ARSINE (>10%) In HYDROGEN
Safety Data Sheet

1. IDENTIFICATION

Product identifier
Product Name
ARSINE (>10%) In HYDROGEN

Other means of identification
Safety data sheet number
LIND-M0015
UN/ ID no.
UN1953

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
575 Mountain Ave.
Murray Hill, NJ 07974
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: 905-501-1700
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
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

-----------------------------------------------
Page 1 / 11
OSHA Regulatory Status
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200).

<table>
<thead>
<tr>
<th>Acute toxicity - Inhalation (Gases)</th>
<th>Category 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carcinogenicity</td>
<td>Category 2</td>
</tr>
<tr>
<td>Specific target organ toxicity (repeated exposure)</td>
<td>Category 2</td>
</tr>
<tr>
<td>Flammable gases</td>
<td>Category 1</td>
</tr>
<tr>
<td>Gases under pressure</td>
<td>Compressed gas</td>
</tr>
</tbody>
</table>

Label elements

Signal word  Danger

Hazard Statements
Extremely flammable gas
Contains gas under pressure; may explode if heated
Fatal if inhaled
Suspected of causing cancer
May cause liver damage through prolonged or repeated exposure
Very toxic to aquatic life with long lasting effects
May form explosive mixtures with air
Symptoms may be delayed

Precautionary Statements - Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Keep away from heat, sparks, open flames, hot surfaces. — No smoking
Do not breathe gas.
Use and store only outdoors or in a well ventilated place
Avoid release to the environment
Wear protective gloves, protective clothing, eye protection, respiratory protection, and/ or face protection
Use a backflow preventive device in piping
Use only with equipment of compatible materials of construction and rated for cylinder pressure
Do not open valve until connected to equipment prepared for use
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. Immediately call a POISON CENTER or doctor/ physician. IF EXPOSED OR CONCERNED: Get medical advice/ attention.
Leaking gas fire: do not extinguish, unless leak can be stopped safely
Eliminate all ignition sources if safe to do so

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

<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>80-90</td>
<td>H₂</td>
</tr>
<tr>
<td>Arsine</td>
<td>7784-42-1</td>
<td>10-20</td>
<td>AsH₃</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**
Immediate medical attention is required. Show this safety data sheet to the doctor in attendance.

**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**
Immediately flush skin with plenty of water for at least 30 minutes. Immediate medical attention is required.

**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. Immediate medical attention is required.

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

**Self-protection of the first aider**
Remove all sources of ignition. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS. Use personal protective equipment. Avoid contact with skin, eyes and 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**
Fatal if inhaled. Arsine is an an extremely toxic gas that destroys red blood cells and can cause widespread organ injury. Inhalation of 250 ppm for 30 minutes is fatal and 3-10 ppm can cause poisoning symptoms in a few hours. Early effects are commonly characterized by drowsiness, giddiness, headache, thirst and abdominal pain with vomiting. Arsine may discolor urine to red or a darkened color, and the skin to a bronze or jaundiced color. Symptoms may be delayed.

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

**Note to physicians**
Arsine is a powerful hemolytic agent. The principle clinical manifestation of arsine toxicity is acute intravascular hemolysis and consequent renal failure. Bronze skin pigmentation may be confused with jaundice. In all cases of exposure, T-wave elevation of serial EKGs has been found. Survivors followed for as long as 18 months showed evidence that arsine was the causal agent of myocardial degeneration and cardiac failure. Management of intoxication is dependent on treatment of the hemolytic episode and its consequences. Dimercaptol does not appear to alter the course of hemolysis, however, it may be useful in the treatment of arsenic neuropathy that appears to follow some cases of arsine poisoning. Severe hemolytic anemia may require transfusion of red cells. Alkalinization of the urine with small doses of oral sodium bicarbonate has been recommended by
some clinicians in the management of hemoglobinurea. The advice of a nephrologist should be sought quickly.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
Dry chemical or CO2. Water spray (fog). DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.

Unsuitable extinguishing media
Do not use halogenated extinguishing agents or foam.

Specific extinguishing methods
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.

Use water spray to cool surrounding containers. Be cautious of a Boiling Liquid Evaporating Vapor Explosion, BLEVE, if flame is impinging on surrounding containers. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible withdraw from area and let fire burn. Damaged cylinders should be handled only by specialists.

Specific hazards arising from the chemical
Extremely flammable gas. May form explosive mixtures with air. Low ignition energy. Will be easily ignited by heat, sparks or flames. Hydrogen is very light and may collect in the upper portions of storage areas. Hydrogen burns with an almost invisible flame. High pressure releases may ignite with no apparent ignition source possibly via static electricity. Vapors may travel to source of ignition and flash back. Vapors from liquefied gas are initially heavier than air and spread along ground. Vapors may accumulate in confined areas (basement, tanks, hopper/ tank cars, etc.). Cylinders may rupture under extreme heat.

Hazardous combustion products
Arsenic compounds including arsenic trioxide.

Protective equipment and precautions for firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/ NIOSH (approved or equivalent) and full protective gear. Additional chemical protective clothing may be required to protect from toxic decomposition products.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

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. Ensure adequate ventilation, especially in confined areas. Consider the risk of potentially explosive atmospheres. Monitor concentration of released product. All equipment used when handling the product must be grounded. Use non-sparking tools and equipment. 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. See Section 12 for additional ecological information.

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

Aluminum, carbon steel, stainless steel, Monel®, and Hastelloy C® are preferred materials for handling arsine. Brass should be avoided. Kel-F® and Teflon® are preferred gasket materials; Viton® and Nylon® are acceptable. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Ground and bond all lines and equipment associated with product system. All equipment should be non-sparking and explosion proof. Separate flammable gas cylinders from oxygen and other oxidizers by a minimum distance of 20 ft. or by a 5 ft. high barrier with a minimum fire resistance rating of a half an hour. "NO SMOKING" signs should be posted in storage and use areas.

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. Outside or detached storage is preferred.

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>
</table>
| Arsine        | TWA: 0.005 ppm  
              | TWA: 0.01 mg/ m³ As | TWA: 0.05 ppm 
              | TWA: 0.2 mg/ m³ | IDLH: 3 ppm  
              | IDLH: 5 mg/ m³ As | Ceiling: 0.002 mg/ m³ As 15 min |

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 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. Explosion proof ventilation systems. 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
Tightly fitting safety goggles.

Skin and body protection
Wear fire/flame resistant/retardant clothing. Take precautionary measures against static discharge. Appropriate protective and chemical resistant gloves, clothing and splash protection, or fully encapsulating vapor protective clothing to prevent exposure. For materials of construction consult protective clothing manufacturer’s specifications. Work gloves and safety shoes are recommended when handling cylinders.

Respiratory protection
If exposure limits are exceeded or irritation is experienced, NIOSH/MSHA 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. Regular cleaning of equipment, work area and clothing is recommended. Contaminated work clothing should not be allowed out of the workplace.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

<table>
<thead>
<tr>
<th>Product Information</th>
<th>Gas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical state</td>
<td>Gas</td>
</tr>
<tr>
<td>Appearance</td>
<td>Colorless.</td>
</tr>
<tr>
<td>Odor</td>
<td>Garlic.</td>
</tr>
<tr>
<td>Odor threshold</td>
<td>0.5* ppm (Arsine)</td>
</tr>
<tr>
<td>pH</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Melting point</td>
<td>No data available</td>
</tr>
<tr>
<td>Evaporation rate</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Fire Hazard</td>
<td>Yes</td>
</tr>
<tr>
<td>Flammability Limit in Air</td>
<td>(For Hydrogen)</td>
</tr>
<tr>
<td>Lower flammability limit:</td>
<td>4 %</td>
</tr>
<tr>
<td>Upper flammability limit:</td>
<td>75 %</td>
</tr>
<tr>
<td>Flash point</td>
<td>No information available</td>
</tr>
<tr>
<td>Autoignition temperature</td>
<td>570 °C / 1058 °F; (Hydrogen)</td>
</tr>
<tr>
<td>Decomposition temperature</td>
<td>No data available</td>
</tr>
<tr>
<td>Partition coefficient</td>
<td>No data available</td>
</tr>
<tr>
<td>Kinematic viscosity</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Molecular weight</th>
<th>Boiling point</th>
<th>Vapor Pressure</th>
<th>Vapor density (air =1)</th>
<th>Gas Density kg/ m³@ 20°C</th>
<th>Critical Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrogen</td>
<td>1.00</td>
<td>-252.8 °C</td>
<td>Above critical temperature</td>
<td>0.07</td>
<td>0.083</td>
<td>-240 °C</td>
</tr>
<tr>
<td>Arsine</td>
<td>77.94</td>
<td>-62.48 °C</td>
<td>218 PSIA @ 70°F</td>
<td>2.67</td>
<td>3.27</td>
<td>99.9 °C</td>
</tr>
</tbody>
</table>

Note: *The odor threshold of arsine is 10-fold greater than the OSHA permissible exposure limit. Odor is not an adequate indicator of arsine’s presence and does not provide reliable warning of hazardous concentrations.

10. STABILITY AND REACTIVITY

Reactivity
Normally stable, but can become unstable at elevated temperature and pressure
**Chemical stability**
Stable under recommended storage and handling conditions (see Section 7).

**Explosion data**
- **Sensitivity to Mechanical Impact**: None.
- **Sensitivity to Static Discharge**: Yes.

**Possibility of Hazardous Reactions**
May form explosive mixtures with air.

**Conditions to avoid**
Heat, flames and sparks. Extremes of temperature and direct sunlight.

**Incompatible materials**

**Hazardous Decomposition Products**
Hydrogen gas. May decompose to arsenic and arsenic trioxide above 232 °C (450 °F).

## 11. TOXICOLOGICAL INFORMATION

### Information on likely routes of exposure

**Inhalation**
Arsine is a powerful reducing agent and has a strong affinity for the hemoglobin in the blood. The hemolysis of the red blood cells causes renal failure. The destruction of red blood cells causes the primary manifestation of hemolysis. Renal function impairment and possible complete shutdown is the most serious manifestation of arsine poisoning. Permanent injury, especially to the central nervous system or fatal consequences are also well recognized.

**Skin contact**
May cause irritation.

**Eye contact**
High concentrations may cause eye damage, however, systemic poisoning will occur first.

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

### Information on toxicological effects

**Symptoms**
Fatal if inhaled. Arsine is a an extremely toxic gas that destroys red blood cells and can cause widespread organ injury. Inhalation of 250 ppm for 30 minutes is fatal and 3-10 ppm can cause poisoning symptoms in a few hours. Early effects are commonly characterized by drowsiness, giddiness, headache, thirst and abdominal pain with vomiting. Arsine may discolor urine to red or a darkened color, and the skin to a bronze or jaundiced color. Symptoms may be delayed.

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

**Irritation**
Not classified.

**Sensitization**
Not classified.

**Germ cell mutagenicity**
Not classified.

**Carcinogenicity**
The table below indicates whether each agency has listed any ingredient as a carcinogen. (For arsenic and inorganic arsenic compounds).

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>ACGIH</th>
<th>IARC</th>
<th>NTP</th>
<th>OSHA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsine 7784-42-1</td>
<td>A1</td>
<td>Group 1</td>
<td>Known</td>
<td>X</td>
</tr>
</tbody>
</table>

ACGIH (American Conference of Governmental Industrial Hygienists)
A1 - Known Human Carcinogen

IARC (International Agency for Research on Cancer)
Group 1 - Carcinogenic to Humans

NTP (National Toxicology Program)
Known - Known Carcinogen

OSHA (Occupational Safety and Health Administration of the US Department of Labor)
X - Present
### Reproductive toxicity
- Not classified.

### STOT - single exposure
- Not classified.

### STOT - repeated exposure

### Chronic toxicity
- Contains a known or suspected reproductive toxin. May cause adverse liver and kidney effects. May cause adverse effects on the bone marrow and blood-forming system. Prolonged or repeated exposure increases the risk. Possible risk of irreversible effects.

### Target Organ Effects
- Liver, Kidney, Blood, Lymphatic system.

### Aspiration hazard
- Not applicable.

#### Numerical measures of toxicity

**Component Level Information:**

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Oral LD50</th>
<th>Dermal LD50</th>
<th>Inhalation LC50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrogen</td>
<td>-</td>
<td>-</td>
<td>&gt;15000 ppm (Rat) 1 h</td>
</tr>
<tr>
<td>1333-74-0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arsine</td>
<td>-</td>
<td>-</td>
<td>=16.2 ppm (Rat) 4 h</td>
</tr>
<tr>
<td>7784-42-1</td>
<td></td>
<td></td>
<td>=390 mg/m³ (Rat) 10 min</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>20 ppm (mouse) 1 h</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>178 ppm (Rat) 4 h</td>
</tr>
</tbody>
</table>

**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)**

\[ \text{ATEmix} \leq 100 \text{ ppm} \]

### 12. ECOLOGICAL INFORMATION

#### Ecotoxicity
- Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

#### 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.**
  - UN1953
- **Proper shipping name**
  - Compressed gas, toxic, flammable, n.o.s.
- **Hazard Class**
  - 2.3
- **Subsidiary class**
  - 2.1
- **Special Provisions**
  - 1
- **Description**
  - UN1953, Compressed gas, toxic, flammable, n.o.s.(Hydrogen, Arsine). 2.3 (2.1), Marine Pollutant "Toxic-Inhalation Hazard Zone A". If net weight of product is greater than or equal to 100 lbs., the shipping description must also contain the letters “RQ”.

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Page 8 / 11
**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** 119

### TDG
- **UN/ID no.** UN1953
- **Proper shipping name** Compressed gas, toxic, flammable, n.o.s.
- **Hazard Class** 2.3
- **Subsidiary class** 2.1
- **Description** UN1953, Compressed gas, toxic, flammable, n.o.s. (Hydrogen, Arsine), 2.3 (2.1), Marine Pollutant

### MEX
- **UN/ID no.** UN1953
- **Proper shipping name** Compressed gas, toxic, flammable, n.o.s.
- **Hazard Class** 2.3
- **Subsidiary class** 2.1
- **Description** UN1953, Compressed gas, toxic, flammable, n.o.s. (Hydrogen, Arsine), 2.3 (2.1)

### IATA
- **Forbidden**

### IMDG
- **UN/ID no.** UN1953
- **Proper shipping name** Compressed gas, toxic, flammable, n.o.s.
- **Hazard Class** 2.3
- **Subsidiary hazard class** 2.1
- **EmS-No.** F-D, S-U
- **Special Provisions** 274
- **Description** UN1953, Compressed gas, toxic, flammable, n.o.s. (Hydrogen, Arsine), 2.3 (2.1), Marine Pollutant

### ADR
- **UN/ID no.** UN1953
- **Proper shipping name** Compressed gas, toxic, flammable, n.o.s.
- **Hazard Class** 2.3
- **Classification code** 1TF
- **Tunnel restriction code** (B/D)
- **Special Provisions** 327, 625, 344, 197
- **Description** UN1953, Compressed gas, toxic, flammable, n.o.s. (Hydrogen, Arsine), 2.3 2.1, (B/D)
- **Labels** 2.3 +2.1

### 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>Arsine - 7784-42-1</td>
<td>0.1</td>
</tr>
</tbody>
</table>

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Page 9 / 11
SARA 311/312 Hazard Categories

- Acute Health Hazard: Yes
- Chronic Health Hazard: Yes
- Fire Hazard: Yes
- 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).

<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>Arsine (7784-42-1)</td>
<td>-</td>
<td>100 lb</td>
<td>-</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:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th>Hazardous air pollutants (HAPs) content</th>
<th>VOC Chemicals</th>
<th>Class 1</th>
<th>Class 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsine (7784-42-1)</td>
<td>7784-42-1</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**CWA (Clean Water Act)**
This product contains the following substances which are regulated pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42).

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CWA - Reportable Quantities</th>
<th>CWA - Toxic Pollutants</th>
<th>CWA - Priority Pollutants</th>
<th>CWA - Hazardous Substances</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsine (7784-42-1)</td>
<td>-</td>
<td>X</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**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>Hydrogen</td>
<td>10000 lbs</td>
<td></td>
<td>100 lb</td>
</tr>
<tr>
<td>Arsine (7784-42-1)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**US State Regulations**

**California Proposition 65**
This product contains the following Proposition 65 chemicals:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>California Proposition 65</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsine - 7784-42-1</td>
<td>Carcinogen</td>
</tr>
</tbody>
</table>

**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>Hydrogen (1333-74-0)</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Arsine (7784-42-1)</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Carcinogenicity</th>
<th>Exposure Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsine</td>
<td></td>
<td>Mexico: TWA 0.05 ppm</td>
</tr>
</tbody>
</table>
Mexico: TWA 0.2 mg/ m³

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>NPRI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsine</td>
<td>X</td>
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</tbody>
</table>

Legend
Canada NPRI - National Pollutant Release Inventory

16. OTHER INFORMATION

<table>
<thead>
<tr>
<th>NFPA</th>
<th>Health hazards</th>
<th>Flammability</th>
<th>Instability</th>
<th>Physical and Chemical Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4</td>
<td>4</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 08-May-2015
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Revision Note Initial Release

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End of Safety Data Sheet