

SAFETY DATA SHEET (SDS)

GHS and OSHA 29 CFR §1910.1200 (eCFR) compliant

UN1049



Revision: 2 (May 17, 2015)
ISSUE DATE: December 30, 2014

HYDROGEN, GAS H₂,

CGH₂, CGH₂, Hydrogen under pressure, Hydrogen UHP (Ultra High Purity)

STOODY INDUSTRIAL AND WELDING SUPPLY, INC.
3316 National Ave., San Diego, Ca. 92113
Phone: 619-234-6750

WWW.STOODYIND.COM

PHONE NUMBERS
Product Information: 619-234-6750

24-hour Emergency Response
Professional Emergency Resource Services
800-633-8253

MILITARY EMERGENCY RESPONSE
800-851-8061

Grade A	Grade B (Refill)	Ultra High Purity (UHP)
6830-01-431-1196	6830-01-003-2689	6830-00-474-5789

SUPPLIER INFORMATION:

Safety and handling equipment, gas cylinders and refills, personal protection equipment, fire extinguishers, cylinder services, respirators, etc. are available at Stody Industrial and Welding Supply, Inc. Our main location is at 3316 National Avenue, (near the 32nd Street Naval Base) in San Diego California 92113. Call 1-619-234-6750 or visit our web site, stodyind.com for more information.

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HYDROGEN, GAS

1 IDENTIFICATION

- 1(a) **Product identifier used on label:** Hydrogen, compressed
- 1(b) **Other means of identification:** H2, CGH2, CGH₂, Hydrogen under pressure, Hydrogen UHP (Ultra High Purity)
- 1(c) **Recommended use of the chemical and restrictions on use:**
Recommended use; flame cutting, welding shielding gas, fuel gas
Restriction on use; NONE
- 1(d) **Name, address, and telephone number of the chemical manufacturer, importer, or other responsible party**
Chemical Manufacturer: STOODY INDUSTRIAL AND WELDING SUPPLY, INC
3316 National Avenue
San Diego, CA 92113
619-234-6750
- 1(e) **Emergency phone number**
Professional Emergency Resource Services: **800-633-8253**
Military Emergency Resource: **800-851-8061**

2 HAZARD(S) IDENTIFICATION

- 2(a) **Classification of chemical in accordance with paragraph (d) of §1910.1200**
Flammable
- 2(b) **Signal word, hazard statement(s), symbol(s) and precautionary statement(s) in accordance with paragraph (f) of §1910.1200**

Signal Word	Hazard Statement(s)	Symbol(s)	Precautionary Statements
Danger	(H280) Contains Gases under Pressure; may explode if heated. (H220) Extremely flammable gas.	 Compressed Gas	(General P210) Keep away from heat/sparks/open flames/hot surfaces. - No smoking. (Reaction P377 + P381) Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so. (P410 + P403) Protect from sunlight. Store in a well ventilated place.

- 2(c) **Describe any hazard not otherwise classified that have been identified during the classification process**
Hydrogen is a lighter than air gas. It may escape past closure seals that are air-tight and accumulated in inadequately vented storage spaces.
Large amount of potential energy resulting from compression of the gas makes the cylinder a potential rocket or fragmentation bomb.
- 2(d) **Where an ingredient with unknown acute toxicity is used in a mixture at a concentration = 1% and the mixture is not classified based on testing of the mixture as a whole, a statement that X% of the mixture consist of ingredient(s) of unknown acute toxicity is required.**
Hydrogen, CAS No. 1333-74-0, consists of 0% of unknown acute toxicity.

3 COMPOSITION / INFORMATION ON INGREDIENTS

- 3(a) **Chemical name;** H₂
- 3(b) **Common name;** Hydrogen, compressed
- 3(c) **CAS number and other unique identifiers;**

<u>CAS Number</u> 1333-74-0	<u>Other unique identifiers</u> Hydrogen, Technical, Grade A (MOLE, 99.0%) Hydrogen, H/P, Grade B (MOLE, 99.5%) Hydrogen, UHP (MOLE, 99.999%)
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(H/P = High Purity; UHP = Ultra High Purity)
- 3(d) **Impurities and stabilizing additives which are themselves classified and which contribute to the classification of the substance.**
CAS number 1333-74-0 Hydrogen (Technical, H/P or UHP) contains no other classification influencing impurities or stabilizing additives.

4 FIRST-AID MEASURES

- 4(a) **Description of necessary measures, subdivided according to the different routes of exposure, i.e., inhalation, skin and eye contact, and ingestion:**

ROUTES OF EXPOSURE (UNDER NORMAL CONDITIONS) (yes or no)

INHALATION: Yes	SKIN: Yes	EYE CONTACT: Yes	INGESTION: No
Effects: Simple asphyxiant	Effects: None known	Effects: None known	Effects: None known

RAPIDLY EXPANDING STATE ROUTES OF EXPOSURE (yes or no)

INHALATION: Yes	SKIN: Yes	EYE CONTACT: Yes	INGESTION: No
Effects: Simple asphyxiant	Effects: severe frostbite	Effects: severe frostbite	Effects: None expected

Continued on next page

4 FIRST-AID MEASURES (continued from page 1, Para. 4(a))

FIRST-AID: (No action shall be taken involving any personal risk or without suitable training.)
Inhalation (asphyxiation); persons suffering from lack of oxygen should be removed to fresh air. If victim is not breathing, administer artificial respiration. Obtain prompt medical attention.
Skin frostbite; flush with lukewarm water, and obtain immediate medical attention. **DO NOT RUB EFFECTED AREA.**
Eye frostbite; flush eyes with cool water for 15 minutes and obtain immediate medical attention.
Ingestion; unlikely route of exposure, at normal atmospheric pressure hydrogen is a gas.

5 FIRE-FIGHTING MEASURES

5(a) Suitable (and unsuitable) extinguishing media
Combat fire from sheltered position.
Do not extinguish gas flame unless leak can be stopped safely, then only if absolutely necessary.
 Extinguish any other fire. Use extinguishing media as appropriate, e.g., dry chemical, CO₂, water spray or fog.
 Flood cylinders with water from a maximum distance to keep them cool until they can be moved from fire area, if you can do it without risk.

5(b) Specific hazards arising from the chemical (e.g., nature of any hazardous combustion products).
 Hydrogen burns with a pale blue, nearly invisible flame. (The presence of a hydrogen flame can be detected by approaching cautiously with an outstretched straw broom to make the flame visible.)
 If flames are coming from the cylinder valve allow them to burn out. Accidentally extinguished flames can explosively re-ignite.
 Pressure in a cylinder can build due to nearby fire heat and may rupture if pressure relief devices should fail to function.
 Self-contained breathing apparatus (SCBA) may be required for rescue workers.
 Damaged cylinders should be handled only specialists.

6 ACCIDENTAL RELEASE MEASURES

6(a) Personal precautions, protective equipment, emergency procedures.
 Never enter a confined space or other area where the concentration is greater than (0.04%) 10% of Lower Explosion level (LEL).
Escaping hydrogen gas vapor mixed with air is explosive. See 10(d)
 Reduce gas vapor with fog or fine water spray. Remove all sources of ignition and evacuate all personnel from the affected area. Shut off leak source only when it can be done safely.

6(b) Method and materials for containment and cleaning up.
 Use water spray to reduce or divert vapor cloud drift. Isolate area until gas has dissipated and been determined safe. Before entering area you must check for flammable or oxygen-deficient atmospheres (a normal flammable gas detector is not suited for the purpose). Flammable limits in air by volume: Lower Explosion level (LEL) = 4%; Upper Explosion Level (UEL) = 74%.

7 HANDLING AND STORAGE

• Gas/air mixtures are explosive, there is no odor warning. • Keep away from heat, sparks and open flame. • Use only spark-proof tools and explosion-proof equipment. • All piped hydrogen systems and associated electrical equipment must be grounded. • Do not crack or open cylinder valves unless it is connected for use.
 For “Additional Precautions in Using Hydrogen” see Section 16 - Other Information.

7(b) Conditions for safe storage, including any incompatibilities.

Conditions for safe storage	Incompatibilities
<ol style="list-style-type: none"> 1. Store and use with adequate ventilation. 2. Cylinders should be stored upright with valve protection cap in place and firmly secured to prevent falling or being knocked over. 3. Protect cylinders from physical damage; do not drag, roll, slide or drop. 4. Full cylinders should be segregated from empty cylinders. 5. Do not allow storage area temperature to exceed 125°F (52°C). 6. Use a first-in, first-out inventory system to prevent full containers from being stored for long periods of time. 7. Use a suitable hand truck for cylinder movement. 8. Never attempt to lift a cylinder by its valve protection cap. 9. Keep cylinders and their valves free from oil and grease. 10. Never insert an object (e.g., wrench, screwdriver, pry bar, etc.) into valve cap openings. Doing so may damage valve, causing a leak to occur. 	<p>Oxygen and other Oxidizers Cylinders of hydrogen should be separated from oxygen cylinders or other oxidizers by a minimum distance of 20 ft., or by a barrier of non-combustible material at least 5 ft. high having a fire resistance rating of at least 1/2hour.</p>

Specific requirements are listed in NFPA 50A. Cylinder storage locations should be well-protected, well-ventilated, dry, and separated from combustible materials. Cylinders should never knowingly be allowed to reach a temperature exceeding 125°F (52°C).

8 EXPOSURE CONTROLS / PERSONAL PROTECTION

2 8(a) OSHA permissible exposure limit (PEL), American Conference of Governments Industrial Hygienists (ACGIH) Threshold Limits Value (TLV), and any other exposure limit used or recommended by the chemical manufacturer, importer, or employer preparing the safety data sheet, where available.

2 PEL / TLV: Not established. In confined spaces, oxygen content should be at least 19.5% .

2 Maritime: [29 CFR 1915.1000 Table Z-Shipyards](#) -- Simple asphyxiants. The limiting factor is the available oxygen which shall be at least 18 percent and be within the requirements addressing explosion in subpart B of part 1915.

2 8(b) Appropriate engineering controls.

2 Provide natural or explosion-proof ventilation adequate to ensure hydrogen does not reach its lower explosive limit of 4%.

2 8(c) Individual protection measures, such as personal protective equipment.

- Safety glasses/goggles, work gloves (gloves must be clean and free of oil or grease).
- Safety shoes are recommended when handling cylinders.
- When possible wear cotton clothing to prevent possible electro-static discharge.
- A self-contained breathing apparatus (SCBA) must be used in confined spaces.

9 PHYSICAL and CHEMICAL PROPERTIES

a) Appearance (physical state, color, etc.)	Colorless Gas, Gas at normal temperature and pressure
b) Odor	Odorless
c) Odor threshold	Not applicable
d) pH	Not applicable
e) Melting point/freezing point	-434.49 °F (-259.16 ° C)
f) Initial boiling point	-423.182 °F (-252.879 °C)
g) Flash point	Flammable gas
h) Evaporation rate	Not applicable
i) Flammability (solid, gas)	Flammable (gas)
j) Upper/lower flammability or explosive limits	LEL = 4%; UEL = 75%
k) Vapor pressure	Not available
l) Vapor density	0.00521 lb/ft ³ (0.08342 kg/m ³) @ 70.0 ° F (21.1°C), 1 atm
m) Relative density	0.07 (air = 1)
n) Solubility(ies)	0.019 vol/vol @ 60 ° F (15.6 ° C), solubility in water
o) Partition coefficient: n-octanol/water	Not available
p) Auto-ignition temperature	932-1059.8° F (500-571° C)
q) Decomposition temperature	Not available
r) Viscosity	Not available

10 STABILITY and REACTIVITY

10(a) Reactivity

Reacts violently with air, oxygen, halogens and strong oxidants causing fire and explosion hazard. Metal catalysts, such as platinum and nickel, greatly enhance these reactions.

10(b) Chemical stability

Stable

10(c) Possibility of hazardous reactions

See 10(a)

10(d) Conditions to avoid (e.g., static discharge, shock, or vibration)

Pilot light flame, an electrical heater, an electrical switch spark, static discharge, tool strike spark, and ignition sources at distances away from the release point can cause combustion.

10(f) Incompatible materials

(See 10(a).

Some steels are susceptible to hydrogen embrittlement at high pressures and temperatures

10(g) Hazardous decomposition products

None

11 TOXICOLOGICAL INFORMATION

Description of the various toxicological (health) effects and available data used to identify those effects, including:

- 11(a) **Information on likely routes of exposure (inhalation, ingestion, skin and eye contact);**
Hydrogen can be absorbed into the body by Inhalation. Target organ: Central Nervous System.
- 11(b) **Symptoms related to the physical, chemical and toxicological characteristics;**
Dizziness, unconsciousness, asphyxia; skin severe frostbite/burns, eye frostbite (on contact with liquid).
- 11(c) **Delayed and immediate effects and also chronic effects from short- and long-term exposure;**
Short-term effects: Suffocation.
- 11(d) **Numerical measures of toxicity (such as acute toxicity estimates);**
No identifiable acute toxicity.
- 11(e) **Whether the hazardous chemical is listed in the International Toxicology Program (NTP) Report on Carcinogenic (latest edition) or has been found to be a potential carcinogenic in the International Agency for Research on Cancer (IARC) Monographs (latest edition), or by OSHA.**
Hydrogen is not listed as a carcinogenic or potential carcinogenic by NTP, OSHA or IARC.

12 ECOLOGICAL INFORMATION

- 12(a) **Ecotoxicity (aquatic and terrestrial, where available)**
This product does not contain ecotoxicological properties, aquatic or terrestrial
- 12(b) **Persistence and degradability**
No adverse information found
- 12(c) **Bioaccumulative potential**
This product does not have a bioaccumulative potential
- 12(d) **Mobility in soil**
No adverse information found
- 12(e) **Other adverse effects (such as hazardous to the ozone layer)**
No adverse ecological effects are expected. Hydrogen does not contain any Class I or Class II ozone depleting chemicals (40 CFR Part 82). Hydrogen is not listed as a marine pollutant by DOT (49 CFR Part 171).

13 DISPOSAL CONSIDERATIONS

- 13(a) **Description of waste residue and information on their safe handling and method of disposal, including the disposal of any contaminated packaging.**
Do not attempt to dispose of cylinder or its contents. Cylinder(s) and unused contents should be returned to supplier for disposal in accordance with appropriate Federal, State, local regulation.
Related Information (European Waste Code, EWC 16 05 04): Do not discharge into areas where there is a risk of forming an explosive mixture with air. Waste gas should be flared through a suitable burner with a flash back arrestor. Do not discharge into any place where accumulation could be dangerous.
Residual product within process system may be vented at a controlled rate, to the atmosphere through a vent stack that discharges to an elevated point. This vent stack should be in an isolated area away from ignition sources.

14 TRANSPORTATION INFORMATION

- 14(a) **UN number:** UN 1049
- 14(b) **UN proper shipping name:** Hydrogen, compressed
- 14(c) **Transportation hazard class(es):** 2.1
- 14(d) **Packing group, if applicable:** Product is not listed
- 14(e) **Environmental hazards (e.g.,) Marine pollutant (yes/No):** No
- 14(f) **Transport in bulk (according to Annex II of MARPOL 73/78 and IBC Code):**
Product does not fall under purview of cited regulations.
- 14(g) **Special precautions which a user needs to be aware of, or needs to comply with, in connection with transport or conveyance either within or outside of their premises:**
Cylinders should be properly separated from non-compatible gas cylinders and transported in a upright, secure position, in a well ventilated vehicle. The transportation of compressed gas cylinders in automobiles or in closed-body vehicles can present serious safety hazards and should be discouraged

15 REGULATORY INFORMATION

15(a) Safety, health and environmental regulations specific for the product in question.

User(s) of this product are solely responsible for regulatory compliance on a federal, state, and local level.

U.S. FEDERAL REGULATIONS:

EPA - ENVIRONMENTAL PROTECTION AGENCY

40 CFR PART 68, Risk Management for Chemical Accidental Release, does not list hydrogen as a regulated substance in quantities less than 10,000 lb (4536 kg). Facilities that manufacture, use, store or otherwise handle quantities 10,000 lbs or greater that are required to develop and implement risk management programs.

CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (40 CFR Parts 117 and 302): Reportable Quantity (RQ): None

SARA: Superfund Amendment and Reauthorization Act

SECTION 302/304: Requires emergency planning on threshold planning quantities (TPQ) and release reporting based on reportable quantities (RQ) of EPA's extremely hazardous substances (40 CFR Part 355).

Extremely Hazardous Substances: None
Threshold Planning Quantity (TPQ): None

SECTIONS 311/312: Require submission of material safety data sheets (MSDSs) and chemical inventory reporting with identification of EPA defined hazard classes (40 CFR Part 370). The hazard classes for this product are:

ACUTE HEALTH (Immediate): Yes	CHRONIC HEALTH (Delayed): No
PRESSURE: Yes	REACTIVITY: No
FIRE: Yes	

TSCA: Toxic Substance Control Act: Hydrogen is listed on the TSCA inventory.

OSHA - OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION:

29 CFR 1910.119, Appendix A, does not list Hydrogen as a highly hazardous chemical.

No adverse ecological effects are expected. Hydrogen does not contain any Class I or Class II ozone depleting chemicals (40 CFR Part 82). Hydrogen is not listed as a marine pollutant by DOT (49 CFR Part 171).

Shipment of compressed gas cylinders which have not been filled with the owner's consent is a violation of Federal law (49 CFR Part 173.301 (b)).

CALIFORNIA PROPOSITION 65 (Safe Drinking Water and Toxic Enforcement Act of 1986): Hydrogen is not listed.

CANADIAN REGULATIONS:

WHIMS Classification; A - Compressed gas; B1-Flammable and combustible material - Flammable gas

WHIMIS Health Effects Criteria Met by this Chemical: Does not meet criteria.

WHIMIS Ingredient Disclosure List: Not included. Meets criteria for disclosure at 1% or greater.

Note: "The Canadian supplier / Canadian importer has the legal responsibility to assess their products against the criteria set out in the Controlled Products Regulations."

16 OTHER INFORMATION, Including date of preparation or last revision

16(a) OTHER INFORMATION:

Never rely on the color of the cylinder for identification. (Colors may vary with suppliers.)

Additional Precautions in Using Hydrogen:

1. Post "No Smoking or Open Flames" signs in storage and use areas. (There must be no source of ignition.)
2. Use piping and equipment adequately designed to withstand pressures to be encountered.
3. Hydrogen cylinder valve should only be opened enough to indicate pressure on the regulator gauge (not more than 3/4 to 1 1/2 turns) so that the valve can be closed quickly in emergency situations. Opening too little may provide insufficient pressure and lead to a Back-flash.
4. Use piping and equipment adequately designed to withstand pressures to be encountered.
5. Use a check valve or other protective apparatus in any line or piping from the cylinder to prevent reverse flow.
6. Install valve protective cap firmly in place by hand when the cylinder is not in use.
7. A cylinder should never be emptied to a pressure lower than 172 kPa (25 psi/in2) (the residual contents may become contaminated if the valve is left open)
8. Close cylinder valve after each use even when empty.
9. Under no circumstances should any attempt be made to repair a cylinder or valve.
10. Check all connections with a soap solution for leaks, never check for leaks with using an open flame.

Continued on next page

16 OTHER INFORMATION, Including date of preparation or last revision (continued from page 5)**NFPA RATINGS:**

HEALTH-Blue: = 0 FLAMMABILITY-Red: =4 INSTABILITY-Yellow: = 0 SPECIAL HAZARDS*-White: = SA
LEGEND: 0-4 – 0-least hazardous; 4-most hazardous

**OX (Oxidizers), W (Water reactives), SA (Simple Asphyxiants), (blank if no special hazard)*

STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA:

THREADED: 0-3000 psig CGA 350

PIN-INDEXED YOKE: None

Use the proper CGA connections, DO NOT USE ADAPTERS

Further information pertaining to hydrogen and its uses can be found in pamphlets published by: Compressed Gas Association Inc. (CGA), 1725 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202-4102. Telephone: (703)412-0900.

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1 Information Sources: Data is compiled from a variety of sources, including publicly available documents, internal data and other sources.

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