1. PRODUCT AND COMPANY IDENTIFICATION

Product Name 0.54 - 13.9% TRIMETHYLBORON In HYDROGEN or NITROGEN
UN-Number UN1954
Recommended Use Electronics.
Supplier Address*
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
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
Linde Canada Limited
5860 Chedworth Way
Mississauga, Ontario L5R 0A2
Phone: 905-501-1700
www.lindecanada.com

* 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

DANGER!

Emergency Overview
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.

Aggravated Medical Conditions
- Respiratory disorders.

Environmental Hazard
See Section 12 for additional Ecological Information.

3. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS-No</th>
<th>Volume %</th>
<th>Chemical Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrogen</td>
<td>1333-74-0</td>
<td>86.1 - 99.46</td>
<td>H2</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>7727-37-9</td>
<td>86.1 - 99.46</td>
<td>N2</td>
</tr>
<tr>
<td>Trimethylborane</td>
<td>593-90-8</td>
<td>0.54 - 13.9</td>
<td>B(CH3)3</td>
</tr>
</tbody>
</table>

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 CO2. 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.

Personal Protective Equipment

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

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

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

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Boiling Point</th>
<th>Melting Point</th>
<th>Molecular Weight</th>
<th>Evaporation Rate</th>
<th>Water Solubility</th>
<th>Vapor Pressure</th>
<th>Vapor Density (Air=1)</th>
<th>Gas Density Kg/m³@20°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trimethylborane</td>
<td>-20.2 °C</td>
<td>-161.5 °C</td>
<td>55.91</td>
<td>-</td>
<td>Reacts with water</td>
<td>45 psia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydrogen</td>
<td>-252.8 °C</td>
<td>-259.2 °C</td>
<td>1.00</td>
<td>-</td>
<td>0.019 (vol/vol @ 20°C and 1 atm)</td>
<td>Above critical temperature</td>
<td>0.07</td>
<td>0.083</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Boiling Point</th>
<th>Melting Point</th>
<th>Molecular Weight</th>
<th>Evaporation Rate</th>
<th>Water Solubility</th>
<th>Vapor Pressure</th>
<th>Vapor Density (Air=1)</th>
<th>Gas Density Kg/m³@20°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen</td>
<td>-196 °C</td>
<td>-210 °C</td>
<td>28.01</td>
<td>-</td>
<td>0.023 (vol/vol @ 20°C and 1 atm)</td>
<td>Above critical temperature</td>
<td>0.97</td>
<td>1.165</td>
</tr>
</tbody>
</table>

10. STABILITY AND REACTIVITY

Stability

Stable.

Incompatible Products


Conditions to Avoid

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.

Hazardous Decomposition Products

Methane. Boron oxide.

Hazardous Polymerization

Hazardous polymerization does not occur.

11. TOXICOLOGICAL INFORMATION

Acute Toxicity

Product Information

LD50 Oral: No information available.

LD50 Dermal: No information available.

LC50 Inhalation: No information available.

Repeated Dose Toxicity No information available.
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

<table>
<thead>
<tr>
<th>Proper Shipping Name</th>
<th>Compressed gas, flammable, n.o.s.</th>
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</thead>
<tbody>
<tr>
<td>Hazard Class</td>
<td>2.1</td>
</tr>
<tr>
<td>UN-Number</td>
<td>UN1954</td>
</tr>
<tr>
<td>Description</td>
<td>UN1954 Compressed gas, flammable, n.o.s., 2.1</td>
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</tbody>
</table>

### IATA

<table>
<thead>
<tr>
<th>UN-Number</th>
<th>UN1954</th>
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</thead>
<tbody>
<tr>
<td>Proper Shipping Name</td>
<td>Compressed gas, flammable, n.o.s.</td>
</tr>
<tr>
<td>Hazard Class</td>
<td>2.1</td>
</tr>
<tr>
<td>ERG Code</td>
<td>10L</td>
</tr>
<tr>
<td>Description</td>
<td>UN1954, Compressed gas, flammable, n.o.s., 2.1</td>
</tr>
</tbody>
</table>

### Maximum Quantity for Cargo Only
150 kg

### IMDG/IMO

<table>
<thead>
<tr>
<th>Proper Shipping Name</th>
<th>Compressed gas, flammable, n.o.s.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazard Class</td>
<td>2.1</td>
</tr>
<tr>
<td>EmS No.</td>
<td>F-D, S-U</td>
</tr>
<tr>
<td>Description</td>
<td>UN1954, Compressed gas, flammable, n.o.s., 2.1</td>
</tr>
</tbody>
</table>

### ADR

<table>
<thead>
<tr>
<th>Proper Shipping Name</th>
<th>Compressed gas, flammable, n.o.s.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazard Class</td>
<td>2.1</td>
</tr>
<tr>
<td>UN-Number</td>
<td>UN1954</td>
</tr>
<tr>
<td>Classification Code</td>
<td>1F</td>
</tr>
<tr>
<td>Description</td>
<td>UN1954 Compressed gas, flammable, n.o.s., 2.1</td>
</tr>
</tbody>
</table>

### 15. REGULATORY INFORMATION

#### International Inventories

<table>
<thead>
<tr>
<th>TSCA</th>
<th>Does not Comply</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSL</td>
<td>Does not Comply</td>
</tr>
<tr>
<td>EINECS/ELINCS</td>
<td>Complies</td>
</tr>
</tbody>
</table>

#### 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/NDDSL** - 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

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Health Hazard</td>
<td>No</td>
</tr>
<tr>
<td>Chronic Health Hazard</td>
<td>No</td>
</tr>
<tr>
<td>Fire Hazard</td>
<td>Yes</td>
</tr>
<tr>
<td>Sudden Release of Pressure Hazard</td>
<td>Yes</td>
</tr>
<tr>
<td>Reactive Hazard</td>
<td>No</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrogen</td>
<td></td>
<td>10000 lbs</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th></th>
<th>Massachusetts</th>
<th>New Jersey</th>
<th>Pennsylvania</th>
<th>Illinois</th>
<th>Rhode Island</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>X</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>X</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Prepared By</th>
<th>Product Stewardship</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>23 British American Blvd.</td>
</tr>
<tr>
<td></td>
<td>Latham, NY 12110</td>
</tr>
<tr>
<td></td>
<td>1-800-572-6501</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Issuing Date</th>
<th>26-May-2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revision Date</td>
<td></td>
</tr>
<tr>
<td>Revision Number</td>
<td>0</td>
</tr>
<tr>
<td>Revision Note</td>
<td>Initial Release.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>NFPA Health Hazard</th>
<th>2</th>
<th>Flammability</th>
<th>4</th>
<th>Stability</th>
<th>1</th>
<th>Physical and Chemical Hazards -</th>
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</thead>
<tbody>
<tr>
<td>HMIS Health Hazard</td>
<td>2</td>
<td>Flammability</td>
<td>4</td>
<td>Physical Hazard</td>
<td>3</td>
<td>Personal Protection -</td>
</tr>
</tbody>
</table>

**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.

**DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES**

Although reasonable care has been taken in the preparation of this document, we extend no warranties and make no representations as to the accuracy or completeness of the information contained herein, and assume no responsibility regarding the suitability of this information for the user’s intended purposes or for the consequences of its use. Each individual should make a determination as to the suitability of the information for their particular purpose(s).

End of Safety Data Sheet