025-78-2	0.4-5	Cl ₃ HSi

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. Keep eye wide open while 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.
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. If victim is conscious, rinse mouth and give 4-8 ounces of water or milk to dilute. Never give anything by mouth to an unconscious person.
Notes to Physician	Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated. Do not give chemical antidotes. Asphyxia from glottal edema may occur. Marked decrease in blood pressure may occur with moist rales, frothy sputum, and high pulse pressure. Treat symptomatically.

Protection of First-aiders Use personal protective equipment. Avoid contact with skin, eyes and clothing.

5. FIRE-FIGHTING MEASURES

Flammable Properties Not flammable.

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

Hazardous Combustion Products Hydrogen chloride. Siloxane.

Explosion Data

Sensitivity to Mechanical Impact None

Sensitivity to Static Discharge None

Specific Hazards Arising from the Chemical Reacts with moisture in air or with water to form hydrochloric acid. Continue to cool fire exposed cylinders until flames are extinguished. Cylinders may rupture under extreme heat. Damaged cylinders should be handled only by specialists.

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. Additional chemical protective clothing may be required to protect from toxic decomposition products.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Use personal protective equipment. Do not touch or walk through spilled material. Avoid contact with skin, eyes and clothing.

Environmental Precautions Prevent further leakage or spillage if safe to do so. Prevent spreading of vapors through sewers, ventilation systems and confined areas. Do not allow material to contaminate ground water system. Should not be released into the environment.

Methods for Containment Dike to collect large liquid spills. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.

Methods for Cleaning Up Neutralize with soda ash (sodium carbonate) or lime over area of spill. Return cylinder to Linde or an authorized distributor.

Other Information Refer to protective measures listed in Sections 7 and 8.

7. HANDLING AND STORAGE

Handling Keep product scrupulously dry. Corrosive to most metals when water is present.

Use only in ventilated areas. Do not breathe vapors or spray mist. Do not eat, drink or smoke when using this product. Avoid contact with skin, eyes and clothing. Reacts violently with water. Wash thoroughly after handling.

Never put cylinders into trunks of cars or unventilated areas of passenger vehicles. Protect drums from physical damage, do not drag, roll, slide or drop.

Handle in accordance with good industrial hygiene and safety practice.

Storage Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Outside or detached storage is preferred. Keep in a dry, cool and well-ventilated place. Keep container closed when not in use. Protect from physical damage. Use a "first in-first out" inventory system to prevent full cylinders from being stored for excessive periods of time.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

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

Other Exposure Guidelines Linde recommends using the 2 ppm Ceiling limit for hydrogen chloride. The American Industrial Hygiene Association AIHA has established a ceiling limit Workplace Environmental Exposure Level (WEEL) of 1 ppm, an AIHA Emergency Response Planning Guide (1) (ERPG) of 0.75 ppm (no more than mild, transient effects) for up to 1 H exposure and ERPG(2) of 5 ppm (without serious, adverse effects) for up to 1 H exposure and an ERPG(3) of 37 ppm (not life threatening) for up to 1 H exposure for silicon tetrachloride. For trichlorosilane, the AIHA WEEL is 0.5 ppm and the ERPGs (1-3) are 1 ppm, 3 ppm, and 25 ppm respectively.

Engineering Measures Showers. Eyewash stations. Ventilation systems.

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 When using, do not eat, drink or smoke. Remove and wash contaminated clothing before re-use. Keep away from food, drink and animal feeding stuffs. Provide regular cleaning of equipment, work area and clothing. Avoid contact with skin, eyes and clothing. Wear suitable gloves and eye/face protection.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Colorless.	Odor	Sharp, Acidic.
Odor Threshold	No information available	Physical State	Liquid
Flash Point	Not applicable.	Autoignition Temperature	No information available.
Decomposition Temperature	No information available.	Boiling Point/Boiling Range	57.6 °C / 135.7 °F
Freezing Point	-70 °C / -94 °F	Molecular Weight	169.9
Water Solubility	Hydrolyzes	Evaporation Rate	No information available
Vapor Pressure	3.7 PSIA @ 20°C	Vapor Density	5.9 (air = 1)
VOC Content (%)	Not applicable.	Flammability Limits in Air	
		Upper	Not applicable
		Lower	Not applicable

10. STABILITY AND REACTIVITY

Stability	Stable.
Incompatible Products	Water.
Conditions to Avoid	Contact with water or moist air liberates irritating gas. Violent reaction with sodium and potassium.
Hazardous Decomposition Products	Silicic acid. Clear gelatinous siloxane.
Hazardous Polymerization	Hazardous polymerization does not occur.

11. TOXICOLOGICAL INFORMATION

Acute Toxicity

LD50 Oral:	No information available.
LD50 Dermal:	No information available.
LC50 Inhalation:	Per CGA P-20: 750 ppm/1 hr. (ISO)
Repeated Dose Toxicity	No information available.

Chronic Toxicity

Chronic Toxicity	Chronic exposure to corrosive fumes/gases may cause erosion of the teeth followed by jaw necrosis. Bronchial irritation with chronic cough and frequent attacks of pneumonia are common. Gastrointestinal disturbances may also be seen.
Carcinogenicity	Contains no ingredient listed as a carcinogen.
Irritation	Undiluted silicon tetrachloride produced corrosive eye irritation in rabbits (0.1 ml) and corrosive skin irritation following application to intact rabbit skin. Gastrointestinal tissue corrosion has been observed in animals given a single oral dose.
Sensitization	No information available.
Reproductive Toxicity	No information available.
Developmental Toxicity	No information available.

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

12. ECOLOGICAL INFORMATION

Ecotoxicity

Harmful to aquatic organisms.

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	Silicon tetrachloride
Hazard Class	8
Subsidiary Class	None
UN-Number	UN1818
Packing Group	II
Description	UN1818,Silicon tetrachloride,8,PG II
Emergency Response Guide Number	157

TDG

Proper Shipping Name	Silicon tetrachloride
Hazard Class	8
UN-Number	UN1818
Packing Group	II
Description	UN1818,SILICON TETRACHLORIDE,8,PG II

MEX

Proper Shipping Name	Silicon tetrachloride
Hazard Class	8
UN-Number	UN1818
Description	UN1818 Silicon tetrachloride,8,II
Packing Group	II

IATA

UN-Number	UN1818
Proper Shipping Name	Silicon tetrachloride
Hazard Class	8

Packing Group	II
ERG Code	8L
Description	UN1818,Silicon tetrachloride,8,PG II
Maximum Quantity for Passenger	1 L
Maximum Quantity for Cargo Only	30 L
Limited Quantity	0.5 L

IMDG/IMO

Proper Shipping Name	Silicon tetrachloride
Hazard Class	8
UN-Number	UN1818
Packing Group	II
EmS No.	F-A, S-B
Description	UN1818, Silicon tetrachloride,8,PG II

ADR

Proper Shipping Name	Silicon tetrachloride
Hazard Class	8
UN-Number	UN1818
Packing Group	II
Classification Code	C1
Description	UN1818 Silicon tetrachloride,8,II

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 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	No
Reactive Hazard	Yes

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, contains one or more regulated substances with specified thresholds under 40 CFR Part 68 or regulated as a highly hazardous chemical pursuant to the 29 CFR Part 1910.110 with specified thresholds:

Chemical Name	U.S. - CAA (Clean Air Act) - Accidental Release Prevention - Toxic Substances	U.S. - CAA (Clean Air Act) - Accidental Release Prevention - Flammable Substances	U.S. - OSHA - Process Safety Management - Highly Hazardous Chemicals
Trichlorosilane		10000 lbs	5000 lb

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 RegulationsCalifornia Proposition 65

This product does not contain any Proposition 65 chemicals.

U.S. State Right-to-Know Regulations

Chemical Name	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Silicon tetrachloride		X			
Trichlorosilane	X	X	X		X

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

E Corrosive material

D1A Very toxic materials

F Dangerously reactive material



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Revision Note Not applicable.

<u>NFPA</u>	Health Hazard 3	Flammability 0	Stability 2	Physical and Chemical Hazards W1** Personal Protection -
<u>HMIS</u>	Health Hazard 3	Flammability 0	Physical Hazard 2	

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.

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End of Safety Data Sheet