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MATERIAL SAFETY DATA SHEET

Product Name:

HYDROGEN, Compressed (H₂)

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IDENTIFICATION

Chemical Name: Hydrogen (H₂)
Synonyms: None
UN Number: 1049

Use: Combustion, reducing atmospheres (e.g. steel industry), hydrogenation of oils and fats, laboratory as a carrier gas

HAZARDS IDENTIFICATION

Dangerous Goods Class and Subsidiary Risk: 2.1
HSNO Classification: 2.1.1A

Hazard Statement: Extremely flammable gas.
Explosive; fire, blast or projection hazard.

Precautionary Statements: Read before label before use.
Read material safety data sheet before use.
Keep away from heat, sparks, open flames and hot surfaces.
No smoking.
Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
Eliminate all ignition sources if safe to do so.
Store in a well ventilated place.
Do not subject to any rough handling (grinding/shock/friction/banging).
Explosion risk in case of fire.
Fight fire with normal precautions from a reasonable distance.
Take precautionary measures against static discharges.
Wear protective gloves and eye protection.

COMPOSITION

Ingredients	CAS Number	Proportion
Chemical Entity		
Hydrogen	1333-74-0	100%

Contains no other components or impurities that will influence the classification of the product.

FIRST AID MEASURES**Health Effects****Acute**

Swallowed: Not applicable to gases
Eye: Not irritating to the eye
Skin: Not irritating to the skin

Inhaled: Hydrogen is non-toxic; by diluting the oxygen concentration in air below the level necessary to support life; it can act as an asphyxiant. Effects of oxygen deficiency are:

- 16%: breathing and pulse rate increased, impaired thinking and attention, reduced coordination;
- 14%: Abnormal fatigue upon exertion, emotional upset, faulty coordination, poor judgement;
- 12.5%: Very poor judgement and coordination, impaired respiration that can cause permanent hearing damage, nausea and vomiting;
- below 10%: Inability to perform various movements, loss of consciousness, convulsions, and death.

Chronic

Long term exposure to argon based mixtures has no known health effects. Prolonged exposure to an oxygen deficient atmosphere (below 19% oxygen in air) may affect the heart and nervous system.

First AidInhalation:

In high concentrations may cause asphyxiation. Symptoms may include loss of mobility/consciousness. Remove victim to uncontaminated area whilst wearing self contained breathing apparatus. Victim may not be aware of asphyxiation. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.

Advice to Doctor

Advise doctor that victim has been exposed to an oxygen deficient atmosphere.

General:

Rescuers should not enter an oxygen deficient atmosphere without using self-contained full face positive pressure breathing equipment.

Rescue personnel should be aware of extreme fire hazard associated with hydrogen rich atmospheres.

FIRE FIGHTING MEASURES**Flammability:**

Highly flammable. Spontaneously flammable in air. Avoid all ignition sources.

Fire/Explosion Hazard:

Hydrogen is highly flammable and burns with almost invisible flame.

Exposure to fire may cause container to rupture/explode. Cylinders involved in a fire/explosion may rocket. Move cylinders from vicinity of fire if safe to do so. Cool cylinders by spraying flooding quantities of water from a protected location. If unable to keep cylinders cool, evacuate area, minimum distance 200 meters. Do not extinguish a leaking gas flame unless absolutely necessary. Spontaneous/explosive re-ignition may occur. Extinguish any other fire.

Extinguishing Media:

Water fog or fine water spray. Cool cylinders with water if possible.

Hazchem Code:

2 S E

Recommended Protective Clothing:

In confined space use self-contained breathing apparatus.

ACCIDENTAL RELEASE MEASURES**Personal Protection:**

Personnel engaged in the movement of cylinders shall be provided with safety footwear, safety glasses and leather or PVC gloves. Full cover overalls are recommended. In areas where equipment failure may cause an immediate high concentration of hydrogen, ensure adequate ventilation and have approved self-contained, full face respiratory equipment readily available for emergencies.

Spills and Disposal:

Ventilate area. Stop leak if it can be done without risk. Allow gas to dissipate to atmosphere. Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous.

Reference Guide:

Standard SNZ HB 76:2008 Dangerous Goods – Initial Emergency Response Guide.

AS/NZS 1337 – Eye Protection for Industrial Applications

AS/NZS 2161.1 – Occupational Protective Gloves – Selection, use and maintenance

AS/NZS 1715 – Selection, Use and Maintenance of Respiratory Protective Devices

AS/NZS 1716 – Respiratory Protective Devices

General:

Only experienced and properly instructed personnel should handle compressed gases. Open valve slowly to avoid pressure shock. Cylinder contents and identification labels provided by the supplier must not be removed or defaced. Colour coding should not be the only criterion used for content identification.

HANDLING AND STORAGE**Handling****Flammability:**

Highly flammable. Spontaneously flammable in air. Avoid all ignition sources.

General:

Only experienced and properly instructed personnel should handle compressed gases. Open valve slowly to avoid pressure shock. Cylinder contents and identification labels provided by the supplier must not be removed or defaced. Colour coding should not be the only criterion used for content identification.

Approved Handlers:

Approved handlers are required if more than 100 m³ is stored on site.

Storage:

Storage of compressed gas cylinders shall be in compliance with New Zealand HSNO Regulations.

Cylinders will be kept away from ignition sources (including static discharges).

Cylinders shall be stored in a cool, dry, well ventilated area out of direct sunlight and away from heat and ignition sources.

No part of cylinders shall be exposed to temperatures above 50°C.

Cylinders shall be stored upright on a level, fireproof floor, secured in position and protected from damage.

Full cylinders shall be stored separately from empties.

Cylinders should be moved by hand-truck or cart designed for that purpose.

Separation:

Avoid any contact with oil or grease particularly to the cylinder valve.

Keep hydrogen cylinders a minimum of 5 meters away from ignition sources and from incompatible materials (e.g. HSNO classes 1, 3, 4 and 5).

Keep hydrogen cylinders a minimum of 5 meters away from edge of the controlled zone.

A controlled zone is an area surrounding a hazardous substance location, beyond the controlled zone members of the public are provided with reasonable protection from adverse events.

Spills and Disposal:

Ventilate area. Stop leak if it can be done without risk. Allow gas to dissipate to atmosphere. Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous.

EXPOSURE CONTROLS / PERSONAL PROTECTION**Exposure Standards:**

Simple asphyxiant.

Engineering Controls:

Provide adequate local exhaust and dilution (general) ventilation and supply sufficient replacement air to maintain oxygen concentration above 19%.

Personal Protection:

Personnel engaged in the movement of cylinders shall be provided with safety footwear, safety glasses and leather or PVC gloves. Full cover overalls are recommended. In areas where equipment failure may cause an immediate high concentration of hydrogen, ensure adequate ventilation and have approved self-contained, full face respiratory equipment readily available for emergencies.

Reference Guide:

AS/NZS 1337 – Eye Protection for Industrial Applications
AS/NZS 2161.1 – Occupational Protective Gloves – Selection, use and maintenance
AS/NZS 1715 – Selection, Use and Maintenance of Respiratory Protective Devices
AS/NZS 1716 – Respiratory Protective Devices

PHYSICAL AND CHEMICAL PROPERTIES**Physical Properties**

Appearance:	Colourless, Odourless, Tasteless	Flashpoint:	Not Applicable
Boiling Point:	-252.8°C	Flammability Limits in Air:	4% to 75%
Vapour Pressure:	Not Applicable	Solubility in Water (at 0°C):	0.0210 m ³ /kg

Other Properties

Relative Density (at 15°C) (Air = 1):	0.070	Density of Gas (101.3 kPa, 15°C):	0.0852 kg/m ³
Molecular Weight:	2.016	Critical Temperature:	-239.9°C

STABILITY AND REACTIVITY**Flammability:**

Highly flammable. Spontaneously flammable in air. Avoid all ignition sources.

Materials Compatibility:

Hydrogen is non-corrosive and can be used with all commonly used, non-reactive metals at room temperature and low pressure. At higher pressures, hydrogen causes embrittlement of some materials, particularly cold worked ferritic steels. Most elastomers are compatible with hydrogen.

TOXICOLOGY INFORMATION

No known toxicological effects from this product.

ECOLOGICAL INFORMATION

No known ecological damage caused by this product.

DISPOSAL CONSIDERATIONS

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. Do not discharge into any place where its accumulation could be dangerous.

TRANSPORT INFORMATION

UN Number:	1049
Proper Shipping Name:	HYDROGEN, COMPRESSED
Dangerous Goods Class and Subsidiary Risk:	2.1
Packing Group:	Not applicable
Hazchem Code:	2 S E

Other Information: Avoid transport on vehicles where the load 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 that containers are firmly secured.
- Ensure cylinder valve is closed and not leaking.
- Ensure there is adequate ventilation.
- Compliance with applicable regulations.

REGULATORY INFORMATION

ERMA Register Approval No: HSR001002

HSNO Controls: Hazardous Substances (Classes 1 to 5 Controls) Regulations 2001.
Hazardous Substances (Disposal) Regulations 2001.
Hazardous Substances (Personnel Qualifications) Regulations 2001.
Hazardous Substances (Emergency Management) Regulations 2001.
Hazardous Substances (Identification) Regulations 2001.
Hazardous Substances (Compressed Gases) Regulations 2004.
Hazardous Substances (Tank Wagon and Transportable Containers) Regulations 2004.
Schedule 10 of the Hazardous Substances (Dangerous Goods and Scheduled Toxic Substances) Transfer Notice 2004.
Schedule 12 of the Hazardous Substances (Dangerous Goods and Scheduled Toxic Substances) Transfer Notice 2004.

Approved Handlers: Approved handlers are required if more than 100 m³ is stored on site.

OTHER INFORMATION

Compressed Hydrogen is supplied in high pressure cylinders.

Cylinder Colour: AS 4484-2004 Red PMS 485C

Cylinder Valve Outlet: AS 2473 Type 20

- References:
- . L'Air Liquide Gaz Encyclopaedia - Elsevier Scientific Publishing Co. Amsterdam
 - . NZS 5433:2007 Transport of Dangerous Goods on Land
 - . ERMA Website – Approvals Register – www.erma.govt.nz
 - . SNZ HB76:2008 Dangerous Goods – Initial Emergency Response Guide
 - . Air Liquide Group MSDS – Hydrogen AL067A Rev. 1
 - . ISO 10156 Gases and Gas mixtures – Determination of Fire Potential and Oxidising Ability for the Selection of Cylinder Valve Outlets
 - . Air Liquide Australia "Hydrogen" MSDS June 2008
 - . AS1678 2C1 Emergency Procedure Guide – Transport – Non-Flammable, Compressed Gas
 - . AS 4484-2004 - Gas Cylinders for Industrial, Scientific, medical and refrigerant use - labelling and colour coding
 - . AS 2473.2-2007 - Valves for compressed gas outlets - Part 2 Outlet connections (threaded) and stem (inlet) threads
 - . Air Liquide New Zealand Document - DOPM-Z-TECH-0060 Cylinder Reference Manual for Cylinder Identification
 - . CGA Safety bulletin SB2-2007 Oxygen Deficiency
 - . Operators Handbook for the Transport of Dangerous Goods by Road – NZ Road Transport & Logistics Industry Training Organisation
 - . ALNZ - Transport of Gas cylinders in Non-Dedicated Vehicles Customer Information Guide
 - . Work Place Exposure Standards Effective From 2002, Department of Labour, New Zealand
 - . NZCIC Code of Practice – Preparation of Safety Data Sheets

END MSDS

This MSDS summarises to our best knowledge, at the date of issue, the health and safety hazard information regarding this product and general guidance on how to safely handle the product in the workplace. All due care has been taken to include accurate and up-to-date information in this MSDS.

Each user should read this MSDS and consider the information in the context of how the product will be handled and used in the workplace in conjunction with other products. If clarification or further information is needed to ensure that an appropriate risk assessment can be made, the user should contact Air Liquide New Zealand.

As far as lawfully possible, no liability for any loss, injury or damage (including consequential loss) which may be suffered or incurred by any person as a consequence of their reliance on the information contained in this MSDS can be accepted.

Our responsibility for products sold is subject to our standard terms and conditions, a copy of which is available on request.

This MSDS has been prepared in accordance with NZCIC Code of Practice – Preparation of Safety Data Sheets.

This MSDS is subject to change without notice, for the latest version of this MSDS visit <http://www.airliquide.com.au/en/technical/new-zealand-msds.html>

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