Section 1 - PRODUCT AND COMPANY IDENTIFICATION

Material Name
0.67% - <2% Phosphine in Hydrogen

Product Use
Industrial and Specialty Gas Applications.

Restrictions on Use
None known.

Details of the supplier of the safety data sheet
MATHESON TRI-GAS, INC.
150 Allen Road, Suite 302
Basking Ridge, NJ 07920
General Information: 1-800-416-2505
Emergency #: 1-800-424-9300 (CHEMTREC)
Outside the US: 703-527-3887 (Call collect)

Section 2 - HAZARDS IDENTIFICATION

Classification in accordance with paragraph (d) of 29 CFR 1910.1200.

Flammable Gases - Category 1
Gases Under Pressure - Compressed gas
Acute Toxicity - Inhalation - Gas - Category 3
Skin Corrosion/Irritation - Category 2
Serious Eye Damage/Eye Irritation - Category 2A
Specific target organ toxicity - Single exposure - Category 1
Specific target organ toxicity - Repeated exposure - Category 1
Hazardous to the Aquatic Environment - Acute - Category 3

GHS Label Elements

Symbol(s)

Signal Word
Danger

Hazard Statement(s)
Extremely flammable gas.
Contains gas under pressure; may explode if heated.
Toxic if inhaled.
May displace oxygen and cause rapid suffocation.
Causes skin irritation.
Causes serious eye irritation.
Causes damage to organs. (Cardiovascular system, digestive system, liver, nervous system, respiratory system)
Causes damage to nervous system and respiratory system through prolonged or repeated exposure.
Harmful to aquatic life.

Precautionary Statement(s)

Prevention
Safety Data Sheet

Material Name: 0.67% - <2% Phosphine in Hydrogen

Keep away from heat, sparks, open flame, and hot surfaces - No smoking.
Do not breathe gas.
Use only outdoors or in a well-ventilated area.
Do not eat, drink or smoke when using this product.
Wear protective gloves and eye/face protection.
Wash thoroughly after handling.
Avoid release to the environment.

Response
Leaking gas fire.
Do not extinguish, unless leak can be stopped safely.
Eliminate all ignition sources if safe to do so.
If exposed: Call a POISON CENTER or doctor/physician.
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
Call a POISON CENTER or doctor/physician.
Specific treatment may be needed, see first aid section of Safety Data Sheet.
IF ON SKIN: Wash with plenty of soap and 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.

Storage
Store in a well-ventilated place.
Protect from sunlight.
Keep container tightly closed.
Store locked up.

Disposal
Dispose in accordance with all applicable regulations.

Other Hazards
Rapid release of compressed gas may cause frostbite.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>CAS</th>
<th>Component Name</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1333-74-0</td>
<td>Hydrogen</td>
<td>&gt;98</td>
</tr>
<tr>
<td>7803-51-2</td>
<td>Phosphine</td>
<td>0.67-1.9</td>
</tr>
</tbody>
</table>

Section 4 - FIRST AID MEASURES

Inhalation
If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.

Skin
If frostbite or freezing occur, immediately flush with plenty of lukewarm water (105-115°F; 41-46°C). DO NOT USE HOT WATER. If warm water is not available, gently wrap affected parts in blankets. Get immediate medical attention.

Eyes
Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Then get immediate medical attention.
**Safety Data Sheet**

**Material Name:** 0.67% - <2% Phosphine in Hydrogen

**Ingestion**
If swallowed, get medical attention.

**Most Important Symptoms/Effects**

**Acute**
Frostbite, suffocation, skin irritation, eye irritation, cardiovascular system damage, digestive tract damage, liver damage, nervous system damage, respiratory system damage

**Delayed**
Nervous system damage, respiratory system damage

**Note to Physicians**
For inhalation, consider oxygen.

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**Section 5 - FIRE FIGHTING MEASURES**

**Extinguishing Media**

**Suitable Extinguishing Media**
Regular dry chemical, carbon dioxide, water spray, alcohol resistant foam.

**Unsuitable Extinguishing Media**
None known.

**Special Hazards Arising from the Chemical**
Severe fire hazard. Severe explosion hazard. Gas/air mixtures are explosive. Containers may rupture or explode if exposed to heat. Electrostatic discharges may be generated by flow or agitation resulting in ignition or explosion.

**Hazardous Combustion Products**
oxides of phosphorus, PHOSPHORUS

**Fire Fighting Measures**
Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For fires in cargo or storage area: Cool containers with water from unmanned hose holder or monitor nozzles until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire. For tank, rail car or tank truck: Stop leak if possible without personal risk. Let burn unless leak can be stopped immediately. For smaller tanks or cylinders, extinguish and isolate from other flammables. Evacuation radius: 800 meters (1/2 mile). Do not attempt to extinguish fire unless flow of material can be stopped first. Flood with fine water spray. Cool containers with water. Apply water from a protected location or from a safe distance. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas. Evacuate if fire gets out of control or containers are directly exposed to fire. Evacuation radius: 500 meters (1/3 mile). Consider downwind evacuation if material is leaking. Stop flow of gas.

**Special Protective Equipment and Precautions for Firefighters**
Wear full protective fire fighting gear including self contained breathing apparatus (SCBA) for protection against possible exposure.

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**Section 6 - ACCIDENTAL RELEASE MEASURES**

**Personal Precautions, Protective Equipment and Emergency Procedures**
Wear personal protective clothing and equipment, see Section 8.

**Methods and Materials for Containment and Cleaning Up**
Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Avoid heat, flames, sparks and other sources of ignition. All equipment used when handling the product must be grounded. Do not touch spilled material. Stop leak if possible without personal risk. Reduce vapors with water spray. Keep unnecessary people away, isolate hazard area and deny entry. Remove sources of ignition. Ventilate closed spaces before entering.

**Environmental Precautions**
Avoid release to the environment.
Section 7 - HANDLING AND STORAGE

Precautions for Safe Handling
Keep away from heat, sparks, open flame, and hot surfaces - No smoking. Do not breathe gas. Use only outdoors or in a well-ventilated area. Do not eat, drink or smoke when using this product. Wear protective gloves/eye protection/face protection. Wash hands thoroughly after handling. Avoid release to the environment.

Conditions for Safe Storage, Including any Incompatibilities
Store in a well-ventilated place.
Protect from sunlight.
Keep container tightly closed.
Store locked up.

Store and handle in accordance with all current regulations and standards. Store in a tightly closed container. Compressed gases can present significant safety hazards. Store in a cool, dry place. Store in a well-ventilated area. Avoid direct sunlight. Protect from physical damage. Cylinders should be stored upright (with valve protection cap in place). Store cylinders away from heavily trafficked areas and emergency exits. Do not store above 125 °F (52 °C). Keep locked up. Subject to storage regulations: U.S. OSHA 29 CFR 1910.101. Keep separated from incompatible substances.

Incompatible Materials
metals, oxidizing materials, metal oxides, combustible materials, halogens, metal salts, halo carbons, lithium, Acids

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

Component Exposure Limits

<table>
<thead>
<tr>
<th>Component</th>
<th>Exposure Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrogen</td>
<td>1333-74-0</td>
</tr>
<tr>
<td>Phosphine</td>
<td>7803-51-2</td>
</tr>
<tr>
<td>ACGIH:</td>
<td>0.3 ppm TWA</td>
</tr>
<tr>
<td></td>
<td>1 ppm STEL</td>
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<tr>
<td>NIOSH:</td>
<td>0.3 ppm TWA ; 0.4 mg/m3 TWA</td>
</tr>
<tr>
<td></td>
<td>1 ppm STEL ; 1 mg/m3 STEL</td>
</tr>
<tr>
<td>Europe:</td>
<td>0.1 ppm TWA ; 0.14 mg/m3 TWA</td>
</tr>
<tr>
<td>OSHA (US):</td>
<td>0.3 ppm TWA ; 0.4 mg/m3 TWA</td>
</tr>
<tr>
<td>Mexico:</td>
<td>0.3 ppm TWA VLE-PPT ; 0.4 mg/m3 TWA VLE-PPT</td>
</tr>
<tr>
<td></td>
<td>1 ppm STEL [PPT-CT ]; 1 mg/m3 STEL [PPT-CT ]</td>
</tr>
</tbody>
</table>

ACGIH - Threshold Limit Values - Biological Exposure Indices (BEI)
There are no biological limit values for any of this product's components.
Engineering Controls
Ventilation equipment should be explosion-resistant if explosive concentrations of material are present. Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

Individual Protection Measures, such as Personal Protective Equipment

Eye/face protection
Wear splash resistant safety goggles. Contact lenses should not be worn. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

Skin Protection
For the gas: Wear appropriate chemical resistant clothing. For the liquid: Wear appropriate protective, cold insulating clothing.

Respiratory Protection
Phosphine: The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA. 3 ppm. Any supplied-air respirator. 7.5 ppm. Any supplied-air respirator operated in a continuous-flow mode. 15 ppm. Any air-purifying full-facepiece respirator (gas mask) with a chin-style, front-mounted or back-mounted canister providing protection against the compound of concern. Any self-contained breathing apparatus with a full facepiece. Any supplied-air respirator with a full facepiece. 50 ppm. Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode. Emergency or planned entry into unknown concentrations or IDLH conditions. Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode. Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode. Escape - Any air-purifying full-facepiece respirator (gas mask) with a chin-style, front-mounted or back-mounted canister providing protection against the compound of concern. Any appropriate escape-type, self-contained breathing apparatus.

Glove Recommendations
For the gas: Wear appropriate chemical resistant gloves. For the liquid: Wear insulated gloves.

<table>
<thead>
<tr>
<th>Section 9 - PHYSICAL AND CHEMICAL PROPERTIES</th>
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<tbody>
<tr>
<td>Appearance</td>
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<tr>
<td>Odor</td>
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<tr>
<td>Odor Threshold</td>
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<td>Melting Point</td>
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<tr>
<td>Boiling Point Range</td>
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<tr>
<td>Evaporation Rate</td>
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<tr>
<td>Autoignition Temperature</td>
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<tr>
<td>Lower Explosive Limit</td>
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<tr>
<td>Upper Explosive Limit</td>
</tr>
</tbody>
</table>
Safety Data Sheet

Material Name: 0.67% - <2% Phosphine in Hydrogen

### Section 10 - STABILITY AND REACTIVITY

**Reactivity**
No reactivity hazard is expected.

**Chemical Stability**
Stable at normal temperatures and pressure.

**Possibility of Hazardous Reactions**
Will not polymerize.

**Conditions to Avoid**
Avoid heat, flames, sparks and other sources of ignition. Minimize contact with material. Avoid direct sunlight. Containers may rupture or explode if exposed to heat.

**Incompatible Materials**
metals, oxidizing materials, metal oxides, combustible materials, halogens, metal salts, halo carbons, lithium, Acids

**Hazardous decomposition products**
oxides of phosphorus, PHOSPHORUS

### Section 11 - TOXICOLOGICAL INFORMATION

**Information on Likely Routes of Exposure**

**Inhalation**
nausea, vomiting, difficulty breathing, irregular heartbeat, headache, fatigue, dizziness, Disorientation, mood swings, tingling sensation, loss of coordination, convulsions, Unconsciousness, coma, irritation, cough, nosebleed, garlic breath, changes in body temperature, changes in blood pressure, tearing, diarrhea, stomach pain, drowsiness, emotional disturbances, tremors, visual disturbances, dilated pupils, bluish skin color, lung congestion, blood disorders, heart damage, kidney damage, liver damage, paralysis, death, chest pain, difficulty speaking, nerve damage, brain damage

**Skin Contact**
frostbite, irritation, blisters

**Eye Contact**
frostbite, irritation, blurred vision

**Ingestion**
ingestion of a gas is unlikely

**Acute and Chronic Toxicity**

**Component Analysis - LD50/LC50**
The components of this material have been reviewed in various sources and the following selected endpoints are published:

**Hydrogen (1333-74-0)**
Inhalation LC50 Rat >15000 ppm 1 h

**Phosphine (7803-51-2)**
Inhalation LC50 Rat 11 ppm 4 h
Product Toxicity Data
Acute Toxicity Estimate
No data available.

Immediate Effects
frostbite, suffocation, skin irritation, eye irritation, cardiovascular system damage, digestive tract damage, liver
damage. nervous system damage, respiratory system damage

Delayed Effects
nervous system damage, respiratory system damage

Irritation/Corrosivity Data
skin irritation, eye irritation

Respiratory Sensitization
No data available.

Dermal Sensitization
No data available.

Component Carcinogenicity
None of this product's components are listed by ACGIH, IARC, NTP, DFG or OSHA.

Germ Cell Mutagenicity
No data available.

Tumorigenic Data
No data available

Reproductive Toxicity
No data available for the mixture.

Specific Target Organ Toxicity - Single Exposure
Cardiovascular system, digestive system, liver, nervous system, Respiratory system

Specific Target Organ Toxicity - Repeated Exposure
nervous system, Respiratory system

Aspiration hazard
Not applicable.

Medical Conditions Aggravated by Exposure
respiratory disorders, kidney disorders, liver disorders, nervous system disorders, skin disorders

Section 12 - ECOLOGICAL INFORMATION

Ecotoxicity
Harmful to aquatic life.

Component Analysis - Aquatic Toxicity
No LOLI ecotoxicity data are available for this product's components.

Persistence and Degradability
No data available for the mixture.

Bioaccumulative Potential
No data available for the mixture.

Mobility
No data available for the mixture.

Section 13 - DISPOSAL CONSIDERATIONS

Disposal Methods
Dispose in accordance with all applicable regulations. Subject to disposal regulations: U.S. U.S. EPA 40 CFR 262.
Hazardous Waste Number(s): D001.

Component Waste Numbers
The U.S. EPA has not published waste numbers for this product's components.
Safety Data Sheet

Material Name: 0.67% - <2% Phosphine in Hydrogen

Section 14 - TRANSPORT INFORMATION

US DOT Information:
Shipping Name: COMPRESSED GAS, TOXIC, FLAMMABLE, N.O.S. , (Contains: Hydrogen, Phosphine)
Hazard Class: 2.3
UN/NA #: UN1953
Required Label(s): 2.3 2.1

IMDG Information:
Shipping Name: COMPRESSED GAS, TOXIC, FLAMMABLE, N.O.S. , (Contains: Hydrogen, Phosphine)
Hazard Class: 2.3
UN#: UN1953
Required Label(s): 2.3 2.1

International Bulk Chemical Code
This material does not contain any chemicals required by the IBC Code to be identified as dangerous chemicals in bulk.

Section 15 - REGULATORY INFORMATION

U.S. Federal Regulations
This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65), CERCLA (40 CFR 302.4), TSCA 12(b), and/or require an OSHA process safety plan.

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS</th>
<th>CA</th>
<th>MA</th>
<th>MN</th>
<th>NJ</th>
<th>PA</th>
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<tr>
<td>Phosphine</td>
<td>7803-51-2</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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</table>

SARA Section 311/312 (40 CFR 370 Subparts B and C) reporting categories
Flammable; Gas Under Pressure; Acute toxicity; Skin Corrosion/Irritation; Serious Eye Damage/Eye Irritation; Specific Target Organ Toxicity

U.S. State Regulations
The following components appear on one or more of the following state hazardous substances lists:

Canada Regulations
Canadian WHMIS Ingredient Disclosure List (IDL)
Safety Data Sheet

Material Name: 0.67% - <2% Phosphine in Hydrogen

Components of this material have been checked against the Canadian WHMIS Ingredients Disclosure List. The List is composed of chemicals which must be identified on MSDSs if they are included in products which meet WHMIS criteria specified in the Controlled Products Regulations and are present above the threshold limits listed on the IDL.

<table>
<thead>
<tr>
<th>Component</th>
<th>Inventory</th>
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Component Analysis - Inventory

Hydrogen (1333-74-0)

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Phosphine (7803-51-2)

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</tbody>
</table>

Section 16 - OTHER INFORMATION

NFPA Ratings

Health: 3 Fire: 4 Reactivity: 0

Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

Summary of Changes

Updated: 05/01/2015

Key / Legend

ACGIH - American Conference of Governmental Industrial Hygienists; ADR - European Road Transport; AU - Australia; BOD - Biochemical Oxygen Demand; C - Celsius; CA - Canada; CA/MA/MN/NJ/PA - California/Massachusetts/Minnesota/New Jersey/Pennsylvania*; CAS - Chemical Abstracts Service; CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act; CFR - Code of Federal Regulations (US); CLP - Classification, Labelling, and Packaging; CN - China; CPR - Controlled Products Regulations; DFG - Deutsche Forschungsgemeinschaft; DOT - Department of Transportation; DSD - Dangerous Substance Directive; DSL - Domestic Substances List; EC – European Commission; EEC - European Economic Community; EIN - European Inventory of (Existing Commercial Chemical Substances); EINECS - European Inventory of Existing Commercial Chemical Substances; ENCS - Japan Existing and New Chemical Substance Inventory; EPA - Environmental Protection Agency; EU - European Union; F - Fahrenheit; F - Background (for Venezuela Biological Exposure Indices); IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; ICAO - International Civil Aviation Organization; IDL - Ingredient Disclosure List; IDLH -
Safety Data Sheet

Material Name: 0.67% - <2% Phosphine in Hydrogen

Immediately Dangerous to Life and Health; IMDG - International Maritime Dangerous Goods; ISHL - Japan Industrial Safety and Health Law; IUCLID - International Uniform Chemical Information Database; JP - Japan; Kow - Octanol/water partition coefficient; KR KECI Annex 1 - Korea Existing Chemicals Inventory (KECI) / Korea Existing Chemicals List (KECL); KR KECI Annex 2 - Korea Existing Chemicals Inventory (KECI) / Korea Existing Chemicals List (KECL), KR - Korea; LD50/LC50 - Lethal Dose/ Lethal Concentration; LEL - Lower Explosive Limit; LLV - Level Limit Value; LOLI - List Of Lists™ - ChemADVISOR’s Regulatory Database; MAK - Maximum Concentration Value in the Workplace; MEL - Maximum Exposure Limits; MX - Mexico; Ne- Non-specific; NFPA - National Fire Protection Agency; NIOSH - National Institute for Occupational Safety and Health; NJTSR - New Jersey Trade Secret Registry; Nq - Non-quantitative; NSL – Non- Domestic Substance List (Canada); NTP - National Toxicology Program; NZ - New Zealand; OSHA - Occupational Safety and Health Administration; PEL - Permissible Exposure Limit; PH - Philippines; RCRA - Resource Conservation and Recovery Act; REACH- Registration, Evaluation, Authorisation, and restriction of Chemicals; RID - European Rail Transport; SARA - Superfund Amendments and Reauthorization Act; Sc - Semi-quantitative; STEL - Short-term Exposure Limit; TCCA – Korea Toxic Chemicals Control Act; TDG - Transportation of Dangerous Goods; TLV - Threshold Limit Value; TSCA - Toxic Substances Control Act; TW – Taiwan; TWA - Time Weighted Average; UEL - Upper Explosive Limit; UN/NA - United Nations /North American; US - United States; VLE - Exposure Limit Value (Mexico); VN (Draft) - Vietnam (Draft); WHMIS - Workplace Hazardous Materials Information System (Canada).

Other Information

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