

In an emergency, Call CHEMTREC at 800-424-9300 or 703-527-3887.

Section 1: Chemical Product and Company Identification

Material Name: Dichlorosilane.

Chemical formula: SiH₂Cl₂.

Synonyms: DCS.

Manufacturer: Voltaix, LLC: Post Office Box 5357, North Branch, New Jersey 08876-5357 USA
Voice: 908-231-9060 or 800-VOLTAIX, Facsimile: 908-231-9063

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Section 2: Composition/Information on Ingredients

Component	CAS Registry Number	Molar (volume) concentration	Exposure Guidelines
Dichlorosilane	4109-96-0	100%	2.5 ppm Ceiling (See Section 11)

Section 3: Hazards Identification**Emergency Overview**

Dichlorosilane is a colorless gas with an irritating, acidic odor. The immediate health hazard is that it is a poison gas. It is flammable, and may form mixtures with air that are flammable or explosive. Dichlorosilane is reactive with water. It fumes in moist air to form hydrogen chloride and siloxanes.

NFPA 704 Rating (determined by Voltaix): Health 4 Fire 4 Reactivity 2 Special W

Note: NFPA 49 - 91 lists "Health 3", which not consistent with NFPA 704 - 90.

Potential Health Effects

Routes of Exposure: The primary route of exposure is inhalation. Dichlorosilane also irritates eyes, skin, and mucous membranes.

Lengths of Exposure: LC₅₀ 1 hour, rat 314 ppm. No objective human exposure data are available.

Severity of Effect: Depends on concentration and duration.

Target Organs: Respiratory tract, skin, eyes, and mucous membranes.

Type of Effect: Skin, eye, and mucous membrane irritation, impaired respiratory function (pulmonary edema and chemical pneumonitis).

Signs and Symptoms of Exposure: Skin and mucous membrane irritation, lacrimation (tearing), cough, increased saliva and sputum production, dyspnea (difficulty in breathing).

Medical Conditions that may be Aggravated by Exposure: Respiratory impairment.

Reported Carcinogenic and Reproductive Effects: None known to Voltaix

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Section 4: First Aid Measures

Inhalation

This is the primary route of exposure.

- 1) Remove the affected person from the gas source or contaminated area. Note: Personal Protective Equipment (PPE), including positive pressure, self contained breathing apparatus, may be required to assure the safety of the rescuer.
- 2) If the affected person is not breathing spontaneously, administer rescue breathing.
- 3) If the affected person does not have a pulse, administer CPR.
- 4) If medical oxygen and appropriately trained personnel are available, administer 100% oxygen to the affected person.
- 5) Summon an emergency ambulance. If an ambulance is not available, contact a physician, hospital, or poison control center for instruction.
- 6) Keep the affected person warm, comfortable, and at rest while awaiting professional medical care. *Monitor the breathing and pulse continuously.* Administer rescue breathing or CPR if necessary.

Skin Contact

Flush with a copious stream of water while removing contaminated clothing. Continue flushing until the professional medical assistance arrives, but for no less than fifteen minutes. Treat thermal burns by assuring that affected area is cool by flushing with cool water, then apply dry sterile dressings. Assume that the patient may also have been exposed by inhalation and obtain professional medical assistance immediately.

Eye Contact

Flush continuously with clean water until the professional medical assistance arrives, but for no less than thirty minutes. Continuation of flushing until patient is transferred to an ophthalmologist or emergency physician is recommended. Assume that the patient may also have been exposed by inhalation and obtain professional medical assistance immediately.

Ingestion

Ingestion is not an observed route of exposure to gaseous hazardous materials.

Chronic Effects

Residual vision or respiratory impairment may occur, as may scarring of affected skin.

Note to Physicians:

The reaction products of dichlorosilane and air are hydrogen chloride, silica and siloxanes.

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Section 5: Fire Fighting Measures

Flammability and Explosivity

Flash Point: -52 °C (-62 °F).

Flammability Limits in Air: 4.1% and 98.8%.

Autoignition Temperature: 100 °C (212 °F).

Flammability Classification (per 29 CFR 1910.1200): Flammable gas.

Known or Anticipated Hazardous Products of Combustion: Silicon oxide (silica), hydrogen chloride.

Properties that may Initiate or Intensify Fire: Heating cylinder to the point of activation of the pressure relief device.

Reactions that Release Flammable Gases: Thermal decomposition releases hydrogen.

Extinguishing Media

Water.

Note: Water reacts more rapidly with dichlorosilane than does air. Hydrogen chloride is produced by either reaction. The application of water reduces the temperature of reaction, which may mitigate the spread of the incident.

Fire Fighting Instructions

The best way to extinguish a dichlorosilane fire is to stop the flow of gas. If the flow cannot be stopped, apply water to decompose the dichlorosilane. Cool the cylinder and surroundings with water from a suitable distance. Extinguishing the fire without stopping the flow of gas may permit the formation of ignitable or explosive mixtures with air. These mixtures may propagate to a source of ignition.

Note: If dichlorosilane is released, the water used for fire suppression and cooling may be contaminated with hydrogen chloride. The discharge hydrogen chloride of to the sewer system or the environment may be restricted, requiring the containment and proper disposal of the water.

Excessive pressure may develop in gas cylinders exposed to fire, which may result in explosion, regardless of the cylinder's content. Cylinders with pressure relief devices (PRD's) may release their contents through such devices if the cylinder is exposed to fire. Cylinders without PRD's have no provision for controlled release and are therefore more likely to explode if exposed to fire.

Positive pressure, self contained breathing apparatus is required for all fire fighting involving hazardous materials. Full structural fire fighting (bunker) gear is the *minimum* acceptable attire. The need for proximity, entry, and flashover protection and special protective clothing should be determined for each incident by a competent fire fighting safety professional.

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Section 6: Accidental Release Measures

Containment

As this material is a gas at atmospheric conditions, the only means of containment is the enclosure of the space into which the material is released. Such containment is described in Section 7.

Clean Up

Clean up consists of passing the entire gas volume of the enclosure through appropriate exhaust gas treatment equipment (EGTE). Purge the enclosure with a non-reactive gas, such as nitrogen, through the EGTE until an acceptably low level of contamination remains. Equipment contaminated by this material must then be cleaned or decommissioned appropriately.

Evacuation

If the release is not contained in an appropriate device or system, all personnel not appropriately protected (see Section 8) must evacuate the contaminated spaces. Consider evacuation of additional areas, as a precaution against the spread of the release or subsequent explosion or fire.

Special Instructions

Note: Water used for cleanup may be contaminated with hydrogen chloride. The discharge hydrogen chloride of to the sewer system or the environment may be restricted, requiring the containment and proper disposal of the water.

Section 7: Handling and Storage

Handling

Handle this material only in sealed, purged systems. The design of handling systems for hazardous materials is beyond the scope of this MSDS, and should be performed by a competent, experienced professional. Consider the use of doubly-contained piping; diaphragm or bellows sealed, soft seat valves; backflow prevention devices; flash arrestors; and flow monitoring or limiting devices. Gas cabinets, with appropriate exhaust treatment, are recommended, as is automatic monitoring of the secondary enclosures and work areas for release.

Handle sealed gas cylinders in accordance with CGA P-1, *Safe Handling of Compressed Gases in Containers*.

Some material may have accumulated behind the outlet plug. Face the outlet away from you and wear appropriate protective equipment when removing the plug to connect the cylinder to your system.

Never introduce any substance into a gas cylinder. If you believe your cylinder may have been contaminated, notify Voltaix immediately. Provide as much information as possible on the nature and quantity of contamination.

Storage

Store cylinders in accordance with CGA P-1, *Safe Handling of Compressed Gases in Containers*, local building and fire codes and other relevant regulations. Materials should be segregated by the hazards they comprise for storage.

Protect the cylinders from direct sunlight, precipitation, mechanical damage, and temperatures above 55 °C (130 °F).

Ship and store cylinders with the outlet plug and valve protective cap in place.

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Section 8: Exposure Control/Personal Protection**Engineering Controls**

Local exhaust is required. Secondary containment, with appropriate exhaust gas treatment, is strongly encouraged and is required in some jurisdictions.

Monitor the work area and the secondary containment continuously for release of the material. Automatic alerting of personnel and automatic shutdown of flow are appropriate in most applications and are required in some jurisdictions.

Purge all primary containment systems with a nonreactive gas, such as nitrogen, before introducing dichlorosilane.

Personal Protective Equipment (PPE)

Respiratory Protection: Positive pressure, full face, air supplied breathing apparatus should be used for work within the secondary containment equipment if a leak is suspected or the primary containment is to be opened, e.g., for a cylinder change. Air supplied breathing apparatus is required for response to demonstrated or suspected releases from the primary containment.

Eye/Face Protection: When using respiratory protection as described above, use a face mask that provides splash and impact protection for the face and eyes. For handling sealed cylinders, wear safety glasses.

Skin Protection: Wear appropriate gloves when handling sealed cylinders. Use gloves and other skin protection, as assigned by a competent safety professional, when working within the secondary enclosure with the primary enclosure compromised, e.g., cylinder changing, to protect both from exposure to the material and from fire that may result from its release to the air.

Other Protection: Wear appropriate protective footwear when moving cylinders.

Exposure Guidelines

Voltaix recommends a Ceiling of 2.5 ppm. (See Section 11.)

Section 9: Physical and Chemical Properties

Notes: 1) "N/A" means not applicable.

2) Unless otherwise specified, properties are reported at 0 °C (32 °F) and 1 atmosphere (1.0 bar, 14.7 psia).

Property	Dichlorosilane
Appearance	colorless
Odor	irritating
Physical state	gas
pH	N/A
Vapor Pressure	81.3 kPa (11.8 psia)
Vapor Density	4.168 g/L at 25 °C
Boiling point	8.2 °C (46.8 °F)
Melting point	-122.0 °C (-187.6 °F)
Solubility in water (v/v)	N/A (decomposes)
Specific gravity (liquid)	1.22 at 25 °C
Molecular weight	101.01

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Section 10: Stability and Reactivity

Chemical Stability: Stable at room temperature and atmospheric pressure. Decomposes to silicon, hydrogen chloride, hydrogen, and chlorine at elevated temperatures (above 500 °C).

Conditions to Avoid: Sources of ignition, exposure to air or water.

Incompatibility with Other Materials: Oxidizers, including water.

Hazardous Decomposition, Reaction and Oxidation (other than burning) Products: Silicon oxide, hydrogen chloride, hydrogen, chlorine, oligosiloxanes and polysiloxanes.

Hazardous Polymerization: Has not been observed.

Section 11: Toxicological Information

Acute Data (by route): LC₅₀, 1-hour, rat 314 ppm. No other objective information on dichlorosilane's acute toxicity is known to Voltaix. By analogy with hydrogen chloride, the reaction product of dichlorosilane and moist air, exposure by inhalation may cause irritation or thermal burns to skin, eyes and mucous membranes and injury to the respiratory tract.

Chronic and Subchronic Data: Dichlorosilane is not listed in RTECS; no information on its carcinogenicity or other chronic or subchronic effects is known to Voltaix.

Special Studies: None known.

No published exposure guidelines for dichlorosilane are known to Voltaix. Because it hydrolyzes rapidly in moist air to form hydrogen chloride, in a ratio of two moles of hydrogen chloride for each mole of dichlorosilane, Voltaix recommends a Ceiling of 2.5 ppm, which is half the Ceiling specified by ACGIH and OSHA for hydrogen chloride.

Section 12: Ecological Information

Ecotoxicity: None known to Voltaix.

Environmental Fate: None known to Voltaix.

Section 13: Disposal Considerations

Classification under RCRA, 40 CFR 261: This material meets the criteria for an Acute Hazardous Waste.

US EPA waste number and descriptions: D001 (ignitability), D003 (reactivity).

Special Instructions and Limitations: Treat process and other exhaust streams appropriately before release to the atmosphere.

Notice: The information above is derived from Voltaix's interpretation of the US federal laws, regulations and policies concerning the material, as shipped by Voltaix, at the time this MSDS was prepared. Federal controls are subject to change and state and local controls may also apply. Proper waste disposal is the responsibility of the owner of the waste. The user is encouraged to consult with appropriate experts in developing a disposal plan.

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Section 14: Transport Information

Basic Description: Dichlorosilane, Division 2.3 (Toxic Gas, Flammable Gas), UN 2189 Toxic - Inhalation Hazard, Inhalation Hazard Zone B.

Note: This material may also bear a "Corrosive" label.

Additional Information for shipment by water: IMDG Page Number 2131.

Additional Information for shipment by air: Transportation by air is forbidden.

Section 15: Regulatory Information

TSCA Status: Listed on the Inventory of Chemical Substances.

CERCLA Reportable Quantity (40CFR302.40): This material is not listed. The Reportable Quantity (RQ) for "Unlisted Hazardous Wastes Characteristic of Ignitability" (D001)) and "Unlisted Hazardous Wastes Characteristic of Reactivity" (D003) of 45.4 kg (100 lbs.) therefore applies.

SARA Title III Status (Section 302 (40CFR355), Section 311/312, Section 313 (40CFR372)): No Threshold Planning Quantities (TPQ's) or Reportable Quantities (RQ's) are listed for these substances. The default federal MSDS submission and inventory requirement filing threshold of 4,540 kg (10,000 lbs.) therefore applies.

Note: State and local requirements may be more stringent.

Section 16: Other Information**References**

Book of SEMI Standards, Facilities Standards and Safety Guidelines. Mountain View, CA: Semiconductor Equipment and Materials International, 1993.

Borak, Jonathan, M.D., Michael Callan and William Abbott, *Hazardous Materials Exposure: Emergency Response and Patient Care.* Englewood Cliffs, NJ: Prentice-Hall, Inc., 1991.

Effects of Exposure to Toxic Gases: First Aid and Treatment. Lyndhurst, NJ: Matheson Gas Products, 1977.

Fire Protection Guide on Hazardous Materials. Quincy, MA: National Fire Protection Association, 1993.

Safe Handling of Compressed Gases in Containers (Pamphlet P-1). Arlington, VA: Compressed Gas Association, Inc., 1991.

Revision Indication

Revise to reflect company name change

Disclaimer

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