PHOSPHINE (1%) in HELIUM or NITROGEN
Safety Data Sheet

1. IDENTIFICATION

**Product identifier**

**Product Name**

PHOSPHINE (1%) in HELIUM or NITROGEN

**Other means of identification**

**Safety data sheet number**

LIND-M0163

**UN/ID no.**

UN1955

**Recommended use of the chemical and restrictions on use**

**Recommended Use**

Electronics. Industrial and professional use.

**Uses advised against**

Consumer use

**Details of the supplier of the safety data sheet**

Linde Gas North America LLC - Linde Merchant Production Inc. - Linde LLC
200 Somerset Corporate Blvd, Suite 7000
Bridgewater, NJ 08807
Phone: 908-464-8100
www.lindeus.com

Linde Gas Puerto Rico, Inc.
Road 869, Km 1.8
Barrio Palmas, Catano, PR 00962
Phone: 787-641-7445
www.pr.lindegas.com

Linde Canada Limited
5860 Chedworth Way
Mississauga, Ontario L5R 0A2
Phone: 905-501-2500/905-501-1700
www.lindecanada.com

* May include subsidiaries or affiliate companies/divisions.

For additional product information contact your local customer service.

**Emergency telephone number**

**Company Phone Number**

+1 800-232-4726 (Linde National Operations Center, US) 905-501-0802 (Canada)
CHEMTREC: 1-800-424-9300 (North America) +1-703-527-3887 (International)
2. HAZARDS IDENTIFICATION

Classification

OSHA Regulatory Status
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200).

<table>
<thead>
<tr>
<th>Hazard Category</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute toxicity - Inhalation (Gases)</td>
<td>Category 3</td>
</tr>
<tr>
<td>Skin corrosion/ irritation</td>
<td>Category 2</td>
</tr>
<tr>
<td>Serious eye damage/ eye irritation</td>
<td>Category 2A</td>
</tr>
<tr>
<td>Gases under pressure</td>
<td>Compressed gas</td>
</tr>
</tbody>
</table>

Label elements

Signal word: Danger

Hazard Statements
Contains gas under pressure; may explode if heated
Toxic if inhaled
Causes skin irritation
Causes serious eye irritation
Symptoms may be delayed

Precautionary Statements - Prevention
Do not handle until all safety precautions have been read and understood
Avoid breathing gas
Use and store only outdoors or in a well ventilated place
Wear protective gloves, protective clothing, eye protection, respiratory protection, and/ or face protection
Use a backflow preventive device in piping
Use equipment rated for cylinder pressure
Close valve after each use and when empty
When returning cylinder, install leak tight valve outlet cap or plug

Precautionary Statements - Response
IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or doctor/ physician.
IF ON SKIN: Wash with plenty of water. IF SKIN IRRITATION OCCURS: Get medical advice/ attention. Take off contaminated clothing and wash before reuse.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/ attention

Precautionary Statements - Storage
Store locked up
Protect from sunlight when ambient temperature exceeds 52°C/ 125°F

Precautionary Statements - Disposal
Dispose of contents/ containers in accordance with container supplier/ owner instructions

Hazards not otherwise classified (HNOC)
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>Nitrogen</td>
<td>7727-37-9</td>
<td>0-99</td>
<td>N\textsubscript{2}</td>
</tr>
<tr>
<td>Helium</td>
<td>7440-59-7</td>
<td>0-99</td>
<td>He</td>
</tr>
<tr>
<td>Phosphine</td>
<td>7803-51-2</td>
<td>1</td>
<td>PH\textsubscript{3}</td>
</tr>
</tbody>
</table>

Composition covers range of mixtures that fall within the same hazard classifications.

4. FIRST AID MEASURES

**Description of first aid measures**

**General advice**
Show this safety data sheet to the doctor in attendance. Immediate medical attention is required.

**Inhalation**
Remove to fresh air and keep comfortable for breathing. If breathing is difficult, give oxygen. If breathing has stopped, give artificial respiration. Get medical attention immediately.

**Skin contact**
Wash off immediately with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention if symptoms occur.

**Eye contact**
Immediately flush eyes with running water for at least 30 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Keep eye wide open while rinsing. Do not rub affected area. Get medical attention if symptoms occur.

**Ingestion**
Not an expected route of exposure.

**Self-protection of the first aider**
RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS. Use personal protective equipment. Avoid contact with skin, eyes or clothing. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

**Most important symptoms and effects, both acute and delayed**

**Symptoms**
Inhalation may cause severe respiratory irritation and pulmonary edema. Symptoms of overexposure can include headache, coughing, shortness of breath, wheezing, phlegm, abdominal pain, nausea, vomiting, thirst, drowsiness, double vision, dizziness, tremors, and coma. Symptoms may be delayed. Irritating to eyes, respiratory system and skin.

**Indication of any immediate medical attention and special treatment needed**

**Note to physicians**
Treat symptomatically.

5. FIRE-FIGHTING MEASURES

**Suitable extinguishing media**
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

**Specific extinguishing methods**
Continue to cool fire exposed cylinders until flames are extinguished. Damaged cylinders should be handled only by specialists.

**Specific hazards arising from the chemical**
Non-flammable gas. Damaged cylinders should be handled only by specialists.

Protective equipment and precautions for firefighters:
As in any fire, wear self-contained breathing apparatus pressure-demand, NIOSH (approved or equivalent) and full protective gear.

### 6. ACCIDENTAL RELEASE MEASURES

#### Personal precautions, protective equipment and emergency procedures

**Personal precautions**
Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Ensure adequate ventilation, especially in confined areas. Monitor concentration of released product. Use personal protection recommended in Section 8. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe.

**Environmental precautions**
Prevent spreading of vapors through sewers, ventilation systems and confined areas.

#### Methods and material for containment and cleaning up

**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

#### Precautions for safe handling

**Advice on safe handling**
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. Never attempt to lift a cylinder by its valve protection cap. Never insert an object (e.g. wrench, screwdriver, pry bar, etc.) into valve cap openings. Doing so may damage valve, causing leak to occur. Use an adjustable strap wrench to remove over-tight or rusted caps. Use only with adequate ventilation. Use a backflow preventive device in piping. Use only with equipment rated for cylinder pressure. Close valve after each use and when empty. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier. Ensure the complete gas system has been checked for leaks before use.

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.

Only experienced and properly instructed persons should handle gases under pressure. Always store and handle compressed gas cylinders in accordance with Compressed Gas Association, pamphlet CGA-P1, Safe Handling of Compressed Gases in Containers.

#### Conditions for safe storage, including any incompatibilities

**Storage Conditions**
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. Cylinders should be stored upright with valve protection cap in place and firmly secured to prevent falling. 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. Stored containers should be periodically checked for general condition and leakage.
Incompatible materials

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>ACGIH TLV</th>
<th>OSHA PEL</th>
<th>NIOSH IDLH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phosphine</td>
<td>STEL: 1 ppm</td>
<td>TWA: 0.3 ppm</td>
<td>IDLH: 50 ppm</td>
</tr>
<tr>
<td>7803-51-2</td>
<td>TWA: 0.3 ppm</td>
<td>(vacated) STEL: 1 ppm</td>
<td>TWA: 0.3 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(vacated) STEL: 1 mg/m³</td>
<td>TWA: 0.4 mg/m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>STEL: 1 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>STEL: 1 mg/m³</td>
</tr>
</tbody>
</table>

ACGIH TLV: American Conference of Governmental Industrial Hygienists - Threshold Limit Value. OSHA PEL: Occupational Safety and Health Administration - Permissible Exposure Limits. NIOSH IDLH: Immediately Dangerous to Life or Health

Other Information
Vacated limits revoked by the Court of Appeals decision in AFL-CIO v. OSHA, 965 F.2d 962 (11th Cir., 1992).

Appropriate engineering controls

Engineering Controls
Showers. Eyewash stations. Exhaust gas should be vented to a gas treatment system. Consider installation of leak detection systems in areas of use and storage. Systems under pressure should be regularly checked for leakages.

Individual protection measures, such as personal protective equipment

Eye/face protection
Wear safety glasses with side shields (or goggles).

Skin and body protection
Work gloves and safety shoes are recommended when handling cylinders.

Respiratory protection
If exposure limits are exceeded or irritation is experienced, NIOSH approved respiratory protection should be worn. Positive-pressure supplied air respirators may be required for high airborne contaminant concentrations. Respiratory protection must be provided in accordance with current local regulations.

General Hygiene Considerations
Handle in accordance with good industrial hygiene and safety practice. Do not eat, drink or smoke when using this product. Wash hands before breaks and immediately after handling the product.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Product Information
Gas
Physical state
Colorless.
Appearance
Repulsive.
Odor
0.51 ppm (PH³)
Odor threshold
No data available
pH
No data available
Melting point
Not applicable
Evaporation rate
No
Fire Hazard
Flammability Limit in Air (For Phosphine)
1.8 %
Lower flammability limit:
98 %
Upper flammability limit:
38 °C / 100 °F (Phosphine)
Flash point
No information available
Autoignition temperature
No data available
Decomposition temperature
No data available
Partition coefficient
No data available
10. STABILITY AND REACTIVITY

Reactivity
Not reactive under normal conditions

Chemical stability
Stable under normal conditions.

Explosion data

Sensitivity to Mechanical Impact None.

Sensitivity to Static Discharge None.

Possibility of Hazardous Reactions
None under normal processing.

Hazardous polymerization Hazardous polymerization does not occur.

Conditions to avoid
Phosphine liberates hydrogen and forms phosphide when passed over heated metal.

Incompatible materials

Hazardous Decomposition Products
Phosphorus and hydrogen at approximately 1100°F (600°C).

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Inhalation
Acute over-exposures to this gas mixture can be dangerous due to presence of Phosphine. Non-lethal exposures may result in the following symptoms: lacrimation (watery eyes), substernal chest pain, chest tightness, shortness of breath, a slight cough, and cyanosis. Such exposures can cause gastrointestinal tract irritation and central nervous system effects. Abdominal symptoms include nausea, vomiting, severe epigastric pain, and diarrhea. Neurologic symptoms include vertigo, headache, restlessness, involuntary tremors, lack of muscular coordination, double vision, drowsiness, and a decreased sensation in the extremities. Death can occur in humans after exposure as low as 8 ppm of Phosphine for 1-2 hours. Respiratory, gastrointestinal, and nervous system symptoms were noted in workers exposed to mean phosphine concentrations less than 10 ppm.

Skin contact
Contact with moisture on the skin may form irritating materials such as phosphoric acid. Pain, burning and irritation may result from contact.
Eye contact
Causes serious eye irritation.

Ingestion
Not an expected route of exposure.

Information on toxicological effects

Symptoms
Inhalation may cause severe respiratory irritation and pulmonary edema. Symptoms of overexposure can include headache, coughing, shortness of breath, wheezing, phlegm, abdominal pain, nausea, vomiting, thirst, drowsiness, double vision, dizziness, tremors, and coma. Symptoms may be delayed.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Skin corrosion/irritation
Category 2.

Serious eye damage/eye irritation
Category 2.

Irritation
May cause irritation to respiratory tract, eyes and skin.

Sensitization
Not classified.

Germ cell mutagenicity
Not classified.

Carcinogenicity
This product does not contain any carcinogens or potential carcinogens listed by OSHA, IARC or NTP.

Chemical Name | ACGIH | IARC | NTP | OSHA
---|---|---|---|---
Phosphine | 7803-51-2 | - | Group 2A | - | X

Reproductive toxicity
Not classified.

STOT - single exposure
Not classified.

STOT - repeated exposure
Not classified.

Chronic toxicity
May cause adverse liver and kidney effects. Chronic absorption of phosphine may be associated with disturbances of sight, speech and motor functions.

Target Organ Effects
Respiratory system.

Aspiration hazard
Not applicable.

Numerical measures of toxicity

Component Level Information:

| Chemical Name | Oral LD50 | Dermal LD50 | Inhalation LC50 | Inhalation LC50 (CGA P-20) |
---|---|---|---|---|
Phosphine | 7803-51-2 | - | - | 11 ppm (Rat) 4 h | 20 ppm (Rat) 1 hr |

Product Information

<table>
<thead>
<tr>
<th>Oral LD50</th>
<th>No information available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dermal LD50</td>
<td>No information available</td>
</tr>
<tr>
<td>Inhalation LC50</td>
<td>No information available</td>
</tr>
</tbody>
</table>

The following values are calculated based on chapter 3.1 of the GHS document.

ATEmix (inhalation-gas) 1000 ppm

12. ECOLOGICAL INFORMATION

Ecotoxicity
No known acute aquatic toxicity.

Persistence and degradability
Not applicable.

Bioaccumulation
No information available

13. DISPOSAL CONSIDERATIONS
Waste treatment methods

Disposal of wastes
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.

14. TRANSPORT INFORMATION

DOT

UN/ ID no. UN1955
Proper shipping name Compressed gas, toxic, n.o.s.
Hazard Class 2.3
Special Provisions 3, B14
Description UN1955 Compressed gas, toxic, n.o.s.(Phosphine, XXXXX), 2.3
Additional Description: "Toxic-Inhalation Hazard Zone C". If net weight of product is greater than or equal to 100 lbs., the shipping description must also contain the letters "RQ".
Additional Marking Requirements: "Inhalation Hazard" If net weight of product is greater than or equal to 100 lbs., the container must also be marked with the letters "RQ".
Emergency Response Guide Number 123

TDG

UN/ ID no. UN1955
Proper shipping name Compressed gas, toxic, n.o.s.
Hazard Class 2.3
Description UN1955 Compressed gas, toxic, n.o.s.(Phosphine, XXXXX), 2.3

MEX

UN/ ID no. UN1955
Proper shipping name Compressed gas, toxic, n.o.s.
Hazard Class 2.3
Description UN1955 Compressed gas, toxic, n.o.s.(Phosphine, XXXXX), 2.3

IATA

Forbidden

IMDG

UN/ ID no. UN1955
Proper shipping name Compressed gas, toxic, n.o.s.
Hazard Class 2.3
EmS-No. F-C, S-U
Special Provisions 274
Description UN1955, Compressed gas, toxic, n.o.s. (Phosphine, XXXXX), 2.3

ADR

UN/ ID no. UN1955
Proper shipping name Compressed gas, toxic, n.o.s.
Hazard Class 2.3
Classification code 1T
Tunnel restriction code (C/D)
Special Provisions 274
Description UN1955 Compressed gas, toxic, n.o.s.(Phosphine, XXXXX), 2.3, (C/D)
Labels 2.3

15. REGULATORY INFORMATION

International Inventories

TSCA Complies
DSL/ NDSL Complies
**EINECS/ ELINCS**

Complies

**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 Chemical Substances/ European List of Notified Chemical Substances

**US Federal Regulations**

**SARA 313**

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product contains a chemical or chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372.

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>SARA 313 - Threshold Values %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phosphine - 7803-51-2</td>
<td>1.0</td>
</tr>
</tbody>
</table>

**SARA 311/ 312 Hazard Categories**

<table>
<thead>
<tr>
<th>Health Hazard</th>
<th>Acute Health Hazard</th>
<th>Chronic Health Hazard</th>
<th>Fire Hazard</th>
<th>Sudden release of pressure hazard</th>
<th>Reactive Hazard</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

**CERCLA**

This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302).

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Hazardous Substances RQs</th>
<th>CERCLA/ SARA RQ</th>
<th>Reportable Quantity (RQ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phosphine - 7803-51-2</td>
<td>100 lb</td>
<td>100 lb</td>
<td>100 lb</td>
</tr>
</tbody>
</table>

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

This product contains the following substances which are listed hazardous air pollutants (HAPS) under Section 112 of the Clean Air Act:

- **Phosphine - 7803-51-2**

**CWA (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>Chemical Name</th>
<th>U.S. - CAA (Clean Air Act) - Accidental Release Prevention - Toxic Substances</th>
<th>U.S. - CAA (Clean Air Act) - Accidental Release Prevention - Flammable Substances</th>
<th>U.S. - OSHA - Process Safety Management - Highly Hazardous Chemicals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phosphine</td>
<td>5000 lb</td>
<td></td>
<td>100 lb</td>
</tr>
</tbody>
</table>

**US 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>Chemical Name</th>
<th>New Jersey</th>
<th>Massachusetts</th>
<th>Pennsylvania</th>
</tr>
</thead>
<tbody>
<tr>
<td>Helium - 7440-59-7</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Nitrogen - 7727-37-9</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
**16. OTHER INFORMATION**

**NFPA**

<table>
<thead>
<tr>
<th>Health hazards</th>
<th>Flammability</th>
<th>Instability</th>
<th>Physical and Chemical Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>0</td>
<td>0</td>
<td>-</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.

**Issue Date** 05-May-2015  
**Revision Date** 13-Jul-2016  
**Revision Note** SDS sections updated; 1

**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*