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Safety advice.

Compressed gases

Safety Data Sheet
HYDROGEN
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Version: 01

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name	HYDROGEN
UN-Number	UN1049
Recommended Use	Compressed gas
Synonyms	Compressed Hydrogen
Manufacturer's Registered Office	Oxygen House, P-43 Taratala Road, Kolkata - 700 088, India www.linde.in
Telephone Number	(+91 33) 66021600
24 Hour Emergency Contact Number:	(+91) 9831851034

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Oxygen House, P-43 Taratala Road, Kolkata-700 088
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2. HAZARDS IDENTIFICATION

DANGER!

Extremely Flammable gas. Spontaneous combustion with air is possible. May form explosive mixtures with air. Avoid heat, sparks, and flames Simple asphyxiant Contents under pressure this line will be changed by High pressure compressed gas.
Keep at temperatures below 52° C/125° F

Appearance Colorless

Physical State Compressed gas

Odor Odorless

OSHA Regulatory Status This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Potential Health Effects

Principle Routes of Exposure Inhalation. Skin contact.

Acute Toxicity

Inhalation Simple asphyxiant. High concentrations may exclude an adequate supply of oxygen to the lungs. Effect of oxygen deficiency (<19.5% oxygen level) may include rapid breathing , diminished mental alertness, impaired muscular coordination, faulty judgement, deprivation of all sensations, emotional instability and fatigue. As asphyxiation progresses nausea, vomiting, prostration and loss of consciousness may occur, leading to convulsions, coma and even death.

Eyes None known. Contact with rapidly expanding gas near the point of release may cause severe harm.

Skin None known.

Skin Absorption Hazard No known hazard in contact with skin.

Ingestion Not an expected route of exposure.

Chronic Effects None Known.

Aggravated Medical Conditions None Known.

Environmental Hazard See Section 12 for additional Ecological Information.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS-No	Volume %	Chemical Formula
Hydrogen	1333-74-0	>99	H_2

4. FIRST AID MEASURES

Eye Contact None under normal use. Get medical attention if symptoms occur.

Skin Contact None under normal use. Get medical attention if symptoms occur.

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Inhalation	PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF INHALATION OVEREXPOSURE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS (SCBA). Conscious inhalation victims should be assisted to an uncontaminated area and inhale fresh air. If breathing is difficult, Administer oxygen under medical supervision / trained personnel supervision. Unconscious persons should be moved to an uncontaminated area and, as necessary, given artificial resuscitation and supplemental oxygen. Treatment should be symptomatic and supportive.
Ingestion	None under normal use. Get medical attention if symptoms occur.
Notes to Physician	Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Flammable Properties	Extremely flammable.
Suitable Extinguishing Media	Dry chemical or CO_2. Water spray or fog.
Explosion Data	
Sensitivity to Mechanical Impact	None
Sensitivity to Static Discharge	Yes.
Specific Hazards Arising from the Chemical	Hydrogen is very light and may collect in the upper portions of storage areas. Hydrogen burns with an almost invisible flame. High-pressure releases may ignite with no apparent ignition source possibly via static electricity rapid flame propagation and flashback possibly easily ignited over a wide range of concentrations in air. Position where to be mentioned in this paragraph. EL: 4%. UEL: 76%. Autoignition temperature (AIT): 570 Continue to cool fire-exposed cylinders until flames are extinguished. Cylinders may rupture under extreme heat. Damaged cylinders should be handled only by specialists.
Protective Equipment and Precautions for Firefighters	If possible, stop the flow of gas. Do not extinguish the fire until supply is shut off as otherwise an explosive-ignition may occur. If the fire is extinguished and the flow of gas continues, use increased ventilation to prevent the build-up of an explosive atmosphere. A water fog may be used to create ventilation. Ventilation fans must be explosion-proof. Use non-sparking tools to close container valves. Isolate spill or leak area. 100 meters distance is recommended from the leak area. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible withdraw from the area and let the fire burn. Use water spray to cool surrounding containers limit the number of personnel in the proximity of fire and evacuate surrounding areas in all directions. As in any fire, wear self-contained breathing apparatus pressure-demand, NIOSH (approved or equivalent), and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions	ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). Evacuate personnel to safe areas. Keep people away from the area of the leak. All equipment used when handling the product must be grounded. Wear self-contained breathing apparatus when entering the area unless the atmosphere is proved to be safe. Monitor oxygen level.
Environmental Precautions	Beware of vapors accumulating to form explosive concentrations. Prevent the spreading of vapors through overhead ventilation systems and confined areas.
Methods for Containment	Stop the flow of gas or remove the cylinder to outdoor location if this can be done without risk. If a leak is in the container or container valve, contact the appropriate emergency telephone number in Section 1 or call your closest Linde location.
Methods for Cleaning Up	Return cylinder to Linde India Ltd.

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7. HANDLING AND STORAGE

Handling

Ground and bond all lines and equipment associated with the hydrogen system. All equipment should be non-sparking and explosion-proof. Separate hydrogen cylinder from oxygen cylinder and other oxidizers by a minimum distance of 20 ft. or by a 5 ft. high barrier with a minimum fire-resistance rating of half an hour. Post "NO SMOKING" signs in use and storage areas. Remove all sources of ignition. Use only in ventilated areas. Hydrogen is non-corrosive. However, hydrogen can interact with metals (hardened steels) to cause embrittlement.

Never attempt to lift a cylinder by its valve protection cap. Protect cylinders from physical damage; do not drag, roll, slide or drop. When moving cylinders, even for short distances, use a cart designed to transport cylinders. Use equipment rated for cylinder pressure. Use a backflow preventive device in the piping.

Never insert an object (e.g. wrench, screwdriver, pry bar, etc.) into valve cap openings. Doing so may damage the valve, causing a leak to occur. If a user experiences any difficulty operating the cylinder valve discontinue use and contact the supplier.

Never put cylinders into trunks of cars or unventilated areas of passenger vehicles. Never attempt to re-fill a compressed gas cylinder without the owner's written consent. Never strike an arc on a compressed gas cylinder or make a cylinder a part of an electrical circuit.

For additional recommendations consult rule number 18 & 20 of the Gas Cylinders, Rules, 2016.

Storage

Outside or detached storage is preferred. Protect from physical damage. Cylinders should be stored upright with a valve protection cap in place and firmly secured to prevent falling. Store in a cool, dry, well-ventilated area of non-combustible construction away from high traffic areas and emergency exits. Keep at temperatures below 52°C / 125°F. Full and empty cylinders should be segregated. Use a "First-In-First-Out" (FIFO) inventory system to prevent full cylinders from being stored for excessive periods of time. Always store and handle compressed gas cylinders in accordance with rule number 21 of the Gas Cylinders, Rules, 2016.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines

This product does not contain any hazardous materials with occupational exposure limits established by the region-specific regulatory bodies.

Engineering Measures

Explosion-proof ventilation systems. Local exhaust ventilation to prevent accumulation of high concentrations and maintain air-oxygen levels at or above 19.5%.

Ventilation

Ensure adequate ventilation, especially in confined areas. Flammable gas concentration must be below 10% of the LEL (0.4%) prior to entry.

Personal Protective Equipment

Eye/Face Protection

Wear protective eyewear (safety glasses).

Skin and Body Protection

Work gloves and safety shoes are recommended when handling cylinders. Cotton or Nomex® clothing is recommended to prevent static build-up.

Respiratory Protection

General Use

No special protective equipment required.

Emergency Use

Use positive pressure airline respirator with escape cylinder or self-contained breathing apparatus foroxygen-deficient atmospheres (<19.5%).

Hygiene Measures

Wear suitable gloves and eye/face protection.

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9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Colorless.	Odor	Odorless.
Odor Threshold	No information available.	Physical State	Compressed gas
Flash Point	No information available	Autoignition Temperature	570 °C / 1058 °F
Decomposition Temperature	No information available.	Boiling Point/Boiling Range	-252.8 °C / -423.2 °F
Freezing Point	-259.2 °C / -434.8 °F	Molecular Weight	2.105 (as H2)
Water Solubility	0.019 vol/vol@15.6°C	Evaporation Rate	No information available
Vapor Pressure	Supercritical	Vapor Density	0.069 (air = 1)
Gas Density	0.00521 lb/ft³ (0.08342 kg/m³) @21.1°C (70°F)	VOC Content (%)	Not applicable.
Specific Vol.@21.1°C & 1 atm	190.8 ft³/lb (11.99 m³/kg)	Critical Pressure	190.8 psia (1315 kPa abs)
Flammability Limits in Air			
Upper	75%		
Lower	4%		

10. STABILITY AND REACTIVITY

Stability	Stable.
Incompatible Products	All oxidizing agents.
Conditions to Avoid	Heat, flames, and sparks. Flammable or explosive when mixed with chlorine or other oxidizing materials. Fluorine and hydrogen react at -418°F (-250°C) when impurities are present. Chlorine/hydrogen mixtures explode if exposed to light. Lithium metal will burn in a hydrogen atmosphere.
Hazardous Decomposition Products	None known.
Hazardous Polymerization	Hazardous polymerization does not occur.

11. TOXICOLOGICAL INFORMATION

Acute Toxicity

LD50 Oral:	No information available.
LD50 Dermal:	No information available.
LC50 Inhalation:	No information available.
Inhalation	Product is a simple asphyxiant.
Repeated Dose Toxicity	No information available.

Toxicity

Chronic Toxicity	None known.
Carcinogenicity	Contains no ingredient listed as a carcinogen.
Irritation	Non-irritating to the skin. Non-irritating to the eye.
Sensitization	No information available.
Reproductive Toxicity	No information available.
Developmental Toxicity	Oxygen deficiency during pregnancy has produced developmental abnormalities in humans and experimental animals.
Synergistic Materials	None known.

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Target Organ Effects	None known.

12. ECOLOGICAL INFORMATION

Ecotoxicity

The environmental impact of this product has not been fully investigated.

Ozone depletion potential; ODP; (R-11 = 1): Does not contain ozone depleting chemical (40 CFR Part 82).

13. DISPOSAL CONSIDERATIONS

Waste Disposal Methods	Do not attempt to dispose of residual waste or unused quantities. Return in the shipping container PROPERLY LABELED WITH ANY VALVE OUTLET PLUGS OR CAPS SECURED AND VALVE PROTECTION CAP IN PLACE to Linde India Ltd for proper disposal.

14. TRANSPORT INFORMATION

DOT

Proper shipping name	Hydrogen, compressed
Hazard Class	2.1
Subsidiary Class	None
UN-Number	UN1049
Description	UN1049, Hydrogen, compressed,2.1

ADR

Proper Shipping Name	Hydrogen, compressed
Hazard Class	2.1
UN-Number	UN1049
Classification Code	1F
Description	UN1049, Hydrogen, compressed,2.1

15. REGULATORY INFORMATION

Labeling of cylinders: 2.1& Flammable gas.

Risk phrases: R12 Extremely Flammable.

Safety Phrases: S9 Keep container in a well-ventilated place
S16 Keep away from sources of ignition – No smoking.
S33 Take precautionary measures against static discharges.

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372.

SARA 311/312 Hazard Categories

Acute Health Hazard	No
Chronic Health Hazard	No
Fire Hazard	Yes
Sudden Release of Pressure Hazard	Yes
Reactive Hazard	No

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16. OTHER INFORMATION

General :	Ensure all national/ local regulations are observed. The hazard of asphyxiation is often overlooked andmust be stressed during operator training.
Document Information:	In preparing this document help has been taken from MSDS for Linde (US)

End of Safety Data Sheet

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