



DICHLOROSILANE

Material Safety Data Sheet

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name DICHLOROSILANE

Product Code(s) G-27

UN-Number UN2189

Recommended Use Compressed gas.

Supplier Address*
 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.
 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

* 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

Extremely flammable

Corrosive

Fatal if inhaled

Water reactive

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 Acrid

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.
Eyes	Corrosive to the eyes and may cause severe damage including blindness.
Skin	Causes burns.
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	No known effect based on information supplied
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
Dichlorosilane	4109-96-0	>99	SiH ₂ Cl ₂

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 15 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. Drink plenty of water. Never give anything by mouth to an unconscious person. Call a physician or Poison Control Center immediately.
Notes to Physician	Treat symptomatically.
Protection of First-aiders	Use personal protective equipment. Avoid contact with skin, eyes and clothing.

5. FIRE-FIGHTING MEASURES

Flammable Properties	Extremely flammable. Pyrophoric gas. May be spontaneously flammable in air.
Suitable Extinguishing Media	DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.
Small Fires	Dry chemical or CO ₂ .
Large Fires	Water spray or fog. A coarse water spray should be used on large fires since the hydrolysis reaction to hydrogen chloride is more rapid than the combustion reaction.
Unsuitable Extinguishing Media	Do not use halogenated extinguishing agents or foam.
Hazardous Combustion Products	Hydrogen chloride. Hydrogen gas. Silicon and Chlorine compounds.

Explosion Data

Sensitivity to Mechanical Impact	None
Sensitivity to Static Discharge	Yes.
Specific Hazards Arising from the Chemical	Rapid flame propagation and flashback possible. Low ignition energy. The material can accumulate static charge and can therefore cause electrical ignition. 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	If possible, stop the flow of gas. Do not extinguish the fire until supply is shut off as otherwise an explosive-ignition may occur. If the fire is extinguished and the flow of gas continues, use increased ventilation to prevent build-up of explosive atmosphere. Ventilation fans must be explosion proof. Use non-sparking tools to close container valves. Isolate spill or leak area for at least 100 meters (330 feet) in all directions. Vapors from liquefied gas are initially heavier than air and spread along ground. Vapors may accumulate in confined areas (basement, tanks, hopper / tank cars, etc.). For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible withdraw from area and let fire burn. Run-off waters from firefighting are toxic and corrosive. Dike for later disposal. Use water spray to cool surrounding containers. Be cautious of a Boiling Liquid Evaporating Vapor Explosion, BLEVE, if flame is impinging on surrounding containers. 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	ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Evacuate personnel to safe areas. Keep people away from and upwind of spill / leak. All equipment used when handling the product must be grounded. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe.
Environmental Precautions	Beware of vapors accumulating to form explosive concentrations. Vapors can accumulate in low areas. Prevent spreading of vapors through sewers, ventilation systems and confined areas. Use water spray to knock down and disperse vapors and protect personnel. (Note: Product forms corrosive hydrochloric acid on contact with water). DO NOT use sorbent spill control materials because self-heating and ignition may occur.

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

7. HANDLING AND STORAGE

Handling	Remove all sources of ignition. Ground and bond all lines and equipment associated with product system. All equipment should be non-sparking and explosion proof. Use only in ventilated areas. "NO SMOKING" signs should be posted in storage and use areas. Any materials suitable for use with anhydrous hydrogen chloride may be used. Systems and equipment must be scrupulously dry. Handle only in sealed, purged systems. Never attempt to lift a cylinder by its valve protection cap. 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. Use equipment rated for cylinder pressure. Use backflow preventive device in piping. Use an adjustable strap wrench to remove over-tight or rusted caps. Close valve after each use and when empty. Never insert an object (e.g. wrench, screwdriver, pry bar, etc.) into valve cap openings. Doing so may damage valve, causing leak to occur. 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 cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. 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. There should be no ignition sources in areas where this product is used or stored. Outside or detached storage is preferred.

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 consideration a 2 ppm (ceiling) for hydrogen chloride (HCl), which forms by the hydrolysis of silane compounds.
Engineering Measures	Showers. Eyewash stations. Exhaust gas should be vented to a gas treatment system. Explosion proof ventilation systems.
Ventilation	Ensure adequate ventilation, especially in confined areas.
<u>Personal Protective Equipment</u>	
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. For exposures above IDLH, an additional escape bottle is required.
Hygiene Measures	When using, do not eat, drink or smoke. Provide regular cleaning of equipment, work area and clothing. Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product. Keep away from food, drink and animal feeding stuffs.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Colorless.	Odor	Acrid.
Odor Threshold	No information available	Physical State	Gas
Flash Point	-62 °F / -52 °C	Flashpoint Method	Closed cup
Autoignition Temperature	44 °C / 111 °F	Decomposition Temperature	No information available.
Boiling Point / Boiling Range	8.4 °C / 47.1 °F	Freezing Point	-122 °C / -188 °F
Molecular Weight	101.01	Water Solubility	Hydrolyzes
Evaporation Rate	No information available	Vapor Pressure	22.5 PSIA @ 70°F
Vapor Density	3.48 (air = 1)	VOC Content (%)	Not applicable.
Flammability Limits in Air			
Upper	96.5%		
Lower	4.7%		

10. STABILITY AND REACTIVITY

Stability	Stable under recommended storage conditions.
Incompatible Products	Strong oxidizing agents. Halogens. Water.
Conditions to Avoid	Keep away from open flames, hot surfaces and sources of ignition. May react with a broad range of materials. Reacts vigorously with water or moist air yielding hydrogen chloride. It is also flammable in air over a very wide range. Explodes on contact with strong oxidizers and may explode with halocarbons when ignited.
Hazardous Decomposition Products	Hydrogen gas. Silicon and Chlorine 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:	Per CGA P-20: LC50: 314 ppm / 1 hr. (Rat)
Eye Contact	Corrosive to the eyes and may cause severe damage including blindness.
Repeated Dose Toxicity	Groups of male and female Sprague-Dawley rats were exposed to 0,3, 7, or 15 ppm (6 hr / day, 5 days / week, total of 9 exposures). Effects included ocular and respiratory irritation, pulmonary lesions, alterations in hematology, serum chemistry and urinalysis parameters, body weight reduction, and increased lung weights.
<u>Chronic Toxicity</u>	
Chronic Toxicity	None known.
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	None known.

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	Dichlorosilane
Hazard Class	2.3
Subsidiary Class	2.1, 8
UN-Number	UN2189

Special Provisions	This material is toxic by inhalation in Hazard Zone B.
Description	UN2189,Dichlorosilane,2.3,(2.1, 8),PG None
Additional Description:	"Toxic-Inhalation Hazard Zone B".
Additional Marking Requirements:	"Inhalation Hazard".
Emergency Response Guide Number	119

TDG

Proper Shipping Name	Dichlorosilane
Hazard Class	2.3
Subsidiary Class	(2.1), (8)
UN-Number	UN2189
Description	UN2189,DICHLOROSILANE,2.3(2.1), (8)

MEX

Proper Shipping Name	Dichlorosilane
Hazard Class	2.3
Subsidiary Class	2.1, 8
UN-Number	UN2189
Description	UN2189 Dichlorosilane,2.3

IATA

UN-Number	UN2189
Proper Shipping Name	Dichlorosilane
Hazard Class	2.3
Subsidiary Class	2.1, 8
ERG Code	10P
Description	UN2189,Dichlorosilane,2.3(2.1, 8)
Maximum Quantity for Passenger	Forbidden
Maximum Quantity for Cargo Only	Forbidden
Limited Quantity	No information available.

IMDG / IMO

Proper Shipping Name	Dichlorosilane
Hazard Class	2.3
Subsidiary Class	2.1, 8
UN-Number	UN2189
EmS No.	F-D, S-U
Description	UN2189, Dichlorosilane,2.3(2.1, 8), FP -52C

ADR

Proper Shipping Name	Dichlorosilane
Hazard Class	2.3
UN-Number	UN2189
Classification Code	2TFC
Description	UN2189 Dichlorosilane,2.3,
ADR / RID-Labels	.1, 8

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	No
Fire Hazard	Yes
Sudden Release of Pressure Hazard	Yes
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
Dichlorosilane		10000 lbs	2500 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
Dichlorosilane		X	X		

International Regulations

Mexico - Grade

Severe risk, Grade 4

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

B6 Reactive flammable material

E Corrosive material

D1A Very toxic materials



Prepared By

Product Stewardship
23 British American Blvd.
Latham, NY 12110
1-800-572-6501

Issuing Date

17-Mar-2010

Revision Date

27-Sep-2013

Revision Number

2

Revision Note

Not applicable.

NFPA

Health Hazard 4

Flammability 4

Stability 0

Physical and Chemical
Hazards W2

HMIS

Health Hazard 3

Flammability 4

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.

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End of Safety Data Sheet