

SECTION 1: Identification

1.1. Identification

Product form	: Substance
Substance name	: Silane
Chemical name	: Silane
CAS-No.	: 7803-62-5
Product code	: SG-1001-07374
Formula	: SiH ₄
Synonyms	: Silane, compressed / Silicon tetrahydride / Silicon hydride / Monosilane / Hydrogen silicide

1.2. Recommended use and restrictions on use

Use of the substance/mixture	: Semiconductor
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1.3. Supplier

Air Liquide USA LLC and its affiliates
9811 Katy Freeway, Suite 100
Houston, TX 77024 - USA
T 1-800-819-1704
www.us.airliquide.com

1.4. Emergency telephone number

Emergency number	: Chemtrec: 1-800-424-9300
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SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

GHS US classification

Pyrophoric Gas	H250	Catches fire spontaneously if exposed to air
Flammable gases Category 1	H220	Extremely flammable gas
Gases under pressure	H280	Contains gas under pressure; may explode if heated
Liquefied gas		
Acute toxicity (inhalation:gas) Category 4	H332	Harmful if inhaled
Full text of H statements : see section 16		

2.2. GHS Label elements, including precautionary statements

GHS US labeling

Hazard pictograms (GHS US)



Signal word (GHS US)

: Danger

Hazard statements (GHS US)

: H220 - Extremely flammable gas
H250 - Catches fire spontaneously if exposed to air
H280 - Contains gas under pressure; may explode if heated
H332 - Harmful if inhaled
CGA-HG01 - May cause frostbite
CGA-HG04 - May form explosive mixtures with air

Precautionary statements (GHS US)

: P202 - Do not handle until all safety precautions have been read and understood.
P210 - Keep away from heat, hot surfaces, open flames, sparks. - No smoking.
P222 - Do not allow contact with air.
P261 - Avoid breathing gas.
P271 - Use only outdoors or in a well-ventilated area.
P280 - Wear eye protection, face protection, protective gloves, protective clothing.
P302 - IF ON SKIN: Thaw frosted parts with lukewarm water. Do not rub affected area, Get immediate medical advice/attention.
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308+P313 - If exposed or concerned: Get medical advice/attention.
P377 - Leaking gas fire: Do not extinguish, unless leak can be stopped safely.

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P403 - Store in a well-ventilated place.
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations
P304+P340 - If inhaled: Remove person to fresh air and keep comfortable for breathing
P381 - Eliminate all ignition sources if safe to do so.
CGA-PG02 - Protect from sunlight when ambient temperature exceeds 52°C/125 °F
CGA-PG05 - Use a back flow preventive device in the piping
CGA-PG06 - Close valve after each use and when empty
CGA-PG10 - Use only with equipment rated for cylinder pressure
CGA-PG12 - Do not open valve until connected to equipment prepared for use.
CGA-PG14 - Approach suspected leak area with caution
CGA-PG17 - Use only with equipment purged with inert gas or evacuated prior to discharge from cylinder
CGA-PG18 - When returning cylinder, install leak tight valve outlet cap or plug
CGA-PG21 - Open valve slowly

2.3. Other hazards which do not result in classification

Other hazards not contributing to the classification : Spontaneously flammable in air.

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/Information on ingredients

3.1. Substances

Name	Product identifier	%	GHS US classification
Silane (Main constituent)	(CAS-No.) 7803-62-5	> 99	Pyr. Gas, H250 Flam. Gas 1, H220 Press. Gas (Liq.), H280 Acute Tox. 4 (Inhalation:gas), H332

Full text of hazard classes and H-statements : see section 16

3.2. Mixtures

Not applicable

SECTION 4: First-aid measures

4.1. Description of first aid measures

First-aid measures after inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. Apply artificial respiration with bag and mask if breathing stopped. Get immediate medical advice/attention.

First-aid measures after skin contact : Thaw frosted parts with lukewarm water. Do not rub affected area. Get immediate medical advice/attention.

First-aid measures after eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get immediate medical advice/attention.

First-aid measures after ingestion : Ingestion is not considered a potential route of exposure.

4.2. Most important symptoms and effects (acute and delayed)

Symptoms/effects after inhalation : Harmful if inhaled.

Symptoms/effects after skin contact : May cause frostbite.

Symptoms/effects after eye contact : Contact with the product may cause cold burns or frostbite.

Symptoms/effects after ingestion : Ingestion is not considered a potential route of exposure.

Symptoms/effects upon intravenous administration : Not known.

Most important symptoms and effects, both acute and delayed : In high concentrations may cause asphyxiation. Symptoms may include loss of mobility/consciousness. Victim may not be aware of asphyxiation. May cause headache, nausea and irritation of respiratory tract.

Chronic symptoms : Adverse effects not expected from this product.

4.3. Immediate medical attention and special treatment, if necessary

If you feel unwell, seek medical advice. If breathing is difficult, give oxygen.

SECTION 5: Fire-fighting measures

5.1. Suitable (and unsuitable) extinguishing media

Suitable extinguishing media : Use extinguishing media appropriate for surrounding fire.

Unsuitable extinguishing media : Do not use water jet to extinguish. Carbon dioxide.

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5.2. Specific hazards arising from the chemical

- Fire hazard : This product is flammable.
- Explosion hazard : Heat may build pressure, rupturing closed containers, spreading fire and increasing risk of burns and injuries. May form flammable/explosive vapor-air mixture. In use may form pyrophoric vapor-air mixture.
- Reactivity : Catches fire spontaneously if exposed to air.
- Hazardous combustion products : Silica dust (inert - but may irritate respiratory tract and eyes).

5.3. Special protective equipment and precautions for fire-fighters

- Firefighting instructions : In case of fire: Evacuate area. Fight fire remotely due to the risk of explosion. Use water spray or fog for cooling exposed containers. Exercise caution when fighting any chemical fire.
- Protection during firefighting : Standard protective clothing and equipment (e.g, Self Contained Breathing Apparatus) for fire fighters. Do not enter fire area without proper protective equipment, including respiratory protection.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

- General measures : Ensure adequate ventilation.

6.1.1. For non-emergency personnel

- Protective equipment : Wear protective equipment consistent with the site emergency plan.
- Emergency procedures : Evacuate personnel to a safe area. Close doors and windows of adjacent premises. Keep containers closed. Mark the danger area. Seal off low-lying areas. Keep upwind.

6.1.2. For emergency responders

- Protective equipment : Standard protective clothing and equipment (e.g, Self Contained Breathing Apparatus) for fire fighters. Equip cleanup crew with proper protection.
- Emergency procedures : Evacuate and limit access. Ventilate area. Remove ignition sources. Monitor concentration of released product. Consider the risk of potentially explosive atmospheres. Wear self-contained breathing apparatus when entering atmospheres of unknown contaminant concentration until proven to be safe.

6.2. Environmental precautions

- Try to stop release.

6.3. Methods and material for containment and cleaning up

- For containment : Try to stop release if without risk.
- Methods for cleaning up : Dispose of contents/container in accordance with local/regional/national/international regulations.
- Methods and material for containment and cleaning up : Ventilate area. Dust deposited may be vacuum cleaned or the area hosed down with water.

6.4. Reference to other sections

- See also Sections 8 and 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

- Additional hazards when processed : Pressurized container: Do not pierce or burn, even after use. Use only with equipment rated for cylinder pressure. Close valve after each use and when empty. Handle empty containers with care because residual vapors are flammable. In use, may form flammable vapor-air mixture. In use may form pyrophoric vapor-air mixture.
- Precautions for safe handling : Do not handle until all safety precautions have been read and understood. Use only outdoors or in a well-ventilated area. Keep away from heat/sparks/open flames/hot surfaces. – No smoking. Use only non-sparking tools.
- Hygiene measures : Do not eat, drink or smoke when using this product.

7.2. Conditions for safe storage, including any incompatibilities

- Technical measures : Comply with applicable regulations. Proper grounding procedures to avoid static electricity should be followed.
- Storage conditions : Do not expose to temperatures exceeding 52 °C/ 125 °F. Keep container closed when not in use. Protect cylinders from physical damage; do not drag, roll, slide or drop. Store in well ventilated area.
- Incompatible products : None known.
- Incompatible materials : Oxidizing materials. Air. Water.

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- Conditions for safe storage, including any incompatibilities : Observe all regulations and local requirements regarding storage of containers. Containers should not be stored in conditions likely to encourage corrosion. Container valve guards or caps should be in place. Containers should be stored in the vertical position and properly secured to prevent them from falling over. Stored containers should be periodically checked for general condition and leakage. Keep container below 50°C in a well ventilated place. Store containers in location free from fire risk and away from sources of heat and ignition. Keep away from combustible materials. Segregate from oxidant gases and other oxidants in store. All electrical equipment in the storage areas should be compatible with the risk of a potentially explosive atmosphere.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Silane (7803-62-5)		
ACGIH	ACGIH TWA (ppm)	5 ppm
NIOSH	NIOSH REL (TWA) (mg/m³)	7 mg/m³
NIOSH	NIOSH REL (TWA) (ppm)	5 ppm

8.2. Appropriate engineering controls

- Appropriate engineering controls : Provide adequate general and local exhaust ventilation. Systems under pressure should be regularly checked for leakages. Ensure exposure is below occupational exposure limits (where available). Oxygen detectors should be used when asphyxiating gases may be released. Consider the use of a work permit system e.g. for maintenance activities. Preferably use permanent leak-tight installations (e.g. welded pipes). Product to be handled in a closed system and under strictly controlled conditions.
- Environmental exposure controls : Refer to local regulations for restriction of emissions to the atmosphere. See section 13 for specific methods for waste gas treatment.

8.3. Individual protection measures/Personal protective equipment

Hand protection:

Wear working gloves when handling gas containers. Wear chemically resistant protective gloves. Wear leather safety gloves. 29 CFR 1910.138: Hand protection

Eye protection:

Wear safety glasses with side shields. 29 CFR 1910.133: Eye and Face Protection. Wear goggles and a face shield when transfilling or breaking transfer connections.

Skin and body protection:

Wear suitable protective clothing, e.g. lab coats, coveralls or flame resistant clothing.

Respiratory protection:

None necessary during normal and routine operations. See Sections 5 & 6.

Thermal hazard protection:

None necessary during normal and routine operations.

Other information:

Wear safety shoes while handling containers. 29 CFR 1910.136: Foot Protection.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

- Physical state : Gas
- Appearance : Clear, colorless gas.
- Color : Colourless.
- Odor : strong Extremely disagreeable.
- Odor threshold : No data available
- pH : No data available
- Melting point : -186 °C
- Freezing point : -186 °C

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Boiling point	: -111.15 °C
Critical temperature	: -2.45 °C
Critical pressure	: 4840 kPa
Flash point	: Not applicable for gases and gas mixtures.
Relative evaporation rate (butyl acetate=1)	: No data available
Flammability (solid, gas)	: See Section 2.1 and 2.2
Vapor pressure	: 6894 bar
Relative vapor density at 20 °C	: 1.1
Relative density	: 0.55
Molecular mass	: 32.11 g/mol
Relative gas density	: Heavier than air
Solubility	: Water: No data available
Log Pow	: Not applicable for inorganic products.
Auto-ignition temperature	: 20 °C
Decomposition temperature	: No data available
Viscosity, kinematic	: No data available
Viscosity, dynamic	: Not applicable.
Explosion limits	: 1.37 - 100 vol % , Pyrophoric above 4.5%
Explosive properties	: Not applicable.
Oxidizing properties	: None.

9.2. Other information

Gas group	: Press. Gas (Liq.)
Additional information	: Gas/vapor heavier than air. May accumulate in confined spaces, particularly at or below ground level

SECTION 10: Stability and reactivity

10.1. Reactivity

Catches fire spontaneously if exposed to air.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

May react violently with oxidants. Can ignite spontaneously in air (fire cannot be put out). Can form spontaneous, violently explosive mixture in air.

10.4. Conditions to avoid

Keep away from heat/sparks/open flames/hot surfaces. – No smoking.

10.5. Incompatible materials

Air, Oxidisers. For additional information on compatibility refer to ISO 11114.

10.6. Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity (oral)	: Not classified
Acute toxicity (dermal)	: Not classified
Acute toxicity (inhalation)	: Inhalation:gas: Harmful if inhaled.

Silane (7803-62-5)	
LC50 inhalation rat (ppm)	9500 ppm/4h
ATE US (gases)	9500 ppmV/4h
Skin corrosion/irritation	: Not classified
Serious eye damage/irritation	: Not classified
Respiratory or skin sensitization	: Not classified
Germ cell mutagenicity	: Not classified
Carcinogenicity	: Not classified

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Reproductive toxicity	: Not classified
Specific target organ toxicity – single exposure	: Not classified
Specific target organ toxicity – repeated exposure	: Not classified
Aspiration hazard	: Not classified
Viscosity, kinematic	: No data available
Symptoms/effects after inhalation	: Harmful if inhaled.
Symptoms/effects after skin contact	: May cause frostbite.
Symptoms/effects after eye contact	: Contact with the product may cause cold burns or frostbite.
Symptoms/effects after ingestion	: Ingestion is not considered a potential route of exposure.
Symptoms/effects upon intravenous administration	: Not known.
Most important symptoms and effects, both acute and delayed	: In high concentrations may cause asphyxiation. Symptoms may include loss of mobility/consciousness. Victim may not be aware of asphyxiation. May cause headache, nausea and irritation of respiratory tract.
Chronic symptoms	: Adverse effects not expected from this product.

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : No data available.

12.2. Persistence and degradability

Silane (7803-62-5)	
Persistence and degradability	Not applicable for inorganic products

12.3. Bioaccumulative potential

Silane (7803-62-5)	
Log Pow	Not applicable for inorganic products.
Bioaccumulative potential	No data available.

12.4. Mobility in soil

Silane (7803-62-5)	
Ecology - soil	Because of its high volatility, the product is unlikely to cause ground or water pollution.

12.5. Other adverse effects

Effect on ozone layer : None.

Effect on global warming : No known effects from this product.

SECTION 13: Disposal considerations

13.1. Disposal methods

Waste treatment methods : Do not discharge into areas where there is a risk of forming an explosive mixture with air. Waste gas should be flared through a suitable burner with flash back arrestor. Do not discharge into any place where its accumulation could be dangerous. Gases formed by combustion should be washed with water to remove silica. Ensure that the emission levels from local regulations or operating permits are not exceeded.

Product/Packaging disposal recommendations : Refer to the CGA Pamphlet P-63 "Disposal of Gases" available at www.cganet.com for more guidance on suitable disposal methods.

SECTION 14: Transport information

Department of Transportation (DOT)

In accordance with DOT

Transport document description : UN2203 Silane, 2.1

UN-No.(DOT) : UN2203

Proper Shipping Name (DOT) : Silane

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Class (DOT) : 2.1 - Class 2.1 - Flammable gas 49 CFR 173.115
Hazard labels (DOT) : 2.1 - Flammable gas



DOT Packaging Non Bulk (49 CFR 173.xxx) : 302
DOT Packaging Bulk (49 CFR 173.xxx) : None
DOT Packaging Exceptions (49 CFR 173.xxx) : None
DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27) : Forbidden
DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75) : Forbidden
DOT Vessel Stowage Location : E - The material may be stowed "on deck" or "under deck" on a cargo vessel and on a passenger vessel carrying a number of passengers limited to not more than the larger of 25 passengers, or one passenger per each 3 m of overall vessel length, but is prohibited from carriage on passenger vessels in which the limiting number of passengers is exceeded.
DOT Vessel Stowage Other : 40 - Stow "clear of living quarters", 57 - Stow "separated from" chlorine, 104 - Stow "separated from" bromine
Emergency Response Guide (ERG) Number : 116
Other information : No supplementary information available.
Special transport precautions : 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. Before transporting product containers:
- Ensure there is adequate ventilation. - Ensure that containers are firmly secured. - Ensure cylinder valve is closed and not leaking. - Ensure valve outlet cap nut or plug (where provided) is correctly fitted. - Ensure valve protection device (where provided) is correctly fitted.

Transportation of Dangerous Goods

Transport document description : UN2203 Silane, 2.1
UN-No. (TDG) : UN2203
Proper Shipping Name : Silane
TDG Primary Hazard Classes : 2.1 - Class 2.1 - Flammable Gas.
TDG Special Provisions : 38 - A person must not handle, offer for transport or transport these dangerous goods in a large means of containment if they are in direct contact with the large means of containment. SOR/2014-306
ERAP Index : 25
Explosive Limit and Limited Quantity Index : 0
Passenger Carrying Road Vehicle or Passenger Carrying Railway Vehicle Index : Forbidden
Passenger Carrying Ship Index : Forbidden

Transport by sea

Transport document description (IMDG) : UN 2203 Silane, 2
UN-No. (IMDG) : 2203
Proper Shipping Name (IMDG) : Silane
Class (IMDG) : 2 - Gases
MFAG-No : 116

Air transport

Forbidden

SECTION 15: Regulatory information

15.1. US Federal regulations

Silane (7803-62-5)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

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15.2. International regulations

CANADA

Silane (7803-62-5)

Listed on the Canadian DSL (Domestic Substances List)

EU-Regulations

Silane (7803-62-5)

Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)

National regulations

Silane (7803-62-5)

Listed on the AICS (Australian Inventory of Chemical Substances)
Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China)
Listed on the Japanese ENCS (Existing & New Chemical Substances) inventory
Listed on the Japanese ISHL (Industrial Safety and Health Law)
Listed on the Korean ECL (Existing Chemicals List)
Listed on NZIoC (New Zealand Inventory of Chemicals)
Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances)
Listed on INSQ (Mexican National Inventory of Chemical Substances)
Listed on the TCSI (Taiwan Chemical Substance Inventory)

15.3. US State regulations

Silane (7803-62-5)

State or local regulations	U.S. - Massachusetts - Right To Know List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List
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SECTION 16: Other information

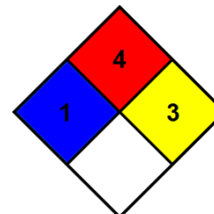
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Revision date : 12/12/2018
Other information : This Safety Data Sheet is offered pursuant to OSHA's Hazard Communication Standard, 29 CFR, 1910.1200. Other government regulations must be reviewed for applicability to this product.

Full text of H-phrases:

H220	Extremely flammable gas
H250	Catches fire spontaneously if exposed to air
H280	Contains gas under pressure; may explode if heated
H332	Harmful if inhaled

NFPA health hazard : 1 - Materials that, under emergency conditions, can cause significant irritation.
NFPA fire hazard : 4 - Materials that rapidly or completely vaporize at atmospheric pressure and normal ambient temperature or that are readily dispersed in air and burn readily.
NFPA reactivity : 3 - Materials that in themselves are capable of detonation or explosive decomposition or explosive reaction but that require a strong initiating source or must be heated under confinement before initiation.



SDS US (GHS HazCom 2012)

This Safety Data Sheet is offered pursuant to OSHA's Hazard Communication Standard, 29 CFR, 1910.1200. Other government regulations must be reviewed for applicability to this product. To the best of Air Liquide USA LLC and its affiliates' knowledge, the information contained herein is reliable and accurate as of this date; however, accuracy, suitability or completeness are not guaranteed and no warranties of any type, either express or implied, are provided. The information contained herein relates only to this specific product. If this product is combined with other materials, all component properties must be considered. Data may be changed from time to time. Be sure to consult the latest edition.