

## Praxair Material Safety Data Sheet

### 1. Chemical Product and Company Identification

<b>Product Name:</b> Liquefied gas, flammable, n.o.s. (trimethylsilane) (MSDS No. P-6301-A)	<b>Trade Names:</b> Trimethylsilane
<b>Chemical Name:</b> Trimethylsilane	<b>Synonyms:</b> Trimethyl silane, trimethylsilylhydride
<b>Chemical Family:</b> Organosilane	<b>Product Grades:</b> None assigned.
<b>Telephone:</b>	<b>Company Name:</b> Praxair, Inc.
<b>Emergencies:</b> 1-800-645-4633*	39 Old Ridgebury Road
<b>CHEMTREC:</b> 1-800-424-9300*	Danbury, CT 06810-5113
<b>Routine:</b> 1-800-PRAXAIR	

\*Call emergency numbers 24 hours a day only for spills, leaks, fire, exposure, or accidents involving this product. For routine information, contact your supplier, Praxair sales representative, or call 1-800-PRAXAIR (1-800-772-9247).

### 2. Hazards Identification

#### EMERGENCY OVERVIEW

**DANGER! Flammable liquid and gas under pressure.**

**May form explosive mixtures with air.**

**Liquid may cause frostbite.**

**May cause eye, skin, and respiratory tract irritation.**

**Reacts with halogens and oxidizers; may react with water.**

**May cause dizziness and drowsiness.**

**Self-contained breathing apparatus and protective clothing must be worn by rescue workers.**

**Under ambient conditions, this colorless gas has a slightly repulsive odor.**

**OSHA REGULATORY STATUS:** This material is considered hazardous by the OSHA Hazard Communications Standard (29 CFR 1910.1200).

#### POTENTIAL HEALTH EFFECTS:

##### Effects of a Single (Acute) Overexposure

**Inhalation.** Effects unknown. Expected to be similar to those of silane—headache, nausea, and irritation of the respiratory tract.

**Skin Contact.** May cause irritation. Contact with the liquid may cause frostbite.

**Swallowing.** An unlikely route of exposure. This product is a gas at normal temperature and pressure.

**Eye Contact.** May cause irritation. Contact with liquid may cause frostbite.

**Effects of Repeated (Chronic) Overexposure.** No information available.

**Other Effects of Overexposure.** None known.

Product: Liquefied gas, flammable, P-6301-A  
n.o.s. (Trimethylsilane)

Date: May 2009

**Medical Conditions Aggravated by Overexposure.** Irritating effects may aggravate existing conditions of the eyes, skin and respiratory tract.

**CARCINOGENICITY:** Trimethylsilane is not listed by NTP, OSHA, or IARC.

**POTENTIAL ENVIRONMENTAL EFFECTS:** None known. For further information, see section 12, Ecological Information.

### 3. Composition/Information on Ingredients

See section 16 for important information about mixtures.

COMPONENT	CAS NUMBER	CONCENTRATION
Trimethylsilane	993-07-7	>99%*

\*The symbol > means "greater than."

### 4. First Aid Measures

**INHALATION:** Immediately remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, qualified personnel may give oxygen. In all cases where trimethylsilane is inhaled, seek immediate medical attention.

**SKIN CONTACT:** Flush affected areas with plenty of water while removing contaminated clothing and shoes. Continue for at least 15 minutes. Use lukewarm water if frostbite is indicated. Flush thermal burns with cool water and apply sterile dressings. In case of frostbite or thermal burns, seek immediate medical attention.

**SWALLOWING:** An unlikely route of exposure. This product is a gas at normal temperature and pressure.

**EYE CONTACT:** Flush eyes with plenty of lukewarm water for at least 30 minutes. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. Seek immediate medical attention. See a physician, preferably an ophthalmologist.

**NOTES TO PHYSICIAN:** *Trimethylsilane reacts with air to produce silicon oxide (silica) dust. Skin and eye burns should be irrigated as necessary to remove the silicon oxide to the extent deemed necessary. Thereafter, treatment of burns should proceed as usual. Treatment of overexposure should be directed at the control of symptoms and the clinical condition of the patient.*

### 5. Fire Fighting Measures

**FLAMMABLE PROPERTIES:** Flammable.

**SUITABLE EXTINGUISHING MEDIA:** CO<sub>2</sub>, foam, or dry chemical

**PRODUCTS OF COMBUSTION:** Silicon dioxide (silica dust). Flammable hydrogen is a product of thermal decomposition; reaction with water may produce flammable methane. See section 10.

**PROTECTION OF FIREFIGHTERS: DANGER! Flammable liquid and gas under pressure.** Evacuate all personnel from danger area. Do not use halon fire extinguisher. Do not approach area without self-contained breathing apparatus and protective clothing. Immediately spray cylinders with water from maximum distance until cool. Avoid direct contact of water with trimethylsilane.

Product: Liquefied gas, flammable, P-6301-A  
n.o.s. (Trimethylsilane)

Date: May 2009

Reverse flow into cylinder may cause rupture. Stop flow of gas if without risk, while continuing cooling water spray. If flow of gas cannot be shut off, allow fire to burn out. Reduce combustion products with water spray or fog. Remove all cylinders from area if without risk. If fire is extinguished while gas is present, explosive reignition may occur. On-site fire brigades must comply with OSHA 29 CFR 1910.156.

**Specific Physical and Chemical Hazards.** Highly flammable gas. May form explosive mixtures with air. Heat of fire can build pressure in cylinder and cause it to rupture. No part of a cylinder should be subjected to a temperature higher than 125°F (52°C). Trimethylsilane cylinders are equipped with a pressure relief device. (Exceptions may exist where authorized by DOT.) Vapors may spread. Flammable vapors can be ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharge, or other ignition sources at locations distant from product handling point.

**Protective Equipment and Precautions for Firefighters.** Firefighters should wear self-contained breathing apparatus and full fire-fighting turnout gear.

## 6. Accidental Release Measures

### STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:

**DANGER! Flammable liquid and gas under pressure.**

**Personal Precautions.** Forms explosive mixtures with air. Immediately evacuate all personnel from danger area. Do not approach area without self-contained breathing apparatus and protective clothing. Reduce combustion products with fog or fine water spray. Avoid direct contact of water with trimethylsilane; water reaction may produce flammable methane gas. Reverse flow into cylinder may cause rupture. Shut off flow if without risk. Ventilate area or move cylinder to a well-ventilated area.

**Environmental Precautions.** Prevent waste from contaminating the surrounding environment. Keep personnel away. Discard any product, residue, disposable container, or liner in an environmentally acceptable manner, in full compliance with federal, state, and local regulations. If necessary, call your local supplier for assistance.

## 7. Handling and Storage

**PRECAUTIONS TO BE TAKEN IN HANDLING:** Use only spark-proof tools and explosion-proof equipment. Keep away from heat, sparks, and open flame. Protect cylinders from damage. Use a suitable hand truck to move cylinders; do not drag, roll, slide, or drop. All piped trimethylsilane systems and associated equipment must be grounded. Electrical equipment must be non-sparking or explosion-proof. Never attempt to lift a cylinder by its cap; the cap is intended solely to protect the valve. Never insert an object (e.g., wrench, screwdriver, pry bar) into cap openings; doing so may damage the valve and cause a leak. Use an adjustable strap wrench to remove over-tight or rusted caps. Open valve slowly. If valve is hard to open, discontinue use and contact your supplier. For other precautions in using trimethylsilane, see section 16.

**PRECAUTIONS TO BE TAKEN IN STORAGE:** Store and use with adequate ventilation. Separate cylinders containing this product from oxygen, chlorine, and other oxidizers by at least 20 ft (6.1 m) or use a barricade of noncombustible material. This barricade should be at least 5 ft (1.53 m) high and have a fire resistance rating of at least ½ hour. Firmly secure cylinders upright to keep them from falling or being knocked over. Screw valve protection cap firmly in place by hand. Post "No Smoking or Open Flames" signs in storage and use areas. There

Product: Liquefied gas, flammable, P-6301-A  
n.o.s. (Trimethylsilane)

Date: May 2009

must be no sources of ignition. All electrical equipment in storage areas must be explosion-proof. Storage areas must meet national electric codes for Class 1 hazardous areas. Store only where temperature will not exceed 125°F (52°C). Store full and empty cylinders separately. Use a first-in, first-out inventory system to prevent storing full cylinders for long periods.

**RECOMMENDED PUBLICATIONS:** For further information on storage, handling, and use, see Praxair publication P-14-153, *Guidelines for Handling Gas Cylinders and Containers*. Obtain from your local supplier.

## 8. Exposure Controls/Personal Protection

COMPONENT	OSHA PEL	ACGIH TLV-TWA (2008)
Trimethylsilane	Not Established.	Not Established.*

\*Praxair recommends use of the 5 ppm TLV for silane (silicon tetrahydride), CAS 7803-62-5 (ACGIH, 2008).

IDLH = Not available.

### ENGINEERING CONTROLS:

**Local Exhaust.** Use an explosion-proof local exhaust system with sufficient airflow velocity to prevent oxygen deficiency and keep hazardous fumes and gases below applicable exposure limits in the worker's breathing zone.

**Mechanical (General).** Not recommended as a primary ventilation system to control worker's exposure.

**Special.** Use only in a closed system.

**Other.** See SPECIAL.

### PERSONAL PROTECTIVE EQUIPMENT:

**Skin Protection.** Wear work gloves when handling cylinders. Metatarsal shoes for cylinder handling. Select in accordance with OSHA 29 CFR 1910.132 and 1910.133. Fire-resistant clothing, ear protection, and face shields are recommended when connecting or disconnecting transfer lines. Select in accordance with OSHA 29 CFR 1910.132 and 1910.133. Regardless of protective equipment, never touch live electrical parts.

**Eye/Face Protection.** Wear safety glasses when handling cylinders. Select eye protection in accordance with OSHA 29 CFR 1910.133.

**Respiratory Protection.** A respiratory protection program that meet OSHA 29 CFR 1910.134, ANSI Z88.2, or MSHA 30 CFR 72.710 (where applicable) requirements must be followed whenever workplace conditions warrant respirator use. Use an air-supplied or air-purifying cartridge if the action level is exceeded. Ensure the respirator has the appropriate protection factor for the exposure level. If cartridge type respirators are used, the cartridge must be appropriate for the chemical exposure (e.g., an organic vapor cartridge). For emergencies or instances with unknown exposure levels, use a self-contained breathing apparatus.

## 9. Physical and Chemical Properties

APPEARANCE:	Colorless liquid and gas
ODOR:	Slight, repulsive
ODOR THRESHOLD:	Not available.

Product: Liquefied gas, flammable,  
n.o.s. (Trimethylsilane)

P-6301-A

Date: May 2009

<b>PHYSICAL STATE:</b>	Liquid and gas at normal temperature and pressure
<b>pH:</b>	Not applicable.
<b>FREEZING POINT</b> at 1 atm:	-212.6°F (-135.9°C)
<b>BOILING POINT</b> at 1 atm:	44°F (6.7°C)
<b>FLASH POINT</b> (test method):	-4°F (-20°C)
<b>EVAPORATION RATE</b> (Butyl Acetate = 1):	High
<b>FLAMMABILITY:</b>	Flammable
<b>FLAMMABLE LIMITS IN AIR</b> , % by volume:	<b>LOWER:</b> 2.0% <b>UPPER:</b> 44%
<b>VAPOR PRESSURE</b> at 68°F (20°C):	23.7 psi (163 kPa abs)
<b>VAPOR DENSITY</b> at 70°F (21.1°C) and 1 atm:	0.1918 lb/ft <sup>3</sup> (3.073 kg/m <sup>3</sup> )
<b>SPECIFIC GRAVITY</b> (H <sub>2</sub> O = 1)@ 44°F (6.7°C):	0.638
<b>SPECIFIC GRAVITY</b> (Air = 1):	2.6
<b>SOLUBILITY IN WATER</b> 68°F (20°C):	Not available.
<b>PARTITION COEFFICIENT: n-octanol/water:</b>	Not available.
<b>AUTOIGNITION TEMPERATURE:</b>	608°F (320°C)
<b>DECOMPOSITION TEMPERATURE:</b>	Not available.
<b>PERCENT VOLATILES BY VOLUME:</b>	100
<b>MOLECULAR WEIGHT:</b>	74.2
<b>MOLECULAR FORMULA:</b>	C <sub>3</sub> H <sub>10</sub> Si

## 10. Stability and Reactivity

**CHEMICAL STABILITY:**  Unstable     Stable

**CONDITIONS TO AVOID:** Per input or existing MSDS.

**INCOMPATIBLE MATERIALS:** Halogens, oxidizers, acids, alkalis. Liberates flammable hydrogen gas on contact with acids, alcohols, alkalis, and metals or metallic compounds.

**HAZARDOUS DECOMPOSITION PRODUCTS:** Hydrogen, methane, silicon oxide.  
Decomposition at temperatures above 932°F (500°C) may release silicon carbonate and hydrogen.

**POSSIBILITY OF HAZARDOUS REACTIONS:**  May Occur     Will Not Occur

Decomposition at temperatures above 932°F (500°C) may release silicon carbonate and hydrogen.

## 11. Toxicological Information

**ACUTE DOSE EFFECTS:** LC<sub>50</sub>, 1 hr, rat = 9,600 ppm

**STUDY RESULTS:** None known.

## 12. Ecological Information

**ECOTOXICITY:** No known effects.

**OTHER ADVERSE EFFECTS:** This product does not contain any Class I or Class II ozone-depleting chemicals.

Product: Liquefied gas, flammable, P-6301-A  
n.o.s. (Trimethylsilane)

Date: May 2009

### 13. Disposal Considerations

**WASTE DISPOSAL METHOD:** Do not attempt to dispose of residual or unused quantities.  
Return cylinder to supplier.

### 14. Transport Information

**DOT/IMO SHIPPING NAME:** Liquefied gas, flammable, n.o.s. (trimethylsilane)

HAZARD CLASS:	PACKING GROUP/Zone:	IDENTIFICATION NUMBER:	PRODUCT RQ:
2.1	NA/NA*	UN3161	None

**SHIPPING LABEL(s):** FLAMMABLE GAS

**PLACARD (when required):** FLAMMABLE GAS

\*NA=Not applicable.

**SPECIAL SHIPPING INFORMATION:** Cylinders should be transported in a secure position, in a well-ventilated vehicle. Cylinders transported in an enclosed, nonventilated compartment of a vehicle can present serious safety hazards.

Shipment of compressed gas cylinders that have been filled without the owner's consent is a violation of federal law [49 CFR 173.301(b)].

**MARINE POLLUTANTS:** This product is not listed as a marine pollutant by DOT.

### 15. Regulatory Information

The following selected regulatory requirements may apply to this product. Not all such requirements are identified. Users of this product are solely responsible for compliance with all applicable federal, state, and local regulations.

#### U.S. FEDERAL REGULATIONS:

EPA (ENVIRONMENTAL PROTECTION AGENCY)

CERCLA: COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980 (40 CFR Parts 117 and 302):

**Reportable Quantity (RQ):** None

SARA: SUPERFUND AMENDMENT AND REAUTHORIZATION ACT:

**SECTIONS 302/304:** Require emergency planning based on Threshold Planning Quantity (TPQ) and release reporting based on Reportable Quantities (RQ) of Extremely Hazardous Substances (EHS) (40 CFR Part 355):

**TPQ:** None

**EHS RQ (40 CFR 355):** None

**SECTIONS 311/312:** Require submission of MSDSs and reporting of chemical inventories with identification of EPA hazard categories. The hazard categories for this product are as follows:

**IMMEDIATE:** Yes

**DELAYED:** No

**PRESSURE:** Yes

**REACTIVITY:** Yes

**FIRE:** Yes

**SECTION 313:** Requires submission of annual reports of release of toxic chemicals that appear in 40 CFR Part 372.

Trimethylsilane is not subject to reporting under Section 313.

Product: Liquefied gas, flammable, P-6301-A  
n.o.s. (Trimethylsilane)

Date: May 2009

**40 CFR 68: RISK MANAGEMENT PROGRAM FOR CHEMICAL ACCIDENTAL RELEASE PREVENTION:** Requires development and implementation of risk management programs at facilities that manufacture, use, store, or otherwise handle regulated substances in quantities that exceed specified thresholds.

Trimethylsilane is not listed as a regulated substance.

**TSCA: TOXIC SUBSTANCES CONTROL ACT:** Trimethylsilane is listed on the TSCA inventory.

**OSHA: OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION:**

**29 CFR 1910.119: PROCESS SAFETY MANAGEMENT OF HIGHLY HAZARDOUS CHEMICALS:** Requires facilities to develop a process safety management program based on Threshold Quantities (TQ) of highly hazardous chemicals.

Trimethylsilane is not listed in Appendix A as a highly hazardous chemical. However, any process that involves a flammable gas on site in one location in quantities of 10,000 lb (4536 kg) or greater is covered under this regulation unless the gas is used as a fuel.

#### STATE REGULATIONS:

**CALIFORNIA:** Trimethylsilane is not listed by California under the SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986 (Proposition 65).

**PENNSYLVANIA:** Trimethylsilane is subject to the PENNSYLVANIA WORKER AND COMMUNITY RIGHT-TO-KNOW ACT (35 P.S. Sections 7301-7320).

## 16. Other Information

Be sure to read and understand all labels and instructions supplied with all containers of this product.

**OTHER HAZARDOUS CONDITIONS OF HANDLING, STORAGE, AND USE:** *Flammable liquid and gas under pressure.* Use piping and equipment adequately designed to withstand pressures to be encountered. Use only in a closed system thoroughly purged with an inert gas prior to introduction of trimethylsilane from cylinder. Close cylinder valve after each use; keep closed even when empty. **Material may accumulate behind valve outlet cap or plug.** Don appropriate protective equipment, and face the outlet away from you before removing the cap or plug. **Prevent reverse flow.** Reverse flow into cylinder may cause rupture. Use a check valve or other protective device in any line or piping from the cylinder. **Store and use with adequate ventilation.** Isolate from all other products. **Follow safe practices when returning cylinder to supplier.** Be sure valve is closed; then tightly install valve outlet cap or plug. **Never work on a pressurized system.** If there is a leak, close the cylinder valve. Blow the system down in an environmentally safe manner in compliance with all federal, state, and local laws; then repair the leak. **Never place a compressed gas cylinder where it may become part of an electrical circuit.**

**NOTE:** Prior to using any plastics, confirm their compatibility with trimethylsilane.

**Recommended Equipment:** In semiconductor process gas and other suitable applications, Praxair recommends the use of engineering controls such as gas cabinet enclosures, automatic gas panels (used to purge systems on cylinder changeout), excess-flow valves throughout the gas distribution system, double containment for the distribution system, and continuous gas monitors.

**MIXTURES:** When you mix two or more gases or liquefied gases, you can create additional, unexpected hazards. Obtain and evaluate the safety information for each component before

Product: Liquefied gas, flammable, P-6301-A  
n.o.s. (Trimethylsilane)

Date: May 2009

you produce the mixture. Consult an industrial hygienist or other trained person when you evaluate the end product. Remember, gases and liquids have properties that can cause serious injury or death.

#### HAZARD RATING SYSTEMS:

##### NFPA RATINGS:

HEALTH = 2  
FLAMMABILITY = 4  
INSTABILITY = 1  
SPECIAL = None

##### HMIS RATINGS:

HEALTH = 1  
FLAMMABILITY = 4  
PHYSICAL HAZARD = 1

#### STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA:

**THREADED:** CGA-350  
**PIN-INDEXED YOKE:** Not applicable.  
**ULTRA-HIGH-INTEGRITY CONNECTION:** CGA-632

Use the proper CGA connections. **DO NOT USE ADAPTERS.** Additional limited-standard connections may apply. See CGA pamphlet V-1 listed below.

Ask your supplier about free Praxair safety literature as referred to in this MSDS and on the label for this product. Further information can be found in the following materials published by the Compressed Gas Association, Inc. (CGA), 4221 Walney Road, 5<sup>th</sup> Floor, Chantilly, VA 20151-2923, Telephone (703) 788-2700, <http://www.cganet.com/Publication.asp>.

AV-1 *Safe Handling and Storage of Compressed Gases*  
P-1 *Safe Handling of Compressed Gases in Containers*  
SB-2 *Oxygen-Deficient Atmospheres*  
V-1 *Compressed Gas Cylinder Valve Inlet and Outlet Connections*  
— *Handbook of Compressed Gases, Fourth Edition*



Product: Liquefied gas, flammable, P-6301-A  
n.o.s. (Trimethylsilane)

Date: May 2009

Praxair asks users of this product to study this MSDS and become aware of product hazards and safety information. To promote safe use of this product, a user should (1) notify employees, agents, and contractors of the information in this MSDS and of any other known product hazards and safety information, (2) furnish this information to each purchaser of the product, and (3) ask each purchaser to notify its employees and customers of the product hazards and safety information.

---

The opinions expressed herein are those of qualified experts within Praxair, Inc. We believe that the information contained herein is current as of the date of this Material Safety Data Sheet. Since the use of this information and the conditions of use of the product are not within the control of Praxair, Inc., it is the user's obligation to determine the conditions of safe use of the product.

---

Praxair MSDSs are furnished on sale or delivery by Praxair or the independent distributors and suppliers who package and sell our products. To obtain current MSDSs for these products, contact your Praxair sales representative or local distributor or supplier, or download from [www.praxair.com](http://www.praxair.com). If you have questions regarding Praxair MSDSs, would like the form number and date of the latest MSDS, or would like the names of the Praxair suppliers in your area, phone or write the Praxair Call Center (**Phone:** 1-800-PRAXAIR; **Address:** Praxair Call Center, Praxair, Inc., PO Box 44, Tonawanda, NY 14151-0044).

*Praxair* and the *Flowing Airstream* design are trademarks or registered trademarks of Praxair Technology, Inc. in the United States and/or other countries.



Praxair, Inc.  
39 Old Ridgebury Road  
Danbury, CT 06810-5113