

Safety Data Sheet

**Section 1: Identification of the Substance/Mixture and of the Company/Undertaking****1.1 Product identifier**

Product Name	Trisilane
Synonyms	Silicopropane; Trisilicane; Trisilicon Octahydride; Trisilicopropane
CAS Number	7783-26-8
Product Code	60044

1.2 Relevant identified uses of the substance or mixture and uses advised against

Relevant identified use(s)	Semiconductor Uses
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1.3 Details of the supplier of the safety data sheet

Manufacturer	Air Liquide 2700 Post Oak Blvd. Houston, TX 77056 United States www.us.airliquide.com sds@airliquide.com
Telephone (Technical)	713-896-2896
Telephone (Technical)	800-819-1704

1.4 Emergency telephone number

Manufacturer	800-424-9300 - CHEMTREC
Manufacturer	+1 703-527-3887 - Outside United States

Section 2: Hazards Identification**EU/EEC**

According to Regulation (EC) No 1272/2008 (CLP)/REACH 1907/2006 [amended by 453/2010]
According to EU Directive 67/548/EEC (DSD) or 1999/45/EC (DPD)

2.1 Classification of the substance or mixture

CLP	Pyrophoric Liquids 1 - H250
DSD/DPD	Flammable R17

2.2 Label Elements

CLP

DANGER

Hazard statements | H250 - Catches fire spontaneously if exposed to air

Precautionary statements

Prevention | P210 - Keep away from heat, sparks, open flames and/or hot surfaces. - No smoking.
P222 - Do not allow contact with air.
P280 - Wear protective gloves and eye/face protection , .

Response | P370+P378 - In case of fire: Use appropriate media for extinction.
P302+P334 - IF ON SKIN: Immerse in cool water/wrap in wet bandages.

Storage/Disposal | P422 - Store contents under appropriate liquid or inert gas - .

DSD/DPD



Risk phrases | R17 - Spontaneously flammable in air.

2.3 Other Hazards

CLP | According to Regulation (EC) No. 1272/2008 (CLP) this material is considered hazardous.

DSD/DPD | This product is considered dangerous according to the European Directive 67/548/EEC.

United States (US)

According to OSHA 29 CFR 1910.1200 HCS

2.1 Classification of the substance or mixture

OSHA HCS 2012 | Pyrophoric Liquids 1 - H250

2.2 Label elements

OSHA HCS 2012

DANGER



Hazard statements | Catches fire spontaneously if exposed to air - H250

Precautionary statements

Prevention | Keep away from heat, sparks, open flames and/or hot surfaces. - No smoking. - P210
Do not allow contact with air. - P222
Wear protective gloves and eye/face protection , . - P280

Response | In case of fire: Use appropriate media for extinction. - P370+P378
IF ON SKIN: Immerse in cool water/wrap in wet bandages. - P302+P334

Storage/Disposal | Store contents under appropriate liquid or inert gas - . - P422

2.3 Other hazards

OSHA HCS 2012 | Under United States Regulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is considered hazardous.

Canada

According to WHMIS

2.1 Classification of the substance or mixture

WHMIS | Flammable Liquids - B2

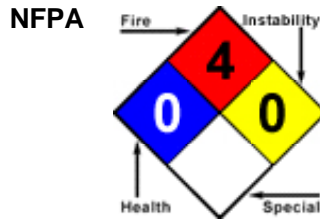
2.2 Label elements

WHMIS

| Flammable Liquids - B2

2.3 Other hazards**WHMIS**

| In Canada, the product mentioned above is considered hazardous under the Workplace Hazardous Materials Information System (WHMIS).

2.4 Other information**Section 3 - Composition/Information on Ingredients****3.1 Substances**

Composition			
Chemical Name	Identifiers	%	Classifications According to Regulation/Directive
Trisilane	CAS:7783-26-8	100%	EU DSD/DPD: Self Classified - F; R17 EU CLP: Self Classified - Pyrophoric Liq. 1, H250 OSHA HCS 2012: Pyrophoric Liq. 1

3.2 Mixtures

| Material does not meet the criteria of a mixture in accordance with Regulation (EC) No 1272/2008.

Section 4 - First Aid Measures**4.1 Description of first aid measures****Inhalation**

| Administer oxygen if breathing is difficult. Give artificial respiration if victim is not breathing. Move victim to fresh air.

Skin

| In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Remove and isolate contaminated clothing. Wash skin with soap and water.

Eye

| In case of contact with substance, immediately flush eyes with running water for at least 20 minutes.

Ingestion

| Get medical attention immediately.

4.2 Most important symptoms and effects, both acute and delayed

| Refer to Section 11 - Toxicological Information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to Physician

- | All treatments should be based on observed signs and symptoms of distress in the patient. Consideration should be given to the possibility that overexposure to materials other than this product may have occurred.

Section 5 - Firefighting Measures

5.1 Extinguishing media

- Suitable Extinguishing Media** | SMALL FIRES: Dry chemical, soda ash, lime or DRY sand.
LARGE FIRES: DRY sand, dry chemical, soda ash or lime, or withdraw from area and let fire burn.

- Unsuitable Extinguishing Media** | Do not use halocarbon-type fire extinguishing agents.

5.2 Special hazards arising from the substance or mixture

- Unusual Fire and Explosion Hazards** | Trisilane is pyrophoric and ignites spontaneously in air. Containers may explode when heated. Vapor explosion hazard indoors, outdoors or in sewers. HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames. Many liquids are lighter than water. Runoff to sewer may create fire or explosion hazard. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. This material may react with water to form corrosive silicic acid. May burn rapidly with flare-burning effect. May ignite on contact with moist air or moisture. May re-ignite after fire is extinguished. Some may decompose explosively when heated or involved in a fire. Some react vigorously or explosively on contact with water.

- Hazardous Combustion Products** | The products of thermal decomposition of this material include amorphous silicon dioxide and hydrogen.

5.3 Advice for firefighters

- | Structural firefighters' protective clothing will only provide limited protection. Wear positive pressure self-contained breathing apparatus (SCBA). Move containers from fire area if you can do it without risk.
- | LARGE FIRES: Cool containers with flooding quantities of water until well after fire is out.
- | FIRE INVOLVING TANKS: Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- | FIRE INVOLVING TANKS: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- | FIRE INVOLVING TANKS: ALWAYS stay away from tanks engulfed in fire.

Section 6 - Accidental Release Measures

6.1 Personal precautions, protective equipment and emergency procedures

- Personal Precautions** | Do not walk through spilled material. Wear appropriate personal protective equipment, avoid direct contact. Fully encapsulating, vapor protective clothing should be worn for spills and leaks with no fire.

- Emergency Procedures** | As an immediate precautionary measure, isolate spill or leak area for at least 50 meters (150 feet) in all directions. If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. LARGE SPILL: Consider initial downwind evacuation for at least 300 meters (1000 feet) ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Keep unauthorized personnel away. Stay upwind. Keep out of low areas. Ventilate closed spaces before entering.

6.2 Environmental precautions

- | Prevent entry into waterways, sewers, basements or confined areas.

6.3 Methods and material for containment and cleaning up

Containment/Clean-up Measures

- | Stop leak if you can do it without risk.
- | Absorb or cover with dry lime, soda ash, or sand and transfer to containers.
- | Use clean non-sparking tools to collect absorbed material.
- | All equipment used when handling the product must be grounded.
- | A vapor suppressing foam may be used to reduce vapors.
- | Avoid contact with water.
- | LARGE SPILLS: Dike far ahead of liquid spill for later disposal.

6.4 Reference to other sections

- | Refer to Section 8 - Exposure Controls/Personal Protection and Section 13 - Disposal Considerations.

Section 7 - Handling and Storage

7.1 Precautions for safe handling

Handling

- | Keep away from heat and ignition sources – No Smoking. Take precautionary measures against static charges. All equipment used when handling the product must be grounded. Use only non-sparking tools. Use explosion-proof - electrical, ventilating and/or lighting equipment. Use only with adequate ventilation. Wear appropriate personal protective equipment, avoid direct contact. Empty containers retain product residue and can be hazardous. Do not cut, weld, puncture or incinerate container. Wash thoroughly with soap and water after handling and before eating, drinking, or using tobacco.

7.2 Conditions for safe storage, including any incompatibilities

Storage

- | Keep container tightly closed. Store in a cool, dry, well-ventilated place. Keep away from heat, sparks, and flame.

7.3 Specific end use(s)

- | Refer to Section 1.2 - Relevant identified uses.

Section 8 - Exposure Controls/Personal Protection

8.1 Control parameters

Exposure Limits/Guidelines

- | Currently there are no applicable exposure limits established for this material.

8.2 Exposure controls

Engineering Measures/Controls

- | Good general ventilation should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Use explosion-proof - electrical, ventilating and/or lighting equipment.

Personal Protective Equipment

Respiratory

- | Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or symptoms are experienced.

Eye/Face

- | Wear safety glasses.

Skin/Body

- | Wear leather gloves when handling cylinders.

Environmental Exposure Controls

- | Follow best practice for site management and disposal of waste. Controls should be engineered to prevent release to the environment, including procedures to prevent spills, atmospheric release and release to waterways.

Section 9 - Physical and Chemical Properties

9.1 Information on Physical and Chemical Properties

Material Description			
Physical Form	Liquid	Appearance/Description	Colorless liquid with a repulsive odor.
Color	Colorless	Odor	Repulsive
Odor Threshold	Data lacking		
General Properties			
Boiling Point	52.9 C(127.22 F)	Melting Point	-117.4 C(-179.32 F)
Decomposition Temperature	Data lacking	pH	Data lacking
Specific Gravity/Relative Density	0.743 Water=1 @ 0 C(32 F)	Water Solubility	Decomposes
Viscosity	Data lacking	Explosive Properties	Data lacking
Oxidizing Properties:	Data lacking		
Volatility			
Vapor Pressure	Data lacking	Vapor Density	Data lacking
Evaporation Rate	Data lacking		
Flammability			
Flash Point	Trisilane is pyrophoric and ignites spontaneously in air.	UEL	Data lacking
LEL	Data lacking	Flame Duration	< 20 Celsius
Autoignition	Data lacking	Flammability (solid, gas)	Data lacking
Environmental			
Octanol/Water Partition coefficient	Data lacking		

9.2 Other Information

- No additional physical and chemical parameters noted.

Section 10: Stability and Reactivity

10.1 Reactivity

- Trisilane may ignite spontaneously in air and reacts violently or explosively with many substances.

10.2 Chemical stability

- Stable under normal temperatures and pressures.

10.3 Possibility of hazardous reactions

- Hazardous polymerization will not occur.

10.4 Conditions to avoid

- Excess heat, sparks, open flame. Exposure to air.

10.5 Incompatible materials

- Trisilane reacts violently with oxidizers and halogens. Trisilane explodes on contact with bromine, carbon tetrachloride, oxygen, and sulfur hexafluoride. Trisilane reacts violently or explosively upon contact with chloroform, chlorine, and fluorine. Contact of Trisilane with potassium hydroxide and other alkali materials will liberate flammable hydrogen gas.

10.6 Hazardous decomposition products

- Thermal decomposition products include oxides of silicon.

Section 11 - Toxicological Information

11.1 Information on toxicological effects

GHS Properties	Classification
Acute toxicity	EU/CLP • Classification criteria not met OSHA HCS 2012 • Classification criteria not met
Aspiration Hazard	EU/CLP • Classification criteria not met OSHA HCS 2012 • Classification criteria not met
Carcinogenicity	EU/CLP • Classification criteria not met OSHA HCS 2012 • Classification criteria not met
Germ Cell Mutagenicity	EU/CLP • Classification criteria not met OSHA HCS 2012 • Classification criteria not met
Skin corrosion/Irritation	EU/CLP • Classification criteria not met OSHA HCS 2012 • Classification criteria not met
Skin sensitization	EU/CLP • Classification criteria not met OSHA HCS 2012 • Classification criteria not met
STOT-RE	EU/CLP • Classification criteria not met OSHA HCS 2012 • Classification criteria not met
STOT-SE	EU/CLP • Classification criteria not met OSHA HCS 2012 • Classification criteria not met
Toxicity for Reproduction	EU/CLP • Classification criteria not met OSHA HCS 2012 • Classification criteria not met
Respiratory sensitization	EU/CLP • Classification criteria not met OSHA HCS 2012 • Classification criteria not met
Serious eye damage/Irritation	EU/CLP • Classification criteria not met OSHA HCS 2012 • Classification criteria not met

Potential Health Effects

Inhalation

- Acute (Immediate) | Under normal conditions of use, no health effects are expected.
- Chronic (Delayed) | No data available

Skin

- Acute (Immediate) | Under normal conditions of use, no health effects are expected.
- Chronic (Delayed) | No data available

Eye

- Acute (Immediate) | Under normal conditions of use, no health effects are expected.
- Chronic (Delayed) | No data available

Ingestion

- Acute (Immediate) | Under normal conditions of use, no health effects are expected.
- Chronic (Delayed) | No data available

Section 12 - Ecological Information

12.1 Toxicity

- | Material data lacking.

12.2 Persistence and degradability

| Material data lacking.

12.3 Bioaccumulative potential

| Material data lacking.

12.4 Mobility in Soil

| Material data lacking.

12.5 Results of PBT and vPvB assessment

| No PBT and vPvB assessment has been conducted.

12.6 Other adverse effects

| No studies have been found.

Section 13 - Disposal Considerations**13.1 Waste treatment methods****Product waste**

| Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

Packaging waste

| Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

Section 14 - Transport Information

	14.1 UN number	14.2 UN proper shipping name	14.3 Transport hazard class(es)	14.4 Packing group	14.5 Environmental hazards
DOT	UN3194	Pyrophoric liquid, inorganic, n.o.s. (Trisilane)	4.2	I	NDA
TDG	UN3194	PYROPHORIC LIQUID, INORGANIC, N.O.S.(Trisilane)	4.2	I	Potential Marine Pollutant
IMO/IMDG	UN3194	PYROPHORIC LIQUID, INORGANIC, N.O.S. (Trisilane)	4.2	I	NDA
IATA/ICAO	NDA	Forbidden	NDA	NDA	NDA

14.6 Special precautions for user

| None known.

14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

| Not relevant.

14.8 Other information

| This material is "Forbidden" to be transported via Commercial or Passenger Aircraft.
IATA/ICAO | Forbidden for Passenger aircraft/rail transport and Cargo aircraft.

Section 15 - Regulatory Information**15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**

SARA Hazard Classifications | Fire

State Right To Know				
Component	CAS	MA	NJ	PA
Trisilane	7783-26-8	No	No	No

Inventory						
Component	CAS	Canada DSL	Canada NDSL	China	EU EINECS	EU ELNICS
Trisilane	7783-26-8	No	No	No	No	No

Inventory (Con't.)		
Component	CAS	TSCA
Trisilane	7783-26-8	No

Canada

Labor

Canada - WHMIS - Classifications of Substances

• Trisilane 7783-26-8 Not Listed

Canada - WHMIS - Ingredient Disclosure List

• Trisilane 7783-26-8 Not Listed

Environment

Canada - CEPA - Priority Substances List

• Trisilane 7783-26-8 Not Listed

China

Environment

China - Ozone Depleting Substances - First Schedule

• Trisilane 7783-26-8 Not Listed

China - Ozone Depleting Substances - Second Schedule

• Trisilane 7783-26-8 Not Listed

China - Ozone Depleting Substances - Third Schedule

• Trisilane 7783-26-8 Not Listed

Other

China - Annex I & II - Controlled Chemicals Lists

• Trisilane 7783-26-8 Not Listed

China - Dangerous Goods List

• Trisilane 7783-26-8 Not Listed

China - Export Control List - Part I Chemicals

• Trisilane 7783-26-8 Not Listed

Europe

Other

EU - CLP (1272/2008) - Annex VI - Table 3.2 - Classification

• Trisilane 7783-26-8 Not Listed

EU - CLP (1272/2008) - Annex VI - Table 3.2 - Concentration Limits

• Trisilane 7783-26-8 Not Listed

EU - CLP (1272/2008) - Annex VI - Table 3.2 - Labelling

• Trisilane	7783-26-8	Not Listed
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EU - CLP (1272/2008) - Annex VI - Table 3.2 - Notes - Substances and Preparations

• Trisilane	7783-26-8	Not Listed
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EU - CLP (1272/2008) - Annex VI - Table 3.2 - Safety Phrases

• Trisilane	7783-26-8	Not Listed
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Germany**Environment****Germany - TA Luft - Types and Classes**

• Trisilane	7783-26-8	Not Listed
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Germany - Water Classification (VwVwS) - Annex 1

• Trisilane	7783-26-8	Not Listed
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Germany - Water Classification (VwVwS) - Annex 2 - Water Hazard Classes

• Trisilane	7783-26-8	Not Listed
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Germany - Water Classification (VwVwS) - Annex 3

• Trisilane	7783-26-8	Not Listed
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Other**Germany - Specifically Regulated Chemicals in TRGS**

• Trisilane	7783-26-8	Not Listed
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Portugal**Other****Portugal - Prohibited Substances**

• Trisilane	7783-26-8	Not Listed
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United Kingdom**Environment****United Kingdom - Pollution Inventory - Schedule 1 - Thresholds for Releases to Air**

• Trisilane	7783-26-8	Not Listed
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Other**United Kingdom - Workplace Exposure Limits (WELs) - Substances in Review**

• Trisilane	7783-26-8	Not Listed
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United Kingdom - List of Dangerous Substances in Water

• Trisilane	7783-26-8	Not Listed
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United States**Labor****U.S. - OSHA - Process Safety Management - Highly Hazardous Chemicals**

• Trisilane	7783-26-8	Not Listed
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U.S. - OSHA - Specifically Regulated Chemicals

• Trisilane	7783-26-8	Not Listed
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Environment**U.S. - CAA (Clean Air Act) - 1990 Hazardous Air Pollutants**

• Trisilane	7783-26-8	Not Listed
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U.S. - CERCLA/SARA - Hazardous Substances and their Reportable Quantities

• Trisilane	7783-26-8	Not Listed
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U.S. - CERCLA/SARA - Radionuclides and Their Reportable Quantities

• Trisilane	7783-26-8	Not Listed
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U.S. - CERCLA/SARA - Section 302 Extremely Hazardous Substances EPCRA RQs

• Trisilane	7783-26-8	Not Listed
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U.S. - CERCLA/SARA - Section 302 Extremely Hazardous Substances TPQs

• Trisilane	7783-26-8	Not Listed
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U.S. - CERCLA/SARA - Section 313 - Emission Reporting

• Trisilane	7783-26-8	Not Listed
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U.S. - CERCLA/SARA - Section 313 - PBT Chemical Listing

• Trisilane	7783-26-8	Not Listed
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United States - California**Environment****U.S. - California - Proposition 65 - Carcinogens List**

• Trisilane	7783-26-8	Not Listed
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U.S. - California - Proposition 65 - Developmental Toxicity

• Trisilane	7783-26-8	Not Listed
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U.S. - California - Proposition 65 - Maximum Allowable Dose Levels (MADL)

• Trisilane	7783-26-8	Not Listed
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U.S. - California - Proposition 65 - No Significant Risk Levels (NSRL)

• Trisilane	7783-26-8	Not Listed
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U.S. - California - Proposition 65 - Reproductive Toxicity - Female

• Trisilane	7783-26-8	Not Listed
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U.S. - California - Proposition 65 - Reproductive Toxicity - Male

• Trisilane	7783-26-8	Not Listed
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United States - Pennsylvania**Labor****U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List**

• Trisilane	7783-26-8	Not Listed
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U.S. - Pennsylvania - RTK (Right to Know) - Special Hazardous Substances

• Trisilane	7783-26-8	Not Listed
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15.2 Chemical Safety Assessment

1 No Chemical Safety Assessment has been carried out.

Section 16 - Other Information**Last Revision Date** | 23/December/2014**Preparation Date** | 23/December/2014**Disclaimer/Statement of Liability** | To the best of Air Liquide's 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 gas mixture 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.**Key to abbreviations**NDA = No Data Available
