



# Hydrogen, compressed

## Safety Data Sheet P-4604

Making our planet more productive<sup>™</sup> according to U.S. Code of Federal Regulations 29 CFR 1910.1200. Hazard Communication. Date of issue: 01/01/1980 Revision date: 04/28/2015 Supersedes: 01/13/2015

### SECTION 1: Product and company identification

- 1.1. Product identifier  
 : Substance  
 : 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  
 : Industrial use. Use as directed.
- 1.3. Details of the supplier of the safety data sheet  
 Praxair, Inc.  
 39 Old Ridgebury Road  
 Danbury, CT 06810-5113 - USA  
 T 1-800-772-9247 (1-800-PRAXAIR) - F 1-716-879-2146  
 www.praxair.com
- 1.4. Emergency telephone number  
 : Onsite Emergency: 1-800-845-4633  
 CHEMTREC: 24hr/day 7days/week — Within USA: 1-800-424-9300. Outside USA: 001-703-527-3887 (collect calls accepted, Contract 17729)

### SECTION 2: Hazards identification

- 2.1. Classification of the substance or mixture  
 Classification (GHS-US)  
 Flam. Gas 1 H220  
 Compressed gas H280

### 2.2. Label elements

- GHS-US labeling  
 Hazard pictograms (GHS-US)  
  GHS02 GHS04  
 : DANGER  
 : H220 - EXTREMELY FLAMMABLE GAS  
 H280 - CONTAINS GAS UNDER PRESSURE. MAY EXPLODE IF HEATED  
 OSHA-H01 - MAY DISPLACE OXYGEN AND CAUSE RAPID SUFFOCATION.  
 OSHA-H02 - MAY BE FLEETINGLY IRRITATING TO THE MUCOUS MEMBRANES WITH AIR  
 CGA-HG08 - BURNS WITH INVISIBLE FLAME.  
 : P202 - Do not handle until all safety precautions have been read and understood  
 P271+P403 - Use and store only outdoors or in a well-ventilated place.  
 P307 - Leaking gas line: Do not extinguish, unless leak can be stopped safely  
 P308+P313 - In case of contact with skin or eyes: Rinse with plenty of water. Seek medical attention immediately.  
 CGA-PG05 - Use only for the intended purpose of 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).
- Precautionary statements (GHS-US)

EN (English US)

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### 2.3. Other hazards

- Other hazards not contributing to the classification : None.

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

No data available

### SECTION 3: Composition/information on ingredients

#### 3.1. Substance

Name	Product Identifier	%
Hydrogen, compressed (Main constituent)	(CAS No) 1333-74-0	100

#### 3.2. Mixture

Not applicable

### SECTION 4: First aid measures

#### 4.1. Description of first aid measures

- First-aid measures after inhalation : Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.
- 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.

### SECTION 5: Firefighting measures

#### 5.1. Extinguishing media

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

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

- 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 in sub-sections below.

#### 5.3. Advice for firefighters

- Firefighting instructions : If venting or leaking gas catches fire, do not extinguish flames. Flammable vapors may spread from leak, creating an explosive re-ignition 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.

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### 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 9. Evacuate personnel to a safe area. Appropriate self-protecting equipment should be used. Do not breathe gas, vapors or mists. Evacuation. Remove all sources of ignition. If safe to do so, reduce gas, vapor, or fume concentration. 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  
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.

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### 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. Initial 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)  
None.

### SECTION 8: Exposure controls/personal protection

#### 8.1. Control parameters

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

ACGIH Not established

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.

: Wear safety glasses with side shields.

Eye protection

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

Respiratory protection

: None necessary.

Thermal hazard protection

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

Other information

### 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 : -252.76 °C (-422.97°F)

Flash point : No data available

Critical temperature : -239.9 °C (-399.82°F)

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- 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 : 0.07
- 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 in sub-sections 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**  
 Keep away from heat/sparks/open flames/hot surfaces. - No smoking.

- 10.5. Incompatible materials**  
 Oxidizing agents. Lithium. Halogens.

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

**SECTION 11: Toxicological information**

**11.1. Information on toxicological effects**

- Acute toxicity : Not classified

<b>Hydrogen, compressed (U) 1333-74-0</b>	
LC50 inhalation rat (ppm)	> 15000 ppm/1h

- Skin corrosion/irritation : Not classified

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

- Respiratory or skin sensitization : Not classified.

- Germ cell mutagenicity : Not classified

- Carcinogenicity : Not classified

- Reproductive toxicity : Not classified

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- 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, compressed (1333-74-0)**  
 Persistence and degradability : No ecological damage caused by this product.

**12.3. Bioaccumulative potential**

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

**12.4. Mobility in soil**

- Hydrogen, compressed (1333-74-0)**  
 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.

**SECTION 13: Disposal considerations**

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

**SECTION 14: Transport information**

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



- 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.

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### 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 tightly secured. - Ensure cylinders are closed and capped. - Ensure the outlet cap (if any) is secured. - Ensure the outlet cap (if any) 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.

#### 15.2. International regulations

##### CANADA

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

<b>Hydrogen, compressed (1333-74-0)</b>	Listed on the EEC Inventory EINECS (European Inventory of Existing Commercial Substances)
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#### 15.2.2. National regulations

<b>Hydrogen, compressed (1333-74-0)</b>	Listed on the ACS (Australian Inventory of Chemical Substances)
	Listed on ECSC (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)

#### 15.3. US State regulations

<b>Hydrogen, compressed (1333-74-0)</b>	U.S. - California - Proposition 65 - Carcinogens List	No
	U.S. - California - Proposition 65 - Developmental	No

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

Toxicity	
U.S. - California - Proposition 65 - Reproductive Toxicity - Female	No
U.S. - California - Proposition 65 - Reproductive Toxicity - Male	No
State or local regulations	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

California Proposition 65 - This product contains, or may contain, trace quantities of a substance(s) known to the state of California to cause cancer and/or reproductive toxicity

### SECTION 16: Other information

Revision date : 4/28/2015 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 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.

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

#### NFPA health hazard

NFPA fire hazard

NFPA reactivity

#### 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

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