
HYDROGEN, REFRIGERATED LIQUID

Safety Data Sheet



1. IDENTIFICATION

Product identifier**Product Name** HYDROGEN, REFRIGERATED LIQUID**Other means of identification****Safety data sheet number** LIND-P067**UN/ID no.** UN1966**Synonyms** Liquid Hydrogen, Hydrogen Liquid, LH2; Para Hydrogen**Recommended use of the chemical and restrictions on use****Recommended Use** Industrial and professional use.**Uses advised against** Consumer use**Details of the supplier of the safety data sheet**

Messer North America, Inc. - Messer LLC - Messer Merchant Production LLC

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Phone: 787-641-7445

* May include subsidiaries or affiliate companies/divisions.

For additional product information contact your local customer service.

Emergency telephone number**Company Phone Number** +1 800-232-4726 (Messer National Operations Center, US)

CHEMTREC: 1-800-424-9300 (North America) +1-703-527-3887 (International)

2. HAZARDS IDENTIFICATION**Classification**

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200).

Flammable gases	Category 1
Gases under pressure	Refrigerated liquefied gas
Simple asphyxiants	Yes

Label elements**Signal word****Danger****Hazard Statements**

Extremely flammable gas
Contains refrigerated gas; may cause cryogenic burns or injury
May displace oxygen and cause rapid suffocation
May form explosive mixtures with air
Burns with invisible flame

Precautionary Statements - Prevention

Do not handle until all safety precautions have been read and understood
Keep away from heat, sparks, open flames, hot surfaces. — No smoking
Use and store only outdoors or in a well ventilated place
Wear cold insulating gloves, face shield, and eye protection
Use a backflow preventive device in piping
Do NOT change or force fit connections
Close valve after each use and when empty
Use insulated hoses and piping to avoid condensation of oxygen-rich liquid air
Always keep container in upright position

Precautionary Statements - Response

IF INHALED: Remove person to fresh air and keep comfortable for breathing. Get medical attention/advice.
IF ON SKIN: Thaw frosted parts with lukewarm water. Do not rub affected area. Get immediate medical advice/attention.
Leaking gas fire: do not extinguish, unless leak can be stopped safely.
Eliminate all ignition sources if safe to do so.

Hazards not otherwise classified (HNOC)

Not applicable

3. COMPOSITION/INFORMATION ON INGREDIENTS

Pure Gas

Chemical Name	CAS No.	Volume %	Chemical Formula
HYDROGEN	1333-74-0	>99	H ₂

4. FIRST AID MEASURES

Description of first aid measures

General advice	Show this safety data sheet to the doctor in attendance.
Inhalation	Remove to fresh air and keep comfortable for breathing. If breathing is difficult, give oxygen. If breathing has stopped, give artificial respiration. Get medical attention immediately.
Skin contact	For dermal contact or suspected frostbite, remove contaminated clothing and flush affected areas with lukewarm water. DO NOT USE HOT WATER. A physician should see the patient promptly if contact with the product has resulted in blistering of the dermal surface or in deep tissue freezing.
Eye contact	If frostbite is suspected, flush eyes with cool water for 15 minutes and obtain immediate medical attention.
Ingestion	Not an expected route of exposure.
Self-protection of the first aider	RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS. Remove all sources of ignition.

Most important symptoms and effects, both acute and delayed

Symptoms	Simple asphyxiant. May cause suffocation by displacing the oxygen in the air. Exposure to oxygen-deficient atmosphere (<19.5%) may cause dizziness, drowsiness, nausea, vomiting, excess salivation, diminished mental alertness, loss of consciousness and death. Exposure to atmospheres containing 8-10% or less oxygen will bring about unconsciousness without warning and so quickly that the individuals cannot help or protect themselves. Lack of sufficient oxygen may cause serious injury or death. Direct contact with liquid can cause severe frostbite.
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Indication of any immediate medical attention and special treatment needed

Note to physicians	Treat symptomatically.
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5. FIRE-FIGHTING MEASURES

Suitable extinguishing media

Dry chemical or CO₂. Water spray (fog). DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.

Unsuitable extinguishing media Do not use a solid water stream as it may scatter and spread fire.

Specific extinguishing methods

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 build-up of explosive atmosphere. Ventilation fans must be explosion proof. Use non-sparking tools to close container valves.

Use water spray to cool surrounding containers. Be cautious of a Boiling Liquid Evaporating Vapor Explosion, BLEVE, if flame is impinging on surrounding containers. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible withdraw from area and let fire burn. Damaged cylinders should be handled only by specialists.

Specific hazards arising from the chemical

Extremely flammable gas. May form explosive mixtures with air. 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. Vapors may travel to source of ignition and flash back. Vapors may accumulate in confined areas (basement, tanks, hopper/tank cars, etc.). Cryogenic liquids and vapors will rapidly freeze water. Do not direct water at source of leak or safety devices; icing may occur. Cylinders may rupture under extreme heat.

Protective equipment and precautions for firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, NIOSH (approved or equivalent) and full protective gear. As an immediate precautionary measure, isolate spill or leak area for at least 100 meters (330 feet) in all directions.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions

ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Evacuate personnel to safe areas. Ensure adequate ventilation, especially in confined areas. Monitor oxygen level. Consider the risk of potentially explosive atmospheres. All equipment used when handling the product must be grounded. Use non-sparking tools and equipment. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe.

Other Information

Liquid spill will vaporize and expand rapidly to a large volume of gas creating risk of flammable atmosphere. A fog cloud of condensed moisture may obscure visibility.

When in contact with refrigerated/cryogenic liquids, many materials become brittle and are likely to break without warning.

Environmental precautions

Environmental precautions

Prevent spreading of vapors through sewers, ventilation systems and confined areas.

Methods and material for containment and cleaning up

Methods for containment

Stop the flow of gas or remove cylinder to outdoor location if this can be done without risk. If leak is in container or container valve, contact the appropriate emergency telephone number in Section 1 or call your closest Messer location. If system leak, close source valves and safely vent pressure before attempting any repairs.

Methods for cleaning up

Return Portable Cryogenic Container to Messer or an authorized distributor.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling

Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking Ground and bond all lines and equipment associated with product system. All equipment should be non-sparking and explosion proof Separate flammable gas cylinders from oxygen and other oxidizers by a minimum distance of 20 ft. or by a 5 ft. high barrier with a minimum fire resistance rating of a half an hour. "NO SMOKING" signs should be posted in storage and use areas.

Cryogenic liquids must be handled and stored only in containers, systems and piping specifically designed for them and constructed of compatible materials for the product. Containers, systems, and piping must be equipped with pressure relief devices to prevent excessive pressure buildup due to vaporization of the liquid as it warms. System vents should be piped to a safe location exterior of the building. Liquid hydrogen is delivered into stationary vacuum jacketed vessels at the customers' location. Consult manufacturer's instructions. NEVER HANDLE LIQUID HYDROGEN IN OPEN VESSELS. NEVER ALLOW LIQUID HYDROGEN TO BOIL IN A SEALED CONTAINER. Do NOT change or force fit connections See container manufacturer's operating instructions to avoid freezing air in vent lines Never allow any unprotected part of the body to touch uninsulated pipes or vessels that contain cold fluids. The extremely cold metal will cause moist flesh to stick fast and tear when one attempts to withdraw from it.

Liquid hydrogen in uninsulated piping may condense oxygen out of the atmosphere. Do not allow the liquified air to contact oils, greases, or other combustible materials such as asphalt and motor oil. Hydrogen is non-corrosive. However hydrogen can interact with metals (hardened steels) to cause embrittlement.

Protect cylinders from physical damage; do not drag, roll, slide or drop. When moving cylinders, even for short distance, use a cart designed to transport cylinders. Never attempt to lift a cylinder by its valve protection cap. Never insert an object (e.g. wrench, screwdriver, pry bar, etc.) into valve cap openings. Doing so may damage valve, causing leak to occur. Use an adjustable strap wrench to remove over-tight or rusted caps. Use only with adequate ventilation. Use a backflow preventive device in piping. Use only with equipment rated for cylinder pressure. Close valve after each use and when empty. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier. Ensure the complete gas system has been checked for leaks before use.

Never put cylinders into trunks of cars or unventilated areas of passenger vehicles. Never attempt to refill 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.

Only experienced and properly instructed persons should handle gases under pressure. Always store and handle compressed gas cylinders in accordance with Compressed Gas Association, publication CGA-P1, Safe Handling of Compressed Gases in Containers.

For additional recommendations, consult Compressed Gas Associations's publications G-5, G-5.3, G-5.5, P-6, P-12 and P-76. Follow state and local codes for storage and use. Consult recommended standards for liquefied hydrogen systems, (NFPA 2, NFPA 55, NFPA 68 and NFPA 70).

Conditions for safe storage, including any incompatibilities**Storage Conditions**

Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Keep at temperatures below 52°C / 125°F. Cylinders should be stored upright with valve protection cap in place and firmly secured to prevent falling. Use a "first in-first out" inventory system to prevent full cylinders from being stored for excessive periods of time. Full and empty cylinders should be segregated. Stored containers should be periodically checked for general condition and leakage. Outside or detached storage is preferred.

Incompatible materials

Oxidizing agents.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines

Chemical Name	ACGIH TLV	OSHA PEL	NIOSH IDLH
HYDROGEN 1333-74-0	: See Appendix F: Minimal Oxygen Content	None	None

ACGIH TLV: American Conference of Governmental Industrial Hygienists - Threshold Limit Value. OSHA PEL: Occupational Safety and Health Administration - Permissible Exposure Limits. NIOSH IDLH: Immediately Dangerous to Life or Health

Appropriate engineering controls

Engineering Controls

Provide general ventilation, local exhaust ventilation, process enclosure or other engineering controls to maintain airborne levels below recommended exposure limits and to maintain oxygen levels above 19.5%. Explosion proof ventilation systems. Consider installation of leak detection systems in areas of use and storage. Oxygen detectors should be used when asphyxiating gases may be released. Systems under pressure should be regularly checked for leakages.

Individual protection measures, such as personal protective equipment

Eye/face protection

Wear safety glasses with side shields (or goggles). If there is potential for exposure to liquid, wear Goggles face-shield over either safety glasses with side shields or safety goggles.

Skin and body protection

Work gloves and safety shoes are recommended when handling cylinders. Wear loose fitting, cold insulating gloves and suitable clothing to prevent skin contact with liquid, cold gas and cold equipment or piping. Wear fire/flame resistant/retardant clothing. Take precautionary measures against static discharge.

Respiratory protection

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

General Hygiene Considerations

Handle in accordance with good industrial hygiene and safety practice. Do not get in eyes, on skin, or on clothing.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state	Gas
Appearance	Colorless
Odor	Odorless
Odor threshold	No information available
pH	Not applicable
Melting/freezing point	-259.2 °C / -434.8 °F
Boiling point / boiling range	-253 °C / -423 °F
Evaporation rate	Not applicable
Flammability (solid, gas)	Flammable Gas
Flammability Limit in Air	
Lower flammability limit:	4%
Upper flammability limit:	75%
Flash point	Not applicable
Autoignition temperature	570 °C / 1058 °F
Decomposition temperature	No data available
Water solubility	0.019 vol/vol @ 15.6°C
Partition coefficient	No data available
Kinematic viscosity	Not applicable

Component Level Information:

Chemical Name	Molecular	Boiling	Vapor Pressure	Vapor density	Gas Density	Critical
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	weight	point/range		(air =1)	kg/m ³ @20°C	Temperature
HYDROGEN	1.00	-252.8 °C	Above critical temperature	0.07	0.083	-240 °C

10. STABILITY AND REACTIVITY

Reactivity

Not reactive under normal conditions

Chemical stability

Stable under normal conditions.

Explosion data

Sensitivity to Mechanical Impact None.

Sensitivity to Static Discharge Yes.

Possibility of Hazardous Reactions

May form explosive mixtures with air. May react violently with oxidizers.

Conditions to avoid

Heat, flames and sparks.

Incompatible materials

Oxidizing agents.

Hazardous Decomposition Products

None known.

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Inhalation	Product is a simple asphyxiant.
Skin contact	Direct contact with extremely cold liquid will cause severe and immediate burns to unprotected skin. Contact with evaporating liquid may cause cold burns/frostbite.
Eye contact	Direct contact with extremely cold liquid will cause severe and immediate burns to unprotected eyes. Contact with evaporating liquid may cause cold burns/frostbite.
Ingestion	Not an expected route of exposure.

Information on toxicological effects

Symptoms	Simple asphyxiant. May cause suffocation by displacing the oxygen in the air. Exposure to oxygen-deficient atmosphere (<=19.5%) may cause dizziness, drowsiness, nausea, vomiting, excess salivation, diminished mental alertness, loss of consciousness and death. Exposure to atmospheres containing 8-10% or less oxygen will bring about unconsciousness without warning and so quickly that the individuals cannot help or protect themselves. Lack of sufficient oxygen may cause serious injury or death.
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Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation	Not classified.
Sensitization	Not classified.
Germ cell mutagenicity	Not classified.

Carcinogenicity	This product does not contain any carcinogens or potential carcinogens listed by OSHA, IARC or NTP.
Reproductive toxicity	Not classified.
STOT - single exposure	Not classified.
STOT - repeated exposure	Not classified.
Chronic toxicity	None known.
Aspiration hazard	Not applicable.

Numerical measures of toxicity

Chemical Name	Oral LD50	Dermal LD50	Inhalation LC50	Inhalation LC50 (CGA P-20)
HYDROGEN 1333-74-0	-	-	> 15000 ppm (Rat) 1 h	-

Product Information

Oral LD50	No information available
Dermal LD50	No information available.
Inhalation LC50	No information available

12. ECOLOGICAL INFORMATION

Ecotoxicity

No known acute aquatic toxicity.

Persistence and degradability

No information available.

Bioaccumulation

No information available.

Other adverse effects

Can cause frost damage to vegetation.

13. DISPOSAL CONSIDERATIONS

Waste treatment methods**Disposal of wastes**

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 Messer for proper disposal.

14. TRANSPORT INFORMATION**DOT**

UN/ID no.	UN1966
Proper shipping name	Hydrogen, refrigerated liquid
Hazard Class	2.1
Special Provisions	T75, TP5
Description	UN1966, Hydrogen, refrigerated liquid, 2.1
Emergency Response Guide Number	115

TDG

UN/ID no.	UN1966
Proper shipping name	Hydrogen, refrigerated liquid
Hazard Class	2.1
Description	UN1966, Hydrogen, refrigerated liquid, 2.1

IATA

Forbidden

IMDG

UN/ID no.	UN1966
Proper shipping name	Hydrogen, refrigerated liquid
Hazard Class	2.1
EmS-No.	F-D, S-U

15. REGULATORY INFORMATION

INTERNATIONAL INVENTORIES

TSCA	Complies
DSL/NDSL	Complies
EINECS/ELINCS	Complies

Legend:

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory

DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances

US FEDERAL REGULATIONS

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

Should this product meet EPCRA 311/312 reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications.

CERCLA

This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material.

Clean Air Act, Section 112 Hazardous Air Pollutants (HAPs) (see 40 CFR 61)

This product does not contain any substances regulated as hazardous air pollutants (HAPS) under Section 112 of the Clean Air Act Amendments of 1990.

CWA (Clean Water Act)

This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

Risk and Process Safety Management Programs

This material, as supplied, contains one or more regulated substances with specified thresholds under 40 CFR Part 68 or regulated as a highly hazardous chemical pursuant to the 29 CFR Part 1910.110 with specified thresholds:

Chemical Name	U.S. - CAA (Clean Air Act) - Accidental Release Prevention - Toxic Substances	U.S. - CAA (Clean Air Act) - Accidental Release Prevention - Flammable Substances	U.S. - OSHA - Process Safety Management - Highly Hazardous Chemicals
HYDROGEN		10000 lb	

US STATE REGULATIONS

California Proposition 65

This product does not contain any Proposition 65 chemicals

U.S. State Right-to-Know Regulations

Chemical Name	New Jersey	Massachusetts	Pennsylvania

Hydrogen 1333-74-0	X	X	X
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16. OTHER INFORMATION

NFPA **Health hazards** 3 **Flammability** 4 **Instability** 0 **Physical and Chemical Properties** -

Note: Ratings were assigned in accordance with Compressed Gas Association (CGA) guidelines as published in CGA Pamphlet P-19-2019, CGA Recommended Hazard Ratings for Compressed Gases, 4th Edition.

Issue Date 24-Feb-2015
Revision Date 17-Mar-2021
Revision Note SDS sections updated; 1; 4; 5; 6; 7; 8

LIND-P067

General Disclaimer

For terms and conditions, including limitation of liability, please refer to the purchase agreement in effect between Messer LLC, Messer Merchant Production LLC, Messer North America, Inc., Messer Gas Puerto Rico, Inc. or Messer Canada Inc. (or any of their affiliates and subsidiaries) and the purchaser.

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End of Safety Data Sheet