



International Gases Company

Safety Data Sheet

According to Regulation (EC) No. 1272/2008, Regulation (EC) 1907/2006

1. Identification of the substance/mixture and of the responsible company

- 1.1. Product Identifier: Hydrogen, hydrogen compressed, hydrogen (H₂), Dihydrogen
 1.2. Relevant identified uses of the substance or mixture and uses advised against:

Identified uses: Used as a reducing agent in metallurgical processes; in organic synthesis; hydrodealkylation, hydrocracking and refining; hydrogenation of oils and fats, UN 1049.

- 1.3. Details of the supplier of the safety data sheet:

International Gases Company (IGC)
PO Box 12021
Post Coe 31961
Jubail Industrial City
Kingdom of Saudi Arabia

Website: www.sipchem.com/en/affiliates.htm

- 1.4. Emergency telephone number: 00966-359 9985 (24 hours)

2. Hazards Identification

Hydrogen CAS 1333-74-0 Purity: >99%

- 2.1. Classification of the substance or mixture:

Classification of Labeling in accordance with the CLP Regulations:

Index No	International Chemical Identification	EC No	CAS No	Classification		Labeling			Specific Conc. Limits, M-factors	Notes
				Hazard Class and Category Code(s)	Hazard statement Code(s)	Pictogram Signal Word Code(s)	Hazard Statement Code(s)	Suppl. Hazard statement Code(s)		
001-001-00-9	215-605-7	215-605-7	1333-74-0	F+, R12	S9, S16, S33	GHS02 GHS04	Flam. Gas 1 Press. Gas	---	100%	1

Note 1: exempt from REACH

Classification according to Regulation 1272/2008/EC (CLP)

Basis for Classification This substance is classified based on Directive 1272/2008/EC and its amendments (CLP Regulation, GHS)

HYDROGEN (1333-74-0)

SAFETY DATA SHEET according to Regulation (EC) No. 1272/2008, Regulation (EC) No.1907/2006

Hydrogen, rev 2 7/2012

Symbol(s):



Signal Word: Danger

Hazard(s):

H220: Extremely flammable gas

H280: Contains gas under pressure, may explode when heated

Prevention:

P210: Keep away from heat/sparks/open flames/hot surfaces. - No smoking.

Response:

P377: Leaking gas fire: Do not extinguish, unless leak can be stopped safely.

P381: Eliminate all ignition sources if safe to do so.

Storage:

P410+P403: Protect from sunlight. Store in a well-ventilated place.

2.2. Label: See table above

2.3. Other hazards: none known

3. Composition/information on ingredients

Formula:	H ₂
CAS-No.:	1333-74-0
Index-No.	001-001-00-9
EC-No.	215-605-7
Mol Wt.	2.02

4. First Aid Measures

4.1. Description of first aid measures

Eye Contact: Check for and remove any contact lenses. As a precaution immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.

Skin Contact: In case of contact, as a precaution immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Check for skin burns if skin contact results from liquid hydrogen or cold gasses released from a pressurized container.

Inhalation: Asphyxiation hazard. Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion: Never give anything by mouth to an unconscious person. Do not induce vomiting unless directed to do so by medical personnel. Wash mouth with water as a precaution.

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

Symptom of overexposure is the result of asphyxiation. Provide oxygen and seek medical attention.

4.3. Indication of immediate medical attention and special treatment needed:

If breathing is difficult, asphyxiation may be occurring due to lack of oxygen. Give oxygen. Seek medical attention.

SAFETY DATA SHEET according to Regulation (EC) No. 1272/2008, Regulation (EC) No.1907/2006

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5. Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media:

Any extinguishing media.

Unsuitable extinguishing media:

None. Attempt to cut off source of hydrogen flow, if this can be done safely to prevent reignition of hydrogen gas.

5.2. Special hazards arising from the substance or mixture:

Flammable. In a fire or if heated, a pressure increase will occur and the container may burst, with risk of subsequent explosion. Vapors are lighter than air but may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back (temperature below ambient). Firewater runoff to sewer may create fire or explosion hazard.

5.3. Advice for fire fighters:

Special protective equipment for fire fighters: Fire fighters must wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Further information: Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving a personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. Do not allow fire extinguishing water to contaminate surface or groundwater systems. Ventilate to disperse hydrogen gasses in area.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures:

Advice for non-emergency personnel: Evacuate the danger zone; follow emergency precautions. Secure emergency assistance immediately. Avoid contact with the material; do not breathe gas, vapors or aerosol. If possible, provide additional ventilation.

Advice for emergency responders: Do not take action without proper training and emergency equipment. See Section 8 for additional information. Evacuate surrounding areas. Eliminate all ignition sources including flares and all open flames. Avoid all contact with spill material. Ventilate area thoroughly. Maintain adequate ventilation and wear appropriate respiratory protection.

6.2. Environmental precautions:

Avoid dispersal of released material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Hydrogen is unlikely to cause an environmental hazard; however emergency responders should be aware of other substances that may be involved in the release.

6.3. Methods and materials for containment:

Stop leak if without risk. Move containers from release area. Approach release from upwind. Ventilate area thoroughly. Use spark-proof tools and explosion proof equipment. Contaminated absorbent material may adsorb H₂ and pose the similar hazard(s) as the released product.

6.4. Reference to other sections:

See disposal instruction 13 and exposure controls Section 8.

7. Handling and storage

7.1. Precautions for safe handling:

Observe all label precautions. Use appropriate personal protective equipment (see section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Do not get in eyes or on skin or clothing. Do not ingest. Avoid breathing vapor or mist. Use only with adequate ventilation. Wear appropriate air supply respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use non-sparking tools. Take precautionary measures against

electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on protection against fire and explosion: Keep away from flames and sources of ignition – including static.

7.2. Conditions for safe storage, including any incompatibilities:

Store in accordance with local regulations. Pressurized container. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10) and food and drink. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

7.3. Specific end uses:

No other additional special end uses are anticipated.

8. Exposure controls/personal protection

8.1. Control parameters:

Contains no substances with occupational limit values. Use only in a well-ventilated area to prevent accumulation of hydrogen gasses (asphyxiation and flammability hazard)

Exposure Limits

Hydrogen (1333-74-0)

No published occupational exposure limits.

Exposure Limits for Chemicals which may be generated during processing

None noted.

8.2. Exposure controls:

Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure low to avoid asphyxiation and flammability hazards. The engineering controls also need to keep the gas concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Individual protection measures:

Hydrogen gas presents a low hazard for employee contact. PPE should be selected to prevent liquid (cryogenic) splash hazard or for other chemical substances in the work area. Measures stated below are good industrial hygiene practice

Hygiene measures: Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Discard contaminated clothing or wash thoroughly before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection: Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.

Hand protection: Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is required.

Glove material: butyl or nitrile rubber
 Glove thickness: 0.7 mm or thicker
 Break through time: > 240 minutes

Other protective equipment: Flame retardant antistatic protective clothing

Respiratory protection: Hydrogen does not have odor warning properties. Only SCBA or an air supply respirator should be worn if a risk assessment indicates that respiratory protection is necessary. Air purifying respirators are **not** effective. Respirator selection must be based upon known or measured levels of exposure to avoid asphyxiation or flammability hazards.

Environmental exposure controls: Use ventilation and engineering controls to protect workers and ventilate work area to at or below recommended flammability levels. Technical measures are preferred over use of personal protective equipment. Environmental controls, such as scrubber or thermal oxidizer may be required to prevent process releases to the atmosphere. Do not release into the atmosphere—risk of fire or explosion.

9. Physical and chemical properties

9.1. Information on basic physical and chemical properties:

Physical State: Gas	Appearance: Not available
Color: colorless	Physical Form: compressed gas
Odor: odorless	Odor Threshold: Not available
Taste: tasteless	Melting Point: -259 °C
Boiling Point: -253 °C liquid	LEL: 4.0 %
UEL: 75 %	Autoignition: 500 °C
Vapor Pressure: 760 mmHg -253 °C	Vapor Density (air = 1): 0.07
Density: 0.899 g/L @ 0 °C	Water Solubility: 0.00196 @0 °C
Viscosity: 0.08957 cP @26.8 °C	Molecular Weight: 2.0
Molecular Formula: H ₂	Flash Point: < -150 °C

Solvent Solubility

Soluble: alcohol, ethers

10. Stability and reactivity

- 10.1. Reactivity:
 Stable under recommended storage conditions. Vapors may form explosive mixture with air.
- 10.2. Chemical stability:
 Stable under recommended storage conditions.
- 10.3. Possibility of hazardous reactions:

Extremely reactive with incompatible and oxidizing substances. May exotherm or catch fire with mixed with incompatible materials.

10.4. Conditions to avoid:

Avoid heat, flames, sparks and other sources of ignition. Avoid inhalation of material or combustion by-products. Do not store at elevated temperatures.

10.5. Incompatible materials:

Combustible materials, alkaline metals and oxidizing materials

10.6. Hazardous decomposition products:

Carbon oxides.

11. Toxicological information

11.1. Information on toxicological effects:

<u>Acute oral toxicity</u> LD50 rat:	N/A ingestion of gas unlikely
<u>Acute inhalation toxicity</u> LC50 rat:	> 15000 ppm/1 hr (RTECS)
<u>Inhalation (man) TC_{LO}</u> :	no data, simple asphyxiant
<u>Acute dermal toxicity</u> LD50 rabbit:	N/A no data available
<u>Skin irritation</u> :	No data available
<u>Eye irritation</u> :	No data available
<u>Sensitization</u> :	No data, likely not sensitizing
<u>Genotoxicity</u> :	
Mutagenicity:	No data available
Reproductive effects	No data available
<u>Specific target organ toxicity - single exposure</u> :	No data available
<u>Specific target organ toxicity - repeated exposure</u> :	No data available
<u>Aspiration hazard</u> :	NA, simple asphyxiant

11.2. Additional information:

Further data: Simple asphyxiant. Liquid hydrogen may cause skin burns (cold). Handle using good occupational and environmental health practices.

12. Ecological information

12.1. Toxicity

<u>Toxicity in fish</u> LC50:	No data
<u>Toxicity to daphnia and other aquatic invertebrates</u> :	No data
<u>Toxicity to algae</u> :	No data
<u>Toxicity to bacteria</u> :	No data

12.2. Persistence and degradability:

No data available

- 12.3. Bio accumulative potential:
Not expected (compressed gas)
- 12.4. Mobility in soil:
No information available.
- 12.5. Results of PBT and vPvB assessment:
Not classified as PBT or vPvB.
- 12.6. Other adverse effects:
None known.

13. Disposal considerations

Waste treatment methods: The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some residual product (i.e. cylinders and containers not completely empty—flammability hazard). Subject to disposal regulations in the U.S.-- EPA 40 CFR 262 Hazardous Waste Number(s): D001.

14. Transport Information

The transport regulations are cited according to international and/or harmonized transport regulations. There may be national deviations and country specific requirements that have additional requirements.

US DOT Information

Shipping Name: Hydrogen, compressed
Hazard Class: 2.1
UN/NA #: UN1049
Required Label(s): 2.1

TDG Information

Shipping Name: Hydrogen, compressed
Hazard Class: 2.1
UN #: UN1049
Required Label(s): 2.1

ADR Information

Shipping Name: Hydrogen, compressed
Hazard Class: 2
UN #: UN1049
Required Label(s): 2.1

ADR Tunnel Code Restrictions

This list contains tunnel restriction codes for those substances and/or chemically related entries which are found in chapter 3.2 of the ADR
HYDROGEN (1333-74-0)
Restriction(s): B/D [UN1049]; B/D [UN1966]

RID Information

Shipping Name: Hydrogen, compressed
Hazard Class: 2
UN #: UN1049
Required Label(s): 2.1, (+13)

IATA Information

Shipping Name: Hydrogen, compressed
Hazard Class: 2.1
UN #: UN1049
Required Label(s): 2.1

ICAO Information

Shipping Name: Hydrogen, compressed

Hazard Class: 2.1
UN #: UN1049
Required Label(s): 2.1

IMDG Information
Shipping Name: Hydrogen, compressed
Hazard Class: 2.1
UN #: UN1049

15. Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture:

U.S. Federal Regulations

This product is not listed under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 311/312 (40 CFR 370.21), SARA Section 313 (40 CFR 372.65), CERCLA (40 CFR 302.4), TSCA 12(b), nor require an OSHA process safety plan.

SARA Section 311/312 (40 CFR 370 Subparts B and C)

Acute Health: Yes **Chronic Health:** No **Fire:** Yes **Pressure:** Yes **Reactive:** No

U.S. State Regulations

The following components appear on one or more of the following state hazardous substances lists:

Component	CAS	CA	MA	MN	NJ	PA
Hydrogen	1333-74-0	Yes	Yes	Yes	Yes	Yes

Not listed under California Proposition 65

Germany Water Classification

HYDROGEN (1333-74-0)

ID Number 741, not considered hazardous to water

Symbol(s)



F+ Extremely Flammable

Risk Phrases

R12 Extremely flammable.

Safety Phrases

S2 Keep out of the reach of children.

S9 Keep container in a well-ventilated place.

S16 Keep away from sources of ignition - No smoking.

S33 Take precautionary measures against static discharges.

Component Analysis - Inventory

Component	CAS	US	CA	EU	AU	PH	JP	KR	CN	NZ
Hydrogen	1333-74-0	Yes	DSL	EIN	Yes	Yes	No	Yes	Yes	Yes

Globally Harmonized System of Classification and Labelling (GHS)

Australia GHS Classifications

No published information available. This material may be hazardous according to published criteria for classification.

European Union GHS Classifications

Classifications below according to Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures (CLP).

HYDROGEN (1333-74-0)

Flammable gases - Category 1 **H220** Extremely flammable gas.

Gases under pressure **H280** Contains gas under pressure, may explode when heated.

European Union GHS Labelling Information

Labelling information below is according to Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures (CLP).

HYDROGEN (1333-74-0)

Symbol(s):



Signal Word: Danger

Hazard(s):

H220: Extremely flammable gas

H280: Contains gas under pressure, may explode when heated

Prevention:

P210: Keep away from heat/sparks/open flames/hot surfaces. - No smoking.

SAFETY DATA SHEET according to Regulation (EC) No. 1272/2008, Regulation (EC) No.1907/2006
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Response:

P377: Leaking gas fire: Do not extinguish, unless leak can be stopped safely.

P381: Eliminate all ignition sources if safe to do so.

Storage:

P410+P403: Protect from sunlight. Store in a well-ventilated place.

Indonesia GHS Classifications

No published information available. This material may be hazardous according to published criteria for classification.

Japan GHS Classifications

Classifications below published under Japan's Chemicals Classification Program according to the Globally Harmonized System of Classification and

Labelling of Chemicals (GHS).

HYDROGEN (1333-74-0)

Flammable gases - Category 1 **H220** Extremely flammable gas.

Gases under pressure - Compressed gas **H280** Contains gas under pressure, may explode when heated.

Gases under pressure - Refrigerated liquefied gas **H281** Contains refrigerated gas, may cause cryogenic burns or injury.

Japan GHS Labelling Information

Labelling information below according to classifications published by Japan's Chemicals Classification Program according to the Globally

Harmonized System of Classification and Labelling of Chemicals (GHS).

HYDROGEN (1333-74-0)**Symbol(s):**

Signal Word: Danger

Hazard(s):

H220: Extremely flammable gas

H280: Contains gas under pressure, may explode when heated

H281: Contains refrigerated gas, may cause cryogenic burns or injury

Prevention:

P210: Keep away from heat/sparks/open flames/hot surfaces. - No smoking.

P282: Wear cold insulating gloves/face shield/eye protection.

Response:

P336: Thaw frosted parts with lukewarm water. Do not rub affected area.

P315: Get immediate medical advice/attention.

P377: Leaking gas fire: Do not extinguish, unless leak can be stopped safely.

P381: Eliminate all ignition sources if safe to do so.

Storage:

P410+P403: Protect from sunlight. Store in a well-ventilated place.

Korea GHS Classifications (SV)

Classifications below published by Korea's Ministry of Environment (MOE), Ministry of Employment and Labor (MOEL) or Office of National

Emergency Management (NEMA, physical hazards only).

HYDROGEN (1333-74-0)

MOEL: Flammable gases - Category 1 **H220** Extremely flammable gas.

Gases under pressure **H280** Contains gas under pressure, may explode when heated.

Korea GHS Labelling Information

Labelling information below according to classifications published by Korea's Ministry of Environment (MOE), Ministry of Employment and Labor (MOEL) or Office of National Emergency Management (NEMA, physical hazards only).

HYDROGEN (1333-74-0)

Symbol(s):



Signal Word: Danger

Hazard(s):

H220: Extremely flammable gas

H280: Contains gas under pressure, may explode when heated

Prevention:

P210: Keep away from heat/sparks/open flames/hot surfaces. - No smoking.

Response:

P377: Leaking gas fire: Do not extinguish, unless leak can be stopped safely.

P381: Eliminate all ignition sources if safe to do so.

Storage:

P410+P403: Protect from sunlight. Store in a well-ventilated place.

New Zealand GHS Classifications

Classifications below according to the Environmental Risk Management Authority's (ERMA) Hazardous Substances and New Organisms (HSNO) Act, as amended.

HYDROGEN (1333-74-0) Approval: HSR001002

Flammable gases - Category 1 **H220** Extremely flammable gas.

New Zealand GHS Labelling Information

Labelling information below according to classifications published by New Zealand's Environmental Risk Management Authority's (ERMA) Hazardous Substances and New Organisms (HSNO) Act, as amended.

HYDROGEN (1333-74-0)

Symbol(s):



Signal Word: Danger

Hazard(s):

H220: Extremely flammable gas

Prevention:

P210: Keep away from heat/sparks/open flames/hot surfaces. - No smoking.

Response:

P377: Leaking gas fire: Do not extinguish, unless leak can be stopped safely.

P381: Eliminate all ignition sources if safe to do so.

Storage:

P403: Store in a well-ventilated place.

South Africa GHS Classifications

Information below presented according to the South African Bureau of Standards (SANS 10234:2008 - Globally Harmonized System (GHS) of Classification and Labelling of Chemicals). The information below identifies substances with recommended GHS classifications by CAS or RR numbers and chemical names; the data field contains the word "Present" along with any clarifying information in parenthesis.

HYDROGEN (1333-74-0)

Listing: Present

Taiwan GHS Classifications

Information below presented according to Taiwan's Bureau of Standards, Metrology and Inspection (BSMI) of the Ministry of Economic Affairs. This agency has published a series of standards (CNS 15030 1-27 Chemical Classification and Labelling) which provide guidance on classification and labelling of chemicals according to GHS.

HYDROGEN (1333-74-0)

Taiwan: Flammable gases - Category 1 **H220** Extremely flammable gas.

Gases under pressure **H280** Contains gas under pressure, may explode when heated.

Taiwan GHS Labelling Information

Labelling information below according to classifications published by Taiwan's Bureau of Standards, Metrology and Inspection (BSMI) of the Ministry of Economic Affairs. This agency has published a series of standards (CNS 15030 1-27 Chemical Classification and Labelling) which provide guidance on classification and labelling of chemicals according to GHS.

HYDROGEN (1333-74-0)

Symbol(s):



Signal Word: Danger

Hazard(s):

H220: Extremely flammable gas

H280: Contains gas under pressure, may explode when heated

Prevention:

P210: Keep away from heat/sparks/open flames/hot surfaces. - No smoking.

Response:

P377: Leaking gas fire: Do not extinguish, unless leak can be stopped safely.

P381: Eliminate all ignition sources if safe to do so.

Storage:

P410+P403: Protect from sunlight. Store in a well-ventilated place.

15.2. **Chemical Safety Assessment:**

Sipchem has not conducted a chemical safety assessment for this product.

16. Other information

16.1. Training Advice:

Provide safety information, instruction and training to operators handling Hydrogen.

The information and recommendations herein are taken from data contained in independent, industry recognized references. Although reasonable care has been taken in the preparation of the information herein, Sipchem and International Gases Company make no guarantee, warranty (express or implied) or other representation and assume no responsibility as to the accuracy or suitability of such information for application of the information, since conditions of its use are beyond control of these companies. Sipchem and International Gases Company shall not bear any liability whatsoever for any loss or damage incurred in connection with the use of this substance.