

Material Safety Data Sheet

Version 1.2
Revision Date 01/11/2004

MSDS Number 30000000047
Print Date 01/14/2004

1. PRODUCT AND COMPANY IDENTIFICATION

Product name : Dichlorosilane
Chemical formula : SiH₂Cl₂
Synonyms : Dichlorosilane, DCS
Product Use Description : General Industrial
Company : Air Products and Chemicals, Inc
7201 Hamilton Blvd.
Allentown, PA 18195-1501
Telephone : 800-345-3148
Emergency telephone number : 800-523-9374 USA
01-610-481-7711 International

2. COMPOSITION/INFORMATION ON INGREDIENTS

Components	CAS Number	Concentration (Volume)
Dichlorosilane	4109-96-0	100 %

Concentration is nominal. For the exact product composition, please refer to Air Products technical specifications.

3. HAZARDS IDENTIFICATION

Emergency Overview

May ignite on contact with air or water.
Reacts with water to form corrosive acids.
Extremely flammable.
May form explosive mixtures in air.
Vapors may spread long distances and ignite.
Immediate fire and explosion hazard exists when mixed with air at concentrations exceeding the lower flammability limit (LFL).
May react violently with water.
Do not breathe gas.
Poisonous, corrosive liquid and gas under pressure.
Corrosive to eyes, respiratory system and skin.
Direct contact with liquid can cause frostbite.
Wear self-contained breathing apparatus and protective suit.

Potential Health Effects

Inhalation : Irritating to respiratory system. Delayed adverse effects possible. Can cause severe lung damage. May be fatal if inhaled. Prolonged exposure to small concentrations may result in pulmonary edema. Delayed fatal pulmonary edema possible.

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Eye contact : Irritating to eyes. Causes severe eye burns. May cause permanent eye injury.

Skin contact : Causes skin irritation. Contact with liquid may cause cold burns/frost bite.
Causes skin burns. May cause burns or external ulcers.

Exposure Guidelines

Primary Routes of Entry : Inhalation
Eye contact
Eye and skin contact.
Skin contact

Target Organs : Respiratory tract.
Skin.

Symptoms : Irritating to eyes and respiratory system. Cough.

Aggravated Medical Condition

Acute or chronic respiratory conditions.
Asthma.

Environmental Effects

Dangerous for the environment.

4. FIRST AID MEASURES

General advice : The potential for hydrogen chloride formation exists with every exposure, therefore its toxicity must be considered. Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped. Use chemically protective clothing.

Eye contact : In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Keep eye wide open while rinsing.

Skin contact : Immediate medical treatment is necessary as untreated wounds from corrosion of the skin heal slowly and badly. Flush with copious amounts of water until treatment is available.

Ingestion : Ingestion is not considered a potential route of exposure.

Inhalation : Move to fresh air. In case of shortness of breath, give oxygen. If breathing is irregular or stopped, administer artificial respiration. Consult a doctor.

Notes to physician

Treatment : Treat bronchospasm and laryngeal edema if present. Observe for delayed chemical pneumonitis, pulmonary hemorrhage or edema.

5. FIRE-FIGHTING MEASURES

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- Suitable extinguishing media : Water.
Foam.
- Specific hazards : Heat from a fire or reaction with water can cause ignition. Product has low autoignition temperature and is extremely easy to ignite. Gas is heavier than air and may collect in low areas or travel along the ground where there may be an ignition source present. Upon exposure to intense heat or flame, cylinder will vent rapidly and or rupture violently. Combustion by-products may be toxic. Use of water may result in the formation of very toxic aqueous solutions. Move away from container and cool with water from a protected position. If possible, shut off the source of gas and allow the fire to burn itself out. Do not extinguish a leaking gas flame unless absolutely necessary. Spontaneous/explosive re-ignition may occur. Extinguish any other fire. Keep adjacent cylinders cool by spraying with large amounts of water until the fire burns itself out. Do not allow run-off from fire fighting to enter drains or water courses.
- Special protective equipment for fire-fighters : Use self-contained breathing apparatus and chemically protective clothing.

6. ACCIDENTAL RELEASE MEASURES

- Personal precautions : Evacuate personnel to safe areas. Remove all sources of ignition. Use self-contained breathing apparatus or positive pressure air line with mask and escape pack in areas where concentration is unknown or above the exposure limits. Never enter a confined space or other area where the flammable gas concentration is greater the 10% of its lower flammable limit. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe. Ventilate the area.
- Environmental precautions : Should not be released into the environment. Prevent further leakage or spillage if safe to do so. Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous.
- Methods for cleaning up : Ventilate the area. Approach suspected leak areas with caution. Keep area evacuated and free from ignition sources until any spilled liquid has evaporated. (Ground free from frost). Reduce vapor with fog or fine water spray.
- Additional advice : Large releases may require considerable downwind evacuation. If possible, stop flow of product. Increase ventilation to the release area and monitor concentrations. If leak is from cylinder or cylinder valve, call the Air Products emergency telephone number. If the leak is in the user's system, close the cylinder valve, safely vent the pressure, and purge with an inert gas before attempting repairs.

7. HANDLING AND STORAGE

Handling

Carbon steel, stainless steel, Monel or copper are suitable materials of construction when no moisture is present. Hastelloy, platinum or gold offer good resistance to corrosion when moisture is present. Protect cylinders from physical damage; do not drag, roll, slide or drop. Do not allow storage area temperature to exceed 50°C (122°F). Only experienced and properly instructed persons should handle compressed gases. Before using the product, determine its identity by reading the label. Know and understand the properties and

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hazards of the product before use. When doubt exists as to the correct handling procedure for a particular gas, contact the supplier. Do not remove or deface labels provided by the supplier for the identification of the cylinder contents. When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders. Leave valve protection caps in place until the container has been secured against either a wall or bench or placed in a container stand and is ready for use. Use an adjustable strap wrench to remove over-tight or rusted caps. Before connecting the container, check the complete gas system for suitability, particularly for pressure rating and materials. Before connecting the container for use, ensure that back feed from the system into the container is prevented. Ensure the complete gas system is compatible for pressure rating and materials of construction. Ensure the complete gas system has been checked for leaks before use. Employ suitable pressure regulating devices on all containers when the gas is being emitted to systems with lower pressure rating than that of the container. Never insert an object (e.g. wrench, screwdriver, pry bar, etc.) into valve cap openings. Doing so may damage valve, causing a leak to occur. Open valve slowly. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier. Close container valve after each use and when empty, even if still connected to equipment. Never attempt to repair or modify container valves or safety relief devices. Damaged valves should be reported immediately to the supplier. Close valve after each use and when empty. Replace outlet caps or plugs and container caps as soon as container is disconnected from equipment. Do not subject containers to abnormal mechanical shocks which may cause damage to their valve or safety devices. Never attempt to lift a cylinder by its valve protection cap or guard. Do not use containers as rollers or supports or for any other purpose than to contain the gas as supplied. Never strike an arc on a compressed gas cylinder or make a cylinder a part of an electrical circuit. Keep container valve outlets clean and free from contaminants particularly oil and water. Do not smoke while handling product or cylinders. Never re-compress a gas or a gas mixture without first consulting the supplier. Never attempt to transfer gases from one cylinder/container to another. Always use backflow protective device in piping. Purge air from system before introducing gas. Purge system with dry inert gas (e.g. helium or nitrogen) before gas is introduced and when system is placed out of service. Avoid suckback of water, acid and alkalis. Installation of a cross purge assembly between the cylinder and the regulator is recommended. When returning cylinder install valve outlet cap or plug leak tight. Never use direct flame or electrical heating devices to raise the pressure of a container. Containers should not be subjected to temperatures above 50°C (122°F). Prolonged periods of cold temperature below -30°C (-20°F) should be avoided. Never attempt to increase liquid withdrawal rate by pressurizing the container without first checking with the supplier. Never permit liquefied gas to become trapped in parts of the system as this may result in hydraulic rupture. All piped systems and associated equipment must be grounded.

Storage

Full containers should be stored so that oldest stock is used first. Containers should be stored in a purpose build compound which should be well ventilated, preferably in the open air. Observe all regulations and local requirements regarding storage of containers. Stored containers should be periodically checked for general condition and leakage. Local codes may have special requirements for toxic gas storage. Protect containers stored in the open against rusting and extremes of weather. Containers should not be stored in conditions likely to encourage corrosion. Containers should be stored in the vertical position and properly secured to prevent toppling. The container valves should be tightly closed and where appropriate valve outlets should be capped or plugged. Container valve guards or caps should be in place. Keep containers tightly closed in a cool, well-ventilated place. Store containers in location free from fire risk and away from sources of heat and ignition. Full and empty cylinders should be segregated. Do not allow storage temperature to exceed 50°C (122°F). Smoking should be prohibited within storage areas or while handling product or containers. Display "No Smoking or Open Flames" signs in the storage areas. The amounts of flammable or toxic gases in storage should be kept to a minimum. Return empty containers in a timely manner. Flammable storage areas should be separated from oxygen and other oxidizers by a minimum distance of 20 ft. (6.1 m.) or by a barrier of non-combustible material at least 5 ft. (1.5 m.) high, having a fire resistance rating of at least 1/2 hour.

Technical measures/Precautions

Containers should be segregated in the storage area according to the various categories (e.g. flammable, toxic, etc.) and in accordance with local regulations. Provide sufficient air exchange and/or exhaust in work rooms.

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Keep away from combustible material. All electrical equipment in the storage areas should be compatible with flammable materials stored. Containers containing flammable gases should be stored away from other combustible materials. Where necessary containers containing oxygen and oxidants should be separated from flammable gases by a fire resistant partition.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Personal protective equipment

- Respiratory protection : Keep self contained breathing apparatus readily available for emergency use. Use self-contained breathing apparatus or positive pressure air line with mask and escape pack in areas where concentration is unknown or above the exposure limits. Users of breathing apparatus must be trained.
- Hand protection : Acid resistant gloves.
Sturdy work gloves are recommended for handling cylinders.
The breakthrough time of the selected glove(s) must be greater than the intended use period.
- Eye protection : Safety glasses recommended when handling cylinders.
A full faceshield should be worn in addition to safety glasses when connecting, disconnecting or opening cylinders.
- Skin and body protection : Acid resistant gloves (e.g. butyl rubber, neoprene, polyethylene) and splash suit when connecting, disconnecting or opening cylinders.
Cold temperatures may cause embrittlement of protective material resulting in breakage and exposure.
Contact with cold evaporating liquid on gloves or suit may cause cryogenic burns or frostbite.
Safety shoes are recommended when handling cylinders.
Wear as appropriate:
Flame retardant protective clothing.
Encapsulated chemical protective suit in emergency situations.
- Special instructions for protection and hygiene : Ensure adequate ventilation, especially in confined areas. Provide good ventilation and/or local exhaust to prevent accumulation of concentrations above exposure limits.

9. PHYSICAL AND CHEMICAL PROPERTIES

- Form : Liquefied gas.
- Color : Gives off white fumes in moist air
- Odor : Pungent.
- Molecular Weight : 101.01 g/mol
- Relative vapor density : 3.487 (air = 1)
- Relative density : 1.3 (water = 1)

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Vapor pressure	: 23.21 psig (1.60 bar) at 68 °F (20 °C)
Density at 70 °F (21 °C)	: 0.268 lb/ft ³ (0.0043 g/cm ³) Note: (as vapor)
Specific Volume at 70 °F (21 °C)	: 3.72 ft ³ /lb (0.2322 m ³ /kg)
Boiling point/range	: 47 °F (8.2 °C)
Critical temperature	: 349 °F (176 °C)
Melting point/range	: -188 °F (-122 °C)
Flash point	: 0 °F (-18 °C)
Autoignition temperature	: 365 °F (185 °C)
Upper flammability limit	: 80 %(V)
Lower flammability limit	: 2.5 %(V)
Water solubility	: Hydrolyses.

10. STABILITY AND REACTIVITY

Stability	: Stable under normal conditions.
Conditions to avoid	: Heat, flames and sparks.
Materials to avoid	: Water. Aluminium. Strong bases. Brass. Oxygen. Oxidizing agents.

11. TOXICOLOGICAL INFORMATION

Acute Health Hazard

Inhalation	: LC50 : 314 ppm Species : Rat. Exposure time : 1 h
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12. ECOLOGICAL INFORMATION

Ecotoxicity effects

Aquatic toxicity	: May cause pH changes in aqueous ecological systems. May cause pH
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changes in aqueous ecological systems.

Toxicity to other organisms : No data available.

Persistence and degradability

Mobility : No data available.

Bioaccumulation : No data available.

13. DISPOSAL CONSIDERATIONS

Waste from residues / unused products : In accordance with local and national regulations. Contact supplier if guidance is required. Return unused product in original cylinder to supplier. Must not be discharged to atmosphere.

Contaminated packaging : Return cylinder to supplier.

14. TRANSPORT INFORMATION

CFR

Proper shipping name : Dichlorosilane
Class : 2.3 (2.1, 8)
UN/ID No. : UN2189

IATA

Proper shipping name : Dichlorosilane
UN/ID No. : UN2189

IMDG

Proper shipping name : DICHLOROSILANE
Class : 2.3 (2.1, 8)
UN/ID No. : UN2189

CTC

Proper shipping name : DICHLOROSILANE
Class : 2.3 (2.1, 8)
UN/ID No. : UN2189

Further Information

Avoid transport on vehicles where the load space is not separated from the driver's compartment. Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency.

15. REGULATORY INFORMATION

OSHA Hazard Communication Standard (29 CFR 1910.1200) Hazard Class(es)
Toxic, Flammable., Corrosive., Compressed Gas

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Country	Regulatory list	Notification
USA	TSCA	Included on Inventory.
EU	EINECS	Included on Inventory.
Canada	DSL	Included on Inventory.
Australia	AICS	Included on Inventory.
Japan	ENCS	Included on Inventory.
South Korea	ECL	Included on Inventory.
China	SEPA	Included on Inventory.
Philippines	PICCS	Included on Inventory.

EPA SARA Title III Section 312 (40 CFR 370) Hazard Classification:
Acute Health Hazard

Fire Hazard., Sudden Release of Pressure Hazard, Reactivity Hazard

US. California Safe Drinking Water & Toxic Enforcement Act (Proposition 65)

This product does not contain any chemicals known to State of California to cause cancer, birth defects or any other harm.

16. OTHER INFORMATION

NFPA Rating

Health : 4
Fire : 4
Instability : 2
Special : W

HMIS Rating

Health : 3
Flammability : 4
Physical hazard : 3

Prepared by : Air Products and Chemicals, Inc. Global EH&S Product Safety Department

For additional information, please visit our Product Stewardship web site at
<http://www.airproducts.com/productstewardship/>