



# 0.54 - 13.9% TRIMETHYLBORON In HYDROGEN or NITROGEN

## Material Safety Data Sheet

### 1. PRODUCT AND COMPANY IDENTIFICATION

Product Name	0.54 - 13.9% TRIMETHYLBORON In HYDROGEN or NITROGEN
UN-Number	UN1954
Recommended Use	Electronics.
Supplier Address*	<p>Linde Gas North America LLC - Linde Merchant Production Inc. - Linde LLC            575 Mountain Ave.            Murray Hill, NJ 07974            Phone: 908-464-8100            www.lindeus.com</p> <p>Linde Gas Puerto Rico, Inc.            Las Palmas Village            Road No. 869, Street No. 7            Catano, Puerto Rico 00962            Phone: 787-641-7445            www.pr.lindegas.com</p> <p>Linde Canada Limited            5860 Chedworth Way            Mississauga, Ontario L5R 0A2            Phone: 905-501-1700            www.lindecana.com</p>
	* May include subsidiaries or affiliate companies/divisions.
	For additional product information contact your local customer service.
Chemical Emergency Phone Number	Chemtrec: 1-800-424-9300 for US/ 703-527-3887 outside US

### 2. HAZARDS IDENTIFICATION

<b>DANGER!</b>		
<b>Emergency Overview</b>		
Flammable gas Pyrophoric gas-Dangerous fire and explosion hazard. Harmful if inhaled Irritating to eyes, respiratory system and skin Contents under pressure Keep at temperatures below 52°C / 125°F		
Appearance Colorless.	Physical State Compressed gas.	Odor Repulsive, Suffocating

OSHA Regulatory Status This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

### Potential Health Effects

Principle Routes of Exposure	Inhalation. Eye contact. Skin contact.
Acute Toxicity	
Inhalation	Harmful if inhaled. Irritating to respiratory system. Suspected to cause headache and nausea.
Eyes	Irritating to eyes. Ignited gas can cause thermal burns.
Skin	Irritating to skin. Ignited gas can cause thermal burns.
Skin Absorption Hazard	No known hazard by skin absorption.
Ingestion	Not an expected route of exposure.
Chronic Effects	None known.
Aggravated Medical Conditions	Respiratory disorders.
Environmental Hazard	See Section 12 for additional Ecological Information.

### 3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS-No	Volume %	Chemical Formula
Hydrogen	1333-74-0	86.1 - 99.46	H <sub>2</sub>
Nitrogen	7727-37-9	86.1 - 99.46	N <sub>2</sub>
Trimethylborane	593-90-8	0.54 - 13.9	B(CH <sub>3</sub> ) <sub>3</sub>

Additional information: Composition listed covers broad ranges rather than exact percentages for specific products.

### 4. FIRST AID MEASURES

Eye Contact	Rinse thoroughly with plenty of water, also under the eyelids. Call a physician immediately.
Skin Contact	Wash off immediately with plenty of water for at least 15 minutes. Call a physician immediately.
Inhalation	PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF INHALATION OVEREXPOSURE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS. Conscious inhalation victims should be assisted to an uncontaminated area and inhale fresh air. If breathing is difficult, administer oxygen. Unconscious persons should be moved to an uncontaminated area and, as necessary, given artificial resuscitation and supplemental oxygen. Treatment should be symptomatic and supportive.
Ingestion	None under normal use. Get medical attention if symptoms occur.
Notes to Physician	Treat symptomatically.

### 5. FIRE-FIGHTING MEASURES

Flammable Properties	Depending on concentration spontaneously combustible (pyrophoric). Spontaneously flammable in air.
Suitable Extinguishing Media	Dry chemical or CO <sub>2</sub> . Water spray or fog. DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.

**Hazardous Combustion Products** Oxides of boron.

**Explosion Data**

**Sensitivity to Mechanical Impact** None

**Sensitivity to Static Discharge** Yes.

**Specific Hazards Arising from the Chemical** Trimethylboron in contact with water releases methane. Continue to cool fire exposed cylinders until flames are extinguished. Cylinders may rupture under extreme heat. Damaged cylinders should be handled only by specialists.

**Protective Equipment and Precautions for Firefighters** If possible, stop the flow of gas. Do not extinguish the fire until supply is shut off as otherwise an explosive-ignition may occur. If the fire is extinguished and the flow of gas continues, use increased ventilation to prevent build-up of explosive atmosphere. Ventilation fans must be explosion proof. Use non-sparking tools to close container valves.

Isolate spill or leak area for at least 100 meters (330 feet) in all directions. Vapors may travel to source of ignition and flash back. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible withdraw from area and let fire burn.

Use water spray to cool surrounding containers. Be cautious of a Boiling Liquid Evaporating Vapor Explosion, BLEVE, if flame is impinging on surrounding containers.

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

## 6. ACCIDENTAL RELEASE MEASURES

**Personal Precautions** ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. All equipment used when handling the product must be grounded. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe. Monitor oxygen level.

**Environmental Precautions** Beware of vapors accumulating to form explosive concentrations. Prevent spreading of vapors through sewers, ventilation systems and confined areas.

**Methods for Containment** Stop the flow of gas or remove cylinder to outdoor location if this can be done without risk. If leak is in container or container valve, contact the appropriate emergency telephone number in Section 1 or call your closest Linde location.

**Methods for Cleaning Up** Return cylinder to Linde or an authorized distributor.

## 7. HANDLING AND STORAGE

**Handling** Ground and bond all lines and equipment associated with product system. All equipment should be non-sparking and explosion proof. Remove all sources of ignition. Use only in ventilated areas.

Never attempt to lift a cylinder by its valve protection cap. Protect cylinders from physical damage; do not drag, roll, slide or drop. When moving cylinders, even for short distance, use a cart designed to transport cylinders. Use equipment rated for cylinder pressure. Use backflow preventive device in piping.

Use an adjustable strap wrench to remove over-tight or rusted caps. Never insert an object (e.g. wrench, screwdriver, pry bar, etc.) into valve cap openings. Doing so may damage valve, causing leak to occur. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier.

Never put cylinders into trunks of cars or unventilated areas of passenger vehicles. Never attempt to refill a compressed gas cylinder without the owner's written consent. Never strike an arc on a compressed gas cylinder or make a cylinder a part of an electrical circuit.

#### Storage

Outside or detached storage is preferred. Protect from physical damage. Cylinders should be stored upright with valve protection cap in place and firmly secured to prevent falling. Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Keep at temperatures below 52°C / 125°F. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders from being stored for excessive periods of time. Always store and handle compressed gas cylinders in accordance with Compressed Gas Association, pamphlet CGA-P1, Safe Handling of Compressed Gases in Containers.

## 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines	This product does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.
Other Exposure Guidelines	Manufacturer recommends a time weighted average workplace limit of 7 ppm for trimethylboron.
Engineering Measures	Showers. Eyewash stations. Explosion proof ventilation systems. Exhaust gas should be vented to a gas treatment system.
Ventilation	Ensure adequate ventilation, especially in confined areas.
<u>Personal Protective Equipment</u>	
Eye/Face Protection	Wear protective eyewear (safety glasses).
Skin and Body Protection	Work gloves and safety shoes are recommended when handling cylinders. Cotton or Nomex® clothing is recommended to prevent static build-up.
Respiratory Protection	
General Use	No protective equipment is needed under normal use conditions. If exposure limits are exceeded or irritation is experienced, ventilation and evacuation may be required.
Emergency Use	Use positive pressure airline respirator with escape cylinder or self contained breathing apparatus for oxygen-deficient atmospheres (<19.5%).
Hygiene Measures	Handle in accordance with good industrial hygiene and safety practice.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### Product Information

<b>Appearance</b>	Colorless.	<b>Odor</b>	Repulsive, Suffocating.
<b>Odor Threshold</b>	No information available	<b>Physical State</b>	Compressed gas
<b>Flash Point</b>	No information available.	<b>Autoignition Temperature</b>	570°C / 1058°F (Hydrogen)
<b>Flammability Limits in Air</b>	(For Hydrogen)		
<b>Upper</b>	75%		
<b>Lower</b>	4 %		

The following information is for the NON-INERT components of this mixture:

Chemical Name	Boiling Point	Melting Point	Molecular Weight	Evaporation Rate	Water Solubility	Vapor Pressure	Vapor Density (Air=1)	Gas Density Kg/m <sup>3</sup> @20°C
Trimethylborane	-20.2 °C	-161.5 °C	55.91	-	Reacts with water	45 psia		2.3 g/L
Hydrogen	-252.8 °C	-259.2 °C	1.00	-	0.019 (vol/vol @ 20°C and 1 atm)	Above critical temperature	0.07	0.083

The following information is for the INERT components that may be part of this mixture:

Chemical Name	Boiling Point	Melting Point	Molecular Weight	Evaporation Rate	Water Solubility	Vapor Pressure	Vapor Density (Air=1)	Gas Density Kg/m <sup>3</sup> @20°C
Nitrogen	-196 °C	-210 °C	28.01	-	0.023 (vol/vol @ 20°C and 1 atm)	Above critical temperature	0.97	1.165

## 10. STABILITY AND REACTIVITY

<b>Stability</b>	Stable.
<b>Incompatible Products</b>	Oxidizing agents. Halogens. Water.
<b>Conditions to Avoid</b>	Heat, flames and sparks. Hydrogen is flammable or explosive when mixed with chlorine or other oxidizing materials. Fluorine and hydrogen react at -418°F (-250°C) when impurities are present. Chlorine/hydrogen mixtures explode if exposed to light. Lithium metal will burn in a hydrogen atmosphere.
<b>Hazardous Decomposition Products</b>	Methane. Boron oxide.
<b>Hazardous Polymerization</b>	Hazardous polymerization does not occur.

## 11. TOXICOLOGICAL INFORMATION

### Acute Toxicity

#### Product Information

<b>LD50 Oral:</b>	No information available.
<b>LD50 Dermal:</b>	No information available.
<b>LC50 Inhalation:</b>	No information available.
<b>Repeated Dose Toxicity</b>	No information available.

#### Component Information

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Hydrogen		-	> 15000 ppm ( Rat ) 1 h

#### Chronic Toxicity

Chronic Toxicity	None known.
Carcinogenicity	Contains no ingredient listed as a carcinogen.
Irritation	No information available.
Sensitization	No information available.
Reproductive Toxicity	No information available.
Developmental Toxicity	Oxygen deficiency during pregnancy has produced developmental abnormalities in humans and experimental animals.
Synergistic Materials	None known.
Target Organ Effects	None known.

## 12. ECOLOGICAL INFORMATION

#### Ecotoxicity

The environmental impact of this product has not been fully investigated.

Ozone depletion potential; ODP; (R-11 = 1): Does not contain ozone depleting chemical (40 CFR Part 82).

## 13. DISPOSAL CONSIDERATIONS

Waste Disposal Methods	Do not attempt to dispose of residual waste or unused quantities. Return in the shipping container PROPERLY LABELED WITH ANY VALVE OUTLET PLUGS OR CAPS SECURED AND VALVE PROTECTION CAP IN PLACE to Linde for proper disposal.
Contaminated Packaging	Do not re-use empty containers.

## 14. TRANSPORT INFORMATION

#### DOT

Proper shipping name	Compressed gas, flammable, n.o.s.
Hazard Class	2.1
Subsidiary Class	None
UN-Number	UN1954
Description	UN1954, Compressed gas, flammable, n.o.s., 2.1
Emergency Response Guide Number	115

#### TDG

Proper Shipping Name	Compressed gas, flammable, n.o.s.
Hazard Class	2.1
UN-Number	UN1954
Description	UN1954,COMPRESSED GAS, FLAMMABLE, N.O.S.,2.1

#### MEX

Proper Shipping Name	Compressed gas, flammable, n.o.s.
Hazard Class	2.1
UN-Number	UN1954
Description	UN1954 Compressed gas, flammable, n.o.s.,2.1

#### IATA

UN-Number	UN1954
Proper Shipping Name	Compressed gas, flammable, n.o.s.
Hazard Class	2.1
ERG Code	10L
Description	UN1954,Compressed gas, flammable, n.o.s.,2.1
Maximum Quantity for Passenger	Forbidden
Maximum Quantity for Cargo Only	150 kg
Limited Quantity	Forbidden

#### IMDG/IMO

Proper Shipping Name	Compressed gas, flammable, n.o.s.
Hazard Class	2.1
UN-Number	UN1954
EmS No.	F-D, S-U
Description	UN1954, Compressed gas, flammable, n.o.s.,2.1

#### ADR

Proper Shipping Name	Compressed gas, flammable, n.o.s.
Hazard Class	2.1
UN-Number	UN1954
Classification Code	1F
Description	UN1954 Compressed gas, flammable, n.o.s.,2.1,

## 15. REGULATORY INFORMATION

### International Inventories

TSCA	Does not Comply
DSL	Does not Comply
EINECS/ELINCS	Complies

**NOTE:** This material is supplied under the manufacturer's "Low Volume Exemption" (40 CFR 723) of TSCA. As such, its use is restricted to use as a doping material in semiconductor materials, a synthesis reagent or use as a reactor fuel additive/surface treatment.

### Legend

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory  
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List  
EINECS/ELINCS - European Inventory of Existing Commercial Chemical Substances/EU List of Notified Chemical Substances

### U.S. Federal Regulations

**SARA 313**

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372.

**SARA 311/312 Hazard Categories**

Acute Health Hazard	No
Chronic Health Hazard	No
Fire Hazard	Yes
Sudden Release of Pressure Hazard	Yes
Reactive Hazard	No

**Clean Water Act**

This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42).

**Risk and Process Safety Management Programs**

This material, as supplied, contains one or more regulated substances with specified thresholds under 40 CFR Part 68 or regulated as a highly hazardous chemical pursuant to the 29 CFR Part 1910.110 with specified thresholds:

Chemical Name	U.S. - CAA (Clean Air Act) - Accidental Release Prevention - Toxic Substances	U.S. - CAA (Clean Air Act) - Accidental Release Prevention - Flammable Substances	U.S. - OSHA - Process Safety Management - Highly Hazardous Chemicals
Hydrogen		10000 lbs	

**Clean Air Act, Section 112 Hazardous Air Pollutants (HAPs) (see 40 CFR 61)**

This product does not contain any substances regulated as hazardous air pollutants (HAPS) under Section 112 of the Clean Air Act Amendments of 1990.

**CERCLA/SARA**

This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material.

**U.S. State Regulations**

**California Proposition 65**

This product does not contain any Proposition 65 chemicals.

**U.S. State Right-to-Know Regulations**

Chemical Name	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Nitrogen	X	X	X	-	X
Hydrogen	X	X	X	-	X

**International Regulations**

**Canada**

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.



**WHMIS Hazard Class**

A Compressed gases  
B1 Flammable gas  
D2B Toxic materials



## 16. OTHER INFORMATION

Prepared By Product Stewardship  
23 British American Blvd.  
Latham, NY 12110  
1-800-572-6501

Issuing Date 26-May-2011

Revision Date

Revision Number 0

Revision Note Initial Release.

<u>NFPA</u>	Health Hazard 2	Flammability 4	Stability 1	Physical and Chemical Hazards -
<u>HMIS</u>	Health Hazard 2	Flammability 4	Physical Hazard 3	Personal Protection -

**Note:** Ratings were assigned in accordance with Compressed Gas Association (CGA) guidelines as published in CGA Pamphlet P-19-2009, CGA Recommended Hazard Ratings for Compressed Gases, 3rd Edition.

General Disclaimer

For terms and conditions, including limitation of liability, please refer to the purchase agreement in effect between Linde LLC, Linde Merchant Production, Inc. or Linde Gas North America LLC (or any of their affiliates and subsidiaries) and the purchaser.

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End of Safety Data Sheet