

## Hydrogen

### SECTION: 1. Product and company

Product form : Substance  
 Name : Hydrogen, compressed  
 CAS No : 1333-74-0  
 Formula : H<sub>2</sub>  
 Other means of identification : Dihydrogen, parahydrogen, refrigerant gas R702, water gas

#### 1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture : Industrial use. Use as directed.

### SECTION 2: Hazards identification

#### 2.1. Classification of the substance or mixture

##### GHS-US classification

#### 2.2. Label elements

##### GHS-US labeling

Hazard pictograms (GHS-US) :



Flam. Gas 1 H220  
 Compressed gas H280

Signal word (GHS-US) : DANGER  
 Hazard statements (GHS-US) :

H220 - EXTREMELY FLAMMABLE GAS  
 H280 - CONTAINS GAS UNDER PRESSURE; MAY EXPLODE IF HEATED  
 OSHA-H01 - MAY DISPLACE OXYGEN AND CAUSE RAPID SUFFOCATION.  
 CGA-HG04 - MAY FORM EXPLOSIVE MIXTURES WITH AIR CGA-HG08 -  
 BURNS WITH INVISIBLE FLAME.

Precautionary statements (GHS-US) :

P202 - Do not handle until all safety precautions have been read and understood  
 P210 - Keep away from Heat, Open flames, Sparks, Hot surfaces. - No smoking P271+P403  
 - Use and store only outdoors or in a well-ventilated place.  
 P377 - Leaking gas fire: Do not extinguish, unless leak can be stopped safely  
 P381 - Eliminate all ignition sources if safe to do so  
 CGA-PG05 - Use a back flow preventive device in the piping.  
 CGA-PG10 - Use only with equipment rated for cylinder pressure.  
 CGA-PG12 - Do not open valve until connected to equipment prepared for use.  
 CGA-PG06 - Close valve after each use and when empty.  
 CGA-PG02 - Protect from sunlight when ambient temperature exceeds 52°C (125°F).

EN (English US) SDS ID: P-4604 1/9

This document is only controlled while on the Praxair, Inc. website and a copy of this controlled version is available for download.

#### 2.3. Other hazards

## Hydrogen

Ehsan international cannot assure the integrity or accuracy of any version of this document after it has been downloaded or removed from our website.

### 2.4. Unknown acute toxicity (GHS-US)

Other hazards not contributing to the classification : None.

No data available

### 3.1. Substance

## SECTION 3: Composition/information on ingredients

Name : Hydrogen, compressed CAS No : 1333-74-0

### 3.2. Mixture

Name	Product identifier	%
Hydrogen	(CAS No) 1333-74-0	99.5 - 100

Not applicable

## SECTION 4: First aid measures

### 4.1. Description of first aid measures

First-aid measures after inhalation : Immediately remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, qualified personnel may give oxygen. Call a physician.

First-aid measures after skin contact : Adverse effects not expected from this product.

First-aid measures after eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. Contact an ophthalmologist immediately. Get immediate medical attention.

First-aid measures after ingestion : Ingestion is not considered a potential route of exposure.

### 4.2. Most important symptoms and effects, both acute and delayed

No additional information available

### 4.3. Indication of any immediate medical attention and special treatment needed

None.

### 5.1. Extinguishing media

## SECTION 5: Firefighting measures

Suitable extinguishing media : Carbon dioxide, dry chemical powder, water spray, fog.

## Hydrogen

### 5.2. Special hazards arising from the substance or mixture

### 5.3. Advice for firefighters

- Fire hazard : EXTREMELY FLAMMABLE GAS. The hydrogen flame is nearly invisible. Hydrogen has a low ignition energy; escaping hydrogen gas may ignite spontaneously. A fireball forms if the gas cloud ignites immediately after release. Hydrogen forms explosive mixtures with air and oxidizing agents.
- Explosion hazard : EXTREMELY FLAMMABLE GAS. Forms explosive mixtures with air and oxidizing agents.
- Reactivity : No reactivity hazard other than the effects described below.
- Firefighting instructions : If venting or leaking gas catches fire, do not extinguish flames. Flammable vapors may spread from leak, creating an explosive reignition hazard. Vapors can be ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharge, or other ignition sources at locations distant from product handling point. Explosive atmospheres may linger. Before entering an area, especially a confined area, check the atmosphere with an appropriate device.
- Evacuate all personnel from the danger area. Use self-contained breathing apparatus (SCBA) and protective clothing. Immediately cool containers with water from maximum distance. Stop flow of gas if safe to do so, while continuing cooling water spray. Remove ignition sources if safe to do so. Remove containers from area of fire if safe to do so. On-site fire brigades must comply with OSHA 29 CFR 1910.156 and applicable standards under 29 CFR 1910 Subpart L—Fire Protection.
- Protection during firefighting : Compressed gas: asphyxiant. Suffocation hazard by lack of oxygen.
- Special protective equipment for fire fighters : Standard protective clothing and equipment (Self Contained Breathing Apparatus) for fire fighters.
- Specific methods : Use fire control measures appropriate for the surrounding fire. Exposure to fire and heat radiation may cause gas containers to rupture. Cool endangered containers with water spray jet from a protected position. Prevent water used in emergency cases from entering sewers and drainage systems.

Stop flow of product if safe to do so.

Use water spray or fog to knock down fire fumes if possible.

## SECTION 6: Accidental release measures

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

General measures : **DANGER: EXTREMELY FLAMMABLE GAS. Forms explosive mixtures with air and oxidizing agents.** See section 5. Evacuate personnel to a safe area. Appropriate self-contained breathing apparatus may be required. Approach suspected leak area with caution. Remove all sources of ignition, if safe to do so. Reduce gas with fog or fine water spray. Stop flow of product if safe to do so. Ventilate area or move container to a well-ventilated area. Flammable gas may spread from leak. Before entering the area, especially a confined area, check the atmosphere with an appropriate device.

#### 6.1.1. For non-emergency personnel

No additional information available

#### 6.1.2. For emergency responders

# Hydrogen

No additional information available

## 6.2. Environmental precautions

Prevent waste from contaminating the surrounding environment. Prevent soil and water pollution. Dispose of contents/container in accordance with local/regional/national/international regulations. Contact supplier for any special requirements.

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

No additional information available

## 6.4. Reference to other sections

See also sections 8 and 13.

## SECTION 7: Handling and storage

### 7.1. Precautions for safe handling

#### Precautions for safe handling

: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Use only non-sparking tools. Use only explosion-proof equipment.

Wear leather safety gloves and safety shoes when handling cylinders. Protect cylinders from physical damage; do not drag, roll, slide or drop. While moving cylinder, always keep in place removable valve cover. Never attempt to lift a cylinder by its cap; the cap is intended solely to protect the valve. When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders. Never insert an object (e.g., wrench, screwdriver, pry bar) into cap openings; doing so may damage the valve and cause a leak. Use an adjustable strap wrench to remove over-tight or rusted caps. Slowly open the valve. If the valve is hard to open, discontinue use and contact your supplier. Close the container valve after each use; keep closed even when empty. Never apply flame or localized heat directly to any part of the container. High temperatures may damage the container and could cause the pressure relief device to fail prematurely, venting the container contents. For other precautions in using this product, see section 16.

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

Storage conditions : Store only where temperature will not exceed 125°F (52°C). Post "No Smoking or Open Flames" signs in storage and use areas. There must be no sources of ignition. Separate packages and protect against potential fire and/or explosion damage following appropriate codes and requirements (e.g., NFPA 30, NFPA 55, NFPA 70, and/or NFPA 221 in the U.S.) or according to requirements determined by the Authority Having Jurisdiction (AHJ). Always secure containers upright to keep them from falling or being knocked over. Install valve protection cap, if provided, firmly in place by hand when the container is not in use. Store full and empty containers separately. Use a first-in, first-out inventory system to prevent storing full containers for long periods. For other precautions in using this product, see section 16.

OTHER PRECAUTIONS FOR HANDLING, STORAGE, AND USE: When handling product under pressure, use piping and equipment adequately designed to withstand the pressures to be encountered. Never work on a pressurized system. Use a back flow preventive device in the piping. Gases can cause rapid suffocation because of oxygen deficiency; store and use with adequate ventilation. If a leak occurs, close the container valve and blow down the system in a safe and environmentally correct manner in compliance with all international, federal/national, state/provincial, and local laws; then repair the leak. Never place a container where it may become part of an electrical circuit.

### 7.3. Specific end use(s)

## Hydrogen

None.

### 8.1. Control parameters

## SECTION 8: Exposure controls/personal protection

### Hydrogen, compressed (1333-74-0)

ACGIH : Not established

USA OSHA : Not established

### Hydrogen (1333-74-0)

ACGIH : Remark (ACGIH) : Simple asphyxiant

USA OSHA : Not established

### 8.2. Exposure controls

Appropriate engineering controls : Use an explosion-proof local exhaust system. Local exhaust and general ventilation must be adequate to meet exposure standards. MECHANICAL (GENERAL): **Inadequate - Use only in a closed system.** Use explosion proof equipment and lighting.

Eye protection : Wear safety glasses with side shields.

Respiratory protection : An air-supplied respirator must be used while working with this product in confined spaces. The respiratory protection used must conform with OSHA rules as specified in 29 CFR 1910.134. Select per OSHA 29 CFR 1910.134 and ANSI Z88.2.

Thermal hazard protection : None necessary.

Other information : Consider the use of flame resistant anti-static safety clothing. Wear safety shoes while handling containers.

## SECTION 9: Physical and chemical properties

### 9.1. Information on basic physical and chemical properties

Physical state : Gas

Appearance : Colorless gas.

Molecular mass : 2 g/mol

Color : Colorless.

Odor : Odorless.

Odor threshold : No data available

pH : Not applicable.

Relative evaporation rate (butyl acetate=1) : No data available

Relative evaporation rate (ether=1) : Not applicable.

Melting point : -259.2 °C (-434.56°F)

Freezing point : No data available

Boiling point : -252.9 °C (-422.97°F)

## Hydrogen

Flash point	: No data available
Critical temperature	: -239.9 °C (-399.82°F)
Auto-ignition temperature	: 566 °C (1051°F)
Decomposition temperature	: No data available
Flammability (solid, gas)	: No data available
Vapor pressure	: Not applicable.
Relative vapor density at 20 °C	: No data available
Relative density	: No data available
Density	: 0.089 g/l (0.0056 lb/ft3) (at STP = 0°C and 1atm)
Relative gas density	: 0.07
Solubility	: Water: 1.6 mg/l
Log Pow	: Not applicable.
Log Kow	: Not applicable.
Viscosity, kinematic	: Not applicable.
Viscosity, dynamic	: Not applicable.
Explosive properties	: Not applicable.
Oxidizing properties	: None.
Explosion limits	: 4 - 77 vol %

### 9.2. Other information

Gas group : Compressed gas  
 Additional information : BURNS WITH INVISIBLE FLAME.

---

## SECTION 10: Stability and reactivity

### 10.1. Reactivity

No reactivity hazard other than the effects described below.

### 10.2. Chemical stability

Stable under normal conditions.

### 10.3. Possibility of hazardous reactions

Can form explosive mixture with air. May react violently with oxidants.

### 10.4. Conditions to avoid

## Hydrogen

### 10.5. Incompatible materials

Keep away from heat/sparks/open flames/hot surfaces. – No smoking.

Oxidizing agents. Lithium. Halogens.

### 10.6. Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced.

### 11.1. Information on toxicological effects

## SECTION 11: Toxicological information

Acute toxicity : Not classified

#### Hydrogen, compressed ( f )1333-74-0

LC50 inhalation rat (ppm) > 15000 ppm/1h

#### Hydrogen (1333-74-0)

LC50 inhalation rat (ppm) > 15000 ppm/1h

Skin corrosion/irritation : Not classified pH:  
Not applicable.

Serious eye damage/irritation : Not classified pH:  
Not applicable.

Respiratory or skin sensitization : Not classified

Germ cell mutagenicity : Not classified

Carcinogenicity : Not classified

Reproductive toxicity : Not classified

Specific target organ toxicity (single exposure) : Not classified

Specific target organ toxicity (repeated exposure) : Not classified

Aspiration hazard : Not classified

## SECTION 12: Ecological information

### 12.1. Toxicity

Ecology - general : No ecological damage caused by this product.

### 12.2. Persistence and degradability

# Hydrogen

<b>Hydrogen, compressed (1333-74-0)</b>	
Persistence and degradability	No ecological damage caused by this product.
<b>Hydrogen (1333-74-0)</b>	
Persistence and degradability	No ecological damage caused by this product.

<b>Hydrogen, compressed (1333-74-0)</b>	
BCF fish 1	(no bioaccumulation expected)
Log Pow	Not applicable.
Log Kow	Not applicable.
Bioaccumulative potential	No ecological damage caused by this product.

<b>Hydrogen (1333-74-0)</b>	
BCF fish 1	(no bioaccumulation expected)
Log Pow	Not applicable.
Log Kow	Not applicable.
Bioaccumulative potential	No ecological damage caused by this product.

<b>Hydrogen, compressed (1333-74-0)</b>	
Mobility in soil	No data available.
Ecology - soil	No ecological damage caused by this product.

**12.4. Mobility in soil**

<b>Hydrogen (1333-74-0)</b>	
Mobility in soil	No data available.
Ecology - soil	No ecological damage caused by this product.

**12.5. Other adverse effects**

Effect on ozone layer : None.

Effect on the global warming : No known effects from this product.

**13.1. Waste treatment methods**

---

## SECTION 13: Disposal considerations

Waste disposal recommendations : Dispose of contents/container in accordance with local/regional/national/international regulations. Contact supplier for any special requirements.

**12.3. Bioaccumulative potential**

## SECTION 14: Transport information

---



## Hydrogen

In accordance with DOT  
 Transport document description : UN1049 Hydrogen, compressed, 2.1  
 UN-No.(DOT) : UN1049  
 Proper Shipping Name (DOT) : Hydrogen, compressed  
 Transport hazard class(es) (DOT) : 2.1 - Class 2.1 - Flammable gas 49 CFR 173.115  
 Hazard labels (DOT) : 2.1 - Flammable gas



DOT Special Provisions (49 CFR 172.102) : N89 - When steel UN pressure receptacles are used, only those bearing the "H" mark are authorized.

### Additional information

Emergency Response Guide (ERG) Number : 115 (UN1049)  
 Other information : No supplementary information available.

Special transport precautions : Avoid transport on vehicles where the load space is not separated from the driver's compartment. Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency. Before transporting product containers: - Ensure there is adequate ventilation. - Ensure that containers are firmly secured. - Ensure cylinder valve is closed and not leaking. - Ensure valve outlet cap nut or plug (where provided) is correctly fitted. - Ensure valve protection device (where provided) is correctly fitted.

### Transport by sea

UN-No. (IMDG) : 1049  
 Proper Shipping Name (IMDG) : HYDROGEN, COMPRESSED  
 Class (IMDG) : 2 - Gases  
 MFAG-No : 115

### Air transport

UN-No. (IATA) : 1049  
 Proper Shipping Name (IATA) : Hydrogen, compressed  
 Class (IATA) : 2  
 Civil Aeronautics Law : Gases under pressure/Gases flammable under pressure

## SECTION 15: Regulatory information

### 15.1. US Federal regulations

<b>Hydrogen, compressed (1333-74-0)</b>	
Listed on the United States TSCA (Toxic Substances Control Act) inventory	
SARA Section 311/312 Hazard Classes	Sudden release of pressure hazard Fire hazard

All components of this product are listed on the Toxic Substances Control Act (TSCA) inventory.

This product or mixture does not contain a toxic chemical or chemicals in excess of the applicable de minimis concentration as specified in 40 CFR §372.38(a) subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

## Hydrogen

### 15.2. International regulations

#### CANADA

<b>Hydrogen, compressed (1333-74-0)</b>
Listed on the Canadian DSL (Domestic Substances List)

<b>Hydrogen (1333-74-0)</b>
Listed on the Canadian DSL (Domestic Substances List)

#### EU-Regulations

<b>Hydrogen, compressed (1333-74-0)</b>
Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)

#### 15.2.2. National regulations

<b>Hydrogen, compressed (1333-74-0)</b>
Listed on the AICS (Australian Inventory of Chemical Substances)
Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China)
Listed on the Korean ECL (Existing Chemicals List)
Listed on NZIoC (New Zealand Inventory of Chemicals)
Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances)

and/or reproductive harm

<b>Hydrogen (1333-74-0)</b>				
U.S. - California - Proposition 65 - Carcinogens List	U.S. - California - Proposition 65 - Developmental Toxicity	U.S. - California - Proposition 65 - Reproductive Toxicity - Female	U.S. - California - Proposition 65 - Reproductive Toxicity - Male	Non-significant risk level (NSRL)
No	No	No	No	

<b>Hydrogen (1333-74-0)</b>
U.S. - Massachusetts - Right To Know List
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right to Know) List

## SECTION 16: Other information

Revision date : 6/3/2015 12:00:00 AM Other information : When you mix two or more chemicals, you can create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture.

Consult an industrial hygienist or other trained person when you evaluate the end product. Before using any plastics, confirm their compatibility with this product.

Praxair asks users of this product to study this SDS and become aware of the product hazards and safety information. To promote safe use of this product, a user should (1) notify employees, agents, and contractors of the information in this SDS and of any other known

## Hydrogen

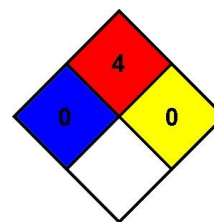
product hazards and safety information, (2) furnish this information to each purchaser of the product, and (3) ask each purchaser to notify its employees and customers of the product hazards and safety information.

The opinions expressed herein are those of qualified experts within Praxair, Inc. We believe that the information contained herein is current as of the date of this Safety Data Sheet. Since the use of this information and the conditions of use are not within the control of Praxair, Inc., it is the user's obligation to determine the conditions of safe use of the product.

Praxair SDSs are furnished on sale or delivery by Praxair or the independent distributors and suppliers who package and sell our products. To obtain current SDSs for these products, contact your Praxair sales representative, local distributor, or supplier, or download from [www.praxair.com](http://www.praxair.com). If you have questions regarding Praxair SDSs, would like the document number and date of the latest SDS, or would like the names of the Praxair suppliers in your area, phone or write the Praxair Call Center (Phone: 1-800-PRAXAIR/1-800-772-9247; Address: Praxair Call Center, Praxair, Inc., P.O. Box 44, Tonawanda, NY 14151-0044).

PRAXAIR and the Flowing Airstream design are trademarks or registered trademarks of Praxair Technology, Inc. in the United States and/or other countries.

NFPA health hazard : 0 - Exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials.  
 NFPA fire hazard : 4 - Will rapidly or completely vaporize at normal pressure and temperature, or is readily dispersed in air and will burn readily.  
 NFPA reactivity : 0 - Normally stable, even under fire exposure conditions, and are not reactive with water.



### HMIS III Rating

Health : 0 Minimal Hazard - No significant risk to health  
 Flammability : 4 Severe Hazard  
 Physical : 3 Serious Hazard

SDS US (GHS HazCom 2012) - Praxair

*This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.*