

HYDROGEN

SECTION 1: CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Identifier : Hydrogen
 CAS No. : 1333-74-0
 Chemical formula : H₂
 Synonyms : Hydrogen
 REACH Registration Number : Listed in Annex IV/V REACH, exempted from registration

Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture : General Industrial and Professional use. Perform risk assessment prior to use.
 Restriction on use : Not for consumer use

Details of the supplier of the safety data sheet

Physical address : Air Products South Africa (Pty) Ltd.
 Silver Stream Business Park, 1st Floor, Building 3,
 10 Muswell Road South,
 Bryanston, 2191
 Telephone : +27 (0)11 570 5000 (Head Office)
 +27 (0)11 977 6444 (Customer Care Cylinders)
 0800 023 298 (Engineering / Bulk Services)

Emergency telephone number (24h) : 0800 650 315

SECTION 2: HAZARDS IDENTIFICATION

Classification of the substance or mixture

Flammable gases – Category 1A H220: Extremely flammable gas.
 Gases under pressure – Compressed gas. H280: Contains gas under pressure, may explode if heated

Label elements

Hazard pictograms/symbols



Signal Word : Danger

Hazard Statements:

H220: Extremely flammable gas.
 H280: Contains gas under pressure, may explode if heated

Precautionary Statements:

Prevention	: P210: Keep away from heat, hot surfaces, sparks, open flames, and other ignition sources. No smoking
Response	: P377: Leaking gas fire: do not extinguish, unless leak can be stopped safely. P381: In case of leakage, eliminate all ignition sources if safe to do so.
Storage	: P403: Store in a well-ventilated place

Other hazards

Burns with an invisible flame
 Can ignite on contact with air
 High pressure gas
 Can cause rapid suffocation
 Extremely flammable
 May form explosive mixtures in air
 Immediate fire and explosion hazard exists when mixed with air at concentrations exceeding the lower flammability limit (LFL)
 High concentrations that can cause rapid suffocation are within the flammable range and should not be entered
 Avoid breathing gas
 Self-contained breathing apparatus (SCBA) may be required.

Environmental Effects

Not harmful.

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SECTION 3: COMPOSITION / INFORMATION ON INGREDIENTS

Substances

Components	EINECS/ELINCS Number	CAS Number	Concentration (Volume)
Hydrogen	215-605-7	1333-74-0	100%

Components	CLASSIFICATION (CLP)	REACH Req #
Hydrogen	Flam. gas 1A; H220 Press Gas (Comp.) ; H280	*1

*1: Listed in Annex IV/V REACH, exempted from registration.

*2: Registration not required. Substance manufactured or imported < t/y

*3: Registration not required: substance manufactured or imported < 1 t/y for non-intermediate uses.

Refer to section 16 for full text of each relevant hazard statement (H)

Concentration is nominal. For the exact product composition, please refer to Air Products product specifications.

Mixtures : Not applicable

SECTION 4: FIRST AID MEASURES

Description of first aid measures

General advice : Move victim to uncontaminated area wearing self-contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.

Eye contact : In case of direct contact with eyes, seek medical advice

Skin contact : Adverse effects not expected from this product. IF exposed or concerned: Get medical advice/attention.

Ingestion : Ingestion is not considered a potential route of exposure.

Inhalation : Move to fresh air. If breathing has stopped or is laboured, give assisted respirations. Supplemental oxygen may be indicated. If the heart has stopped, trained personnel should begin cardiopulmonary resuscitation immediately. In case of shortness of breath, give oxygen. Seek medical advice.

Most important symptoms and effects, both acute and delayed

Symptoms : Exposure to oxygen deficient atmosphere may cause the following symptoms: Dizziness. Salivation. Nausea. Vomiting. Loss of mobility/unconsciousness.

Indication of any medical attention and special treatment need

Treatment : If exposed or concerned: get medical attention/advice.

SECTION 5: FIRE-FIGHTING MEASURES

Extinguishing media

Suitable extinguishing media : Shutting off the source of the gas is the preferred method of control. Be aware of the risk of formation of static electricity with the use of CO₂ extinguishers and do not use them in places where a flammable atmosphere may be present.

Extinguishing media which must not be used for safety reasons : Do not use water jet to extinguish.

Special hazards arising from the substance or mixture

Ignitable by static electricity. Burns with an invisible flame. Gas is lighter than air and can accumulate in the upper sections of enclosed spaces. Upon exposure to intense heat or flame, cylinder will vent rapidly and/or rupture violently. Keep containers and surroundings cool with water spray. Extinguish fire only if gas flow can be stopped. If possible shut off the source of gas and allow the fire to burn itself out. Do not extinguish a leaking gas flame unless absolutely necessary. Spontaneous / explosive re-ignition may occur. Extinguish any other fire. Move away from container and cool with water from a protected position. Keep adjacent cylinders cool by spraying with large amounts of water until fire burns itself out. If flames are accidentally extinguished, explosive re-ignition may occur, therefore, appropriate measures should be taken (e.g. total evacuation to protect persons from cylinder fragments and toxic fumes should a rupture occur).

Advice for fire-fighters : In confined spaces use self-contained breathing apparatus. Standard protective clothing and equipment (Self Contained Breathing Apparatus) for fire fighters. Standard EN 137 – Self-contained open-circuit compressed air breathing apparatus with full face mask. Standard EN 469 – Protective clothing for fire-fighters. Standard EN 659 – Protective gloves for fire-fighters

Further information : The presence of a hydrogen flame can be detected by approaching cautiously with an outstretched straw broom to make the flame visible.

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SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Evacuate personnel to safe areas. Remove all sources of ignition. Never enter a confined space or any other area where the flammable gas concentration is greater than 10% of its lower flammability limit. Ventilate the area.

Environmental precautions : Do not discharge into any place where its accumulation could be dangerous. Should not be released into environment. Prevent further leakage or spillage if safe to do so.

Methods and material for containment and cleaning up

Ventilate the area. Approach suspected leak areas with caution.

Additional advice : Increase ventilation to the release area and monitor concentrations. If leak is from cylinder or cylinder valve, call the Air Products emergency telephone number. If the leak is in the user's system, close the cylinder valve, safely vent the pressure, and purge with an inert gas before attempting repairs.

Reference to other sections : For more information refer to sections 8 and 13.

SECTION 7: HANDLING AND STORAGE

Precautions for safe handling

Cylinders should be stored upright with valve protection guard in place and firmly secured to prevent falling or being knocked over. Use equipment rated for cylinder pressure. May ignite if valve is opened to air. Protect cylinders from physical damage; do not drag, roll, slide or drop. Do not allow storage area temperature to exceed 50°C. Only experienced and properly instructed persons should handle compressed gases/cryogenic liquids. Before using the product, determine its identity by reading the label. Know and understand the properties and hazards of the product before use. When doubt exists as to the correct handling procedure for a particular gas, contact the supplier. Do not remove or deface labels provided by the supplier for the identification of the cylinder contents.

When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders. Do not remove valve guards. Before connecting the container, check the complete gas system for suitability, particularly for pressure rating and materials. Before connecting the container for use, ensure that back feed from the system into the container is prevented. Ensure the complete gas system is compatible for pressure rating and materials of construction. Ensure the complete gas system has been checked for leaks before use. Employ suitable pressure regulating devices on all containers when the gas is being emitted to systems with lower pressure rating than that of the container. Never insert an object (e.g. wrench, screwdriver, pry bar, etc) into the valve openings. Doing so may damage the valve causing a leak to occur.

Open valve slowly. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier. Close container valve after each use and when empty, even if still connected to equipment. Never attempt to repair or modify container valves or safety relief devices. Damaged valves should be reported immediately to the supplier. Close valve after each use and when empty. Do not subject containers to abnormal mechanical shocks which may cause damage to their valve or safety devices. Never attempt to lift a cylinder by its valve guard. Do not use containers as rollers or supports or for any other purpose than to contain the gas as supplied. Never strike an arc on a compressed gas cylinder or make a cylinder a part of an electrical circuit. Do not smoke while handling product or cylinders. Never re-compress a gas or a gas mixture without first consulting the supplier. Never attempt to transfer gases from one cylinder/container to another. Always use backflow protective device in piping. Purge air from system before introducing gas. Never use direct flame or electrical heating devices to raise the pressure of a container. Containers should not be subjected to temperatures above 50°C. Prolonged periods of cold temperature below -30°C should be avoided. Ensure equipment is adequately earthed.

Conditions for safe storage, including any incompatibilities

Full containers should be stored so that oldest stock is used first. Containers should be stored in a purpose built compound which should be well ventilated, preferably in the open air. Stored containers should be periodically checked for general condition and leakage. Observe all regulations and local requirements regarding storage of containers. Protect containers stored in the open against rusting and extremes of weather. Containers should not be stored in conditions likely to encourage corrosion. Containers should be stored in the vertical position and properly secured to prevent toppling. The container valves should be tightly closed and where appropriate valve outlets should be capped or plugged. Container valve guards or caps should be in place. Keep containers tightly closed in a cool, well-ventilated place. Store containers in location free from fire risk and away from sources of heat and ignition. Full and empty cylinders should be segregated. Do not allow storage temperature to exceed 50°C. Smoking should be prohibited within storage areas or while handling product or containers. Display "No Smoking or Open Flames" signs in the storage areas. The amounts of flammable or toxic gases in storage should be kept to a minimum. Return empty containers in a timely manner.

Technical measures/Precautions

Containers should be segregated in the storage area according to the various categories (e.g. flammable, toxic, etc.) and in accordance with local regulations. Keep away from combustible material. All electrical equipment in the storage areas should be compatible with flammable materials stored. Containers containing flammable gases should be stored away from other combustible materials. Where necessary containers containing oxygen and oxidants should be separated from flammable gases by a fire resistant partition.

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SECTION 8: EXPOSURE CONTROLS AND PERSONAL PROTECTION

Control parameters

DNEL: Derived no effect level (Workers) : None available.
PNEC: predicted no effect concentration : None available.

Exposure controls

Engineering measures

Provide natural or explosion proof ventilation that is adequate to ensure flammable gas does not reach its lower explosive limit.

Personal protective equipment

Respiratory protection : High concentrations that can cause rapid suffocation are within flammable range and should not be entered.

Hand protection : Wear work gloves when handling gas cylinders/containers. Standard EN 388 - protective gloves against mechanical risk.
The breakthrough time of the selected glove(s) must be greater than the intended use period.

Eye/face protection : Safety glasses recommended when handling cylinders. Standard EN 166 – personal eye protection.

Skin and body protection : Safety shoes are recommended when handling cylinders. Standard EN ISO 20345 – personal protective equipment – safety footwear.
Wear as appropriate: flame retardant protective clothing. Standard EN ISO 14116 – Limited flame spread materials. Standard EN ISO 1149-5 – Protective clothing: electrostatic properties.

Special instructions for protection and hygiene : Ensure adequate ventilation, especially in confined areas.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Form : Compressed gas.
Colour : Colourless gas
Odour : No odour warning properties.
Molecular Weight : 2.02 g/mol
Relative vapour density : 0.07 (air = 1) Lighter than air
Vapour pressure : Not applicable.
Density : 0.0001 g/cm³ at 21 °C

Boiling point/range : -253 °C
Critical temperature : -240 °C
Melting point/range : -259.2 °C
Water solubility : 0.0016 g/l
Auto-ignition temperature : 560 °C
Upper flammability limit : 75%
Lower flammability limit : 4%
Partition coefficient n-octanol/water [log kow] : Not applicable
pH : Not applicable
Viscosity : No reliable data available
Particle characteristics : Not applicable
Upper and lower explosion/flammability limits : 75 % (V) and 4% (V)
Flash point : Not applicable
Decomposition temperature : Not applicable

Other information

Explosive properties : Not applicable
Oxidizing properties : No oxidising properties.
Odour threshold : Odour threshold is subjective and inadequate to warn of over exposure
Evaporation rate : Not applicable
Flammability (solid/gas) : Tci: 5.5

SECTION 10: STABILITY AND REACTIVITY

Reactivity : No reaction hazard other than the effects described in sub sections below.

Chemical Stability : Stable under normal conditions.

Possibility of hazardous reactions : No data available

Conditions to avoid : Heat, flames and sparks. May form explosive mixtures with air and oxidising agents.

Incompatible Materials : Oxygen.
Oxidising agents.

Hazardous decomposition products : Under normal conditions and use, hazardous decomposition products should not be produced

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SECTION 11: TOXICOLOGICAL INFORMATION

Information on toxicological effects

Likely routes of exposure

Effects on eye	: In case of direct contact with eyes, seek medical advice.
Effects on Skin	: Adverse effects not expected from this product.
Inhalation effects	: In high concentrations may cause asphyxiation. Symptoms may include loss of mobility/consciousness. Victim may not be aware of asphyxiation. Asphyxiation may bring about unconsciousness without warning and so rapidly that victim maybe unable to protect themselves.
Ingestion effects	: Ingestion is not considered a likely route of exposure.
Symptoms	: Exposure to oxygen deficient atmosphere may cause the following symptoms: Dizziness. Salivation. Nausea. Vomiting. Loss of mobility/unconsciousness.

Acute toxicity

Acute oral toxicity	: No data available on the product itself.
Acute inhalation toxicity	: No data available on the product itself.
Acute dermal toxicity	: No data available on the product itself.
Skin corrosion/irritation	: No data available.

Serious eye damage/eye irritation : No data available.

Sensitization : No data available.

Chronic toxicity or effects from long time exposure

Carcinogenicity	: No data available.
Reproductive toxicity	: No data available on the product itself.
Germ cell mutagenicity	: No data available on the product itself.
Specific target organ systemic toxicity (single exposure)	: No data available.
Specific target organ systemic toxicity (repeated exposure)	: No data available.
Aspiration hazard	: No data available.

SECTION 12: ECOLOGICAL INFORMATION

Toxicity

Aquatic toxicity	: No data is available on the product itself.
Toxicity to other organisms	: No data is available on the product itself

Persistence and degradability

No data available	
Bioaccumulative potential	: Refer to section 9 "Partition coefficient (n-octanol/water)".
Mobility in soil	: Because of its high volatility, the product is unlikely to cause ground pollution.

Other adverse effects

This product has no eco-toxicological effects

Effect on the ozone layer

Ozone depleting potential : None

Effect on global warming

Global warming potential : When discharged in large quantities may contribute to the greenhouse effect.

Global warming potential : 6

SECTION 13: DISPOSAL CONSIDERATIONS

Waste treatment method	: Contact supplier if guidance is required. Return unused product in original cylinder to supplier. 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 flash back arrestor.
Contaminated packaging	: Return cylinder to supplier.

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SECTION 14: TRANSPORT INFORMATION

UN number or ID number

UN/ID No. : UN1049

UN proper shipping name

Transport by road/rail (ADR/RID) : HYDROGEN, COMPRESSED

Transport by air (ICAO-TI / IATA-DGR): Hydrogen, compressed

Transport by sea (IMDG) : HYDROGEN, COMPRESSED

Transport hazard class(es)

Label(s) : 2.1

Transport by road/rail (ADR/RID)

Class or Division : 2

ADR/RID/ADN Haz ID no. : 23

Tunnel Code : (B/D)

Transport by air (ICAO-TI / IATA-DGR)

Class or Division : 2.1

Transport by sea (IMDG)

Class or Division : 2.1

Packing group

Transport by road/rail (ADR/RID) : Not applicable.

Transport by air (ICAO-TI / IATA-DGR): Not applicable.

Transport by sea (IMDG) : Not applicable.

Environmental hazards

Transport by road/rail (ADR/RID)

Marine Pollutant : No

Transport by air (ICAO-TI / IATA-DGR)

Marine Pollutant : No

Transport by sea (IMDG)

Marine Pollutant : No

Segregation Group : None

Special precautions for user

Transport by air (ICAO-TI / IATA-DGR)

Passenger and Cargo Aircraft : Transport forbidden.

Cargo Aircraft only : Transport allowed.

Further Information

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. Ensure compliance with applicable regulations.

Before transporting product containers ensure that they are firmly secured and: Cylinder valve is closed and not leaking, valve outlet cap nut or plug (where provided) is correctly fitted, and the valve protection device (where provided) is correctly fitted.

The transportation information is not intended to convey all specific regulatory data relating to this material. For complete transportation information, contact an Air Products customer service representative.

SECTION 15: REGULATORY INFORMATION

OHS Act : Occupational Health and Safety Act 85 of 1993 (and Regulations)

SANS 11014 : Safety data sheet for chemical products- Content and order of sections

SANS 10234 : Globally Harmonized System of classification and labelling of chemicals (GHS)

SANS 10265 : The classification and labelling of dangerous substances and preparations for sale and handling

SANS 10019 : Transportable containers for compressed, dissolved and liquefied gases – Basic design, manufacture, use and maintenance

SANS 1518 : Transport of dangerous goods – Design, construction, testing, approval and maintenance of road vehicles and portable tanks

SANS 10228 : The identification and classification of dangerous goods for transport

SANS 10229-1&2 : Transport of dangerous goods – Packaging and large packaging for road and rail transport Part 1: Packaging / Part 2: Large Packaging

SANS 10263-2 : The warehousing of dangerous goods Part 2: The storage and handling of gas cylinders

NB: Refer to latest edition

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SECTION 16: OTHER INFORMATION

Ensure all national/local regulations are observed.

Hazard Statements

H220: Extremely flammable gas.

H280: Contains gas under pressure, may explode if heated.

Indication of Method

Flammable gases Category 1. Extremely flammable gas.

Gases under pressure. Compressed gas. Contains gas under pressure, may explode if heated.

Abbreviations and acronyms

ATE – Acute Toxicity Estimate

CLP – Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008

REACH – Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation (EC) No 1907/2006

EINECS – European Inventory of Existing Commercial Chemical Substances

ELINCS – European List of Notified Chemical Substances

CAS# - Chemical Abstract Service number

PPE – Personal Protective Clothing

Kow – octanol-water partition coefficient

LC50- Lethal Concentration to 50% of a test population

LD50 – Lethal Dose to 50% of a test population (Median Lethal Dose)

OEL – Occupational Exposure Limit

PBT – Persistent Bioaccumulative and Toxic

vPvB - Very Persistent and Very Bioaccumulative

STOT – Specific Target Organ Toxicity

EN – European Standard

UN – United Nations

ADR – European Agreement concerning the International Carriage of Dangerous Goods by Road

IATA – International Air Transport Association

IMDG – International Maritime Dangerous Goods

RID – Regulations concerning the International Carriage of Dangerous Goods by Rail

Details given in this document are believed to be correct at the time of going to press. Whilst proper care has been taken in the preparation of this document, no liability for injury or damage resulting from its use can be accepted.

Note: This SDS is valid for five years from the date of publishing and will be reviewed once every five years as per Section 14A of the Hazards Chemical Agents Regulations.

*(Reference www.airproducts.com :- Air Products S.A./N.V. Belgium Hydrogen
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