

SDS Number: 067A

HYDROGEN

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name : Hydrogen
 Chemical formula : H₂
 Synonyms : Hydrogen
 Use of the substance/preparation : General Industrial
 Manufacturer/Importer/Distributor : 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

2. COMPOSITION / INFORMATION ON INGREDIENTS

<u>Components</u>	<u>CAS Number</u>	<u>Concentration (Volume)</u>
Hydrogen	1333-74-0	100 %

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

3. HAZARDS IDENTIFICATION

Main Hazard / Emergency Overview

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
 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.

Potential Health Effects

Inhalation : In high concentrations may cause asphyxiation. Asphyxiation may bring about unconsciousness without warning and so rapidly that victim may be unable to protect themselves.
 Eye contact : No adverse effect.
 Skin contact : No adverse effect.
 Ingestion : Ingestion is not considered a potential route of exposure.
 Chronic Health Hazard : Not applicable.
 Aggravated Medical Condition : None.
 Symptoms : Exposure to oxygen deficient atmosphere may cause the following symptoms: Dizziness. Salivation. Nausea. Vomiting. Loss of mobility/consciousness.

Environmental Effects

Not harmful.

4. FIRST AID MEASURES

General advice : Remove 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 : Not applicable.
 Skin contact : Not applicable.
 Ingestion : Ingestion is not considered a potential route of exposure.
 Inhalation : Remove to fresh air. If breathing has stopped or is labored, 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.

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5. FIRE-FIGHTING MEASURES

- Suitable extinguishing media : All known extinguishing media can be used.
- Specific hazards : 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 of 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 (eg. total evacuation to protect persons from cylinder fragments and toxic fumes should a rupture occur).
- Special protective equipment for fire-fighters : Wear self contained breathing apparatus for fire fighting if necessary.
- Further information : The presence of a hydrogen flame can be detected by approaching cautiously with an outstretched straw broom to make the flame visible.

6. ACCIDENTAL RELEASE MEASURES

- Personal precautions : 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 for 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.

7. HANDLING AND STORAGE

Handling

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. 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.

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.

Storage

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

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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.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

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 : Sturdy work gloves are recommended for handling cylinders. The breakthrough time of the selected glove(s) must be greater than the intended use period.
- Eye protection : Safety glasses recommended when handling cylinders.
- Skin and body protection : Safety shoes are recommended when handling cylinders. Wear as appropriate: flame retardant protective clothing.
- Special instructions for protection and hygiene : Ensure adequate ventilation, especially in confined areas.

9. PHYSICAL AND CHEMICAL PROPERTIES

- Form : Compressed gas.
- Color : Colorless gas
- Odor : No odor warning properties.
- Molecular Weight : 2.02 g/mol

- Relative vapor density : 0.07 (air = 1)
- Vapor pressure : Not applicable.
- Density : 0.0001 g/cm³ at 21 °C Note: (as vapor)
- Specific Volume : 11.9830 m³/kg at 21 °C
- Boiling point/range : -252.9 °C
- Critical temperature : -240 °C
- Melting point/range : -259.2 °C
- Water solubility : 0.0016 g/l
- Autoignition temperature : 560 °C
- Upper flammability limit : 75%
- Lower flammability limit : 4%

10. STABILITY AND REACTIVITY

- Stability : Stable under normal conditions.
- Conditions to avoid : Heat, flames and sparks. May form explosive mixtures with air and oxidising agents.
- Materials to avoid : Oxygen.
Oxidising agents.

11. TOXICOLOGICAL INFORMATION

Acute Health Hazard

- Ingestion : No data is available on the product itself.
- Inhalation : No data is available on the product itself.
- Skin : No data is available on the product itself.

12. ECOLOGICAL INFORMATION

Ecotoxicity effects

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

Persistence and degradability

- Mobility : No data available.
- Bioaccumulation : No data is available on the product itself.

Further information

This product has no known eco-toxicological effects.

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13. DISPOSAL CONSIDERATIONS

Waste from residues / unused products : 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.

14. TRANSPORT INFORMATION

ADR

Proper shipping name : HYDROGEN, COMPRESSED
Class : 2.1
UN/ID No. : UN1049
Class : 2
ADR/RID Hazard ID no. : 23

IATA

Proper shipping name : Hydrogen, compressed
Class : 2.1
UN/ID No. : UN1049

IMDG

Proper shipping name : HYDROGEN, COMPRESSED
Class : 2.1
UN/ID No. : UN1049

RID

Proper shipping name : HYDROGEN, COMPRESSED
Class : 2.1
UN/ID No. : UN1049

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. 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.

15. REGULATORY INFORMATION

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

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

16. OTHER INFORMATION

Labelling according to SANS 10265:1999 : 001-001-00-9

Hazard symbol : F+ Extremely flammable

R-phrases : R12 Extremely flammable.

S-phrases : S 9 Keep container in a well-ventilated place.
S16 Keep away from sources of ignition. - No smoking.
S33 Take precautionary measures against static discharges.

Ensure all national/local regulations are observed.

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.

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