



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.lindecana.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).

Acute toxicity - Inhalation (Gases)	Category 3
Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 2A
Gases under pressure	Compressed gas

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)

Not applicable

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS No.	Volume %	Chemical Formula
Nitrogen	7727-37-9	0-99	N ₂
Helium	7440-59-7	0-99	He
Phosphine	7803-51-2	1	PH ₃

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.
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Indication of any immediate medical attention and special treatment needed

Note to physicians	Treat symptomatically.
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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.

Hazardous combustion products Hydrogen. Phosphorus oxides.

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

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 Phosphine is incompatible with: Bases. Halogens. Nitrates. Nitrogen trichloride. Oxidizing agents.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines

Chemical Name	ACGIH TLV	OSHA PEL	NIOSH IDLH
Phosphine 7803-51-2	STEL: 1 ppm TWA: 0.3 ppm	TWA: 0.3 ppm TWA: 0.4 mg/m ³ (vacated) STEL: 1 ppm (vacated) STEL: 1 mg/m ³	IDLH: 50 ppm TWA: 0.3 ppm TWA: 0.4 mg/m ³ STEL: 1 ppm STEL: 1 mg/m ³

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	
Physical state	Gas
Appearance	Colorless.
Odor	Repulsive.
Odor threshold	0.51 ppm (PH ₃)
pH	No data available
Melting point	No data available
Evaporation rate	Not applicable
Fire Hazard	No
Flammability Limit in Air	(For Phosphine)
Lower flammability limit:	1.8 %
Upper flammability limit:	98 %
Flash point	No information available
Autoignition temperature	38 °C / 100 °F (Phosphine)
Decomposition temperature	No data available
Partition coefficient	No data available

Kinematic viscosity

Not applicable

Chemical Name	Molecular weight	Boiling point	Vapor Pressure	Vapor density (air =1)	Gas Density kg/m ³ @20°C	Critical Temperature
Helium	4.00	-268.9 °C	Above critical temperature	0.138	0.165	-267.9 °C
Nitrogen	28.01	-196 °C	Above critical temperature	0.97	1.153	-146.9 °C
Phosphine	34	-82.72 °C	510 PSIA @ 21°C	1.17	1.423	51.61 °C

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

Phosphine is incompatible with: Bases. Halogens. Nitrates. Nitrogen trichloride. Oxidizing agents.

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: lacrymation (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) 1hr

Product Information

Oral LD50 No information available
 Dermal LD50 No information available
 Inhalation LC50 No information available

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 INFORMATIONDOT

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 INFORMATIONInternational 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 RegulationsSARA 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.

Chemical Name	SARA 313 - Threshold Values %
Phosphine - 7803-51-2	1.0

SARA 311/312 Hazard Categories

Acute Health Hazard	Yes
Chronic Health Hazard	Yes
Fire Hazard	No
Sudden release of pressure hazard	Yes
Reactive Hazard	No

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).

Chemical Name	Hazardous Substances RQs	CERCLA/SARA RQ	Reportable Quantity (RQ)
Phosphine 7803-51-2	100 lb	100 lb	100 lb 45.4 kg

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:

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:

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
Phosphine	5000 lb		100 lb

US State RegulationsCalifornia Proposition 65

This product does not contain any Proposition 65 chemicals

U.S. State Right-to-Know Regulations

Chemical Name	New Jersey	Massachusetts	Pennsylvania
Helium 7440-59-7	X	X	X
Nitrogen 7727-37-9	X	X	X

Phosphine 7803-51-2	X	X	X
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Chemical Name	Carcinogenicity	Exposure Limits
Phosphine		Mexico: TWA 0.3 ppm Mexico: TWA 0.4 mg/m ³ Mexico: STEL 1 ppm Mexico: STEL 1 mg/m ³

16. OTHER INFORMATION

NFPA Health hazards 3 Flammability 0 Instability 0 Physical and Chemical Properties -

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

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End of Safety Data Sheet