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# HYDROGEN, REFRIGERATED LIQUID

## Safety Data Sheet

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### 1. IDENTIFICATION

**Product identifier**

**Product Name** HYDROGEN, REFRIGERATED LIQUID

**Other means of identification**

**Safety data sheet number** LIND-P067  
**UN/ID no.** UN1966  
**Synonyms** 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  
(formerly known as Linde North America, Inc., Linde LLC and Linde Merchant Production, Inc.)  
200 Somerset Corporate Blvd, Suite 7000  
Bridgewater, NJ 08807  
Phone: 908-464-8100  
[www.messer-us.com](http://www.messer-us.com)

Messer Gas Puerto Rico, Inc.  
(formerly known as Linde Gas Puerto Rico, Inc.)  
Road 869, Km 1.8  
Barrio Palmas, Catano, PR 00962  
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**

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

**4. FIRST AID MEASURES****Description of first aid measures**

<b>General advice</b>	Show this safety data sheet to the doctor in attendance.
<b>Inhalation</b>	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.
<b>Skin contact</b>	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.
<b>Eye contact</b>	If frostbite is suspected, flush eyes with cool water for 15 minutes and obtain immediate medical attention.
<b>Ingestion</b>	Not an expected route of exposure.
<b>Self-protection of the first aider</b>	RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS. Remove all sources of ignition.

**Most important symptoms and effects, both acute and delayed**

<b>Symptoms</b>	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. Contact with evaporating liquid may cause cold burns/frostbite.
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**Indication of any immediate medical attention and special treatment needed**

<b>Note to physicians</b>	Treat symptomatically.
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## 5. FIRE-FIGHTING MEASURES

### Suitable extinguishing media

Dry chemical or CO<sub>2</sub>. 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.). 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**

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.

#### **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**

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. The excessive pressure could result in vessel rupture. 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. 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. Do NOT change or force fit connections

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. See container manufacturer's operating instructions to avoid freezing air in vent lines 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, pamphlet CGA-P1, Safe Handling of Compressed Gases in Containers.

For additional storage recommendations, consult Compressed Gas Associations's pamphlets G-5, G-5.3, G-5.5, P-1, P-6, P-12, SB-2 and OSHA 1910 Subpart H. NFPA 50B covers liquefied hydrogen at consumer sites.

### 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

Explosion proof ventilation systems. Local exhaust ventilation to prevent accumulation of high concentrations and maintain air-oxygen levels at or above 19.5%. Oxygen detectors should be used when asphyxiating gases may be released. Consider installation of leak detection systems in areas of use and storage. Showers. Eyewash stations.

### Individual protection measures, such as personal protective equipment

#### Eye/face protection

Wear safety glasses with side shields (or goggles). If splashes are likely to occur, wear: Goggles. Face-shield.

#### Skin and body protection

Work gloves and safety shoes are recommended when handling cylinders. Wear cold insulating gloves when handling liquid. 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
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

Chemical Name	Molecular weight	Boiling point/range	Vapor Pressure	Vapor density (air =1)	Gas Density kg/m <sup>3</sup> @20°C	Critical 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

<b>Inhalation</b>	Product is a simple asphyxiant.
<b>Skin contact</b>	Contact with evaporating liquid may cause cold burns/frostbite.
<b>Eye contact</b>	Contact with evaporating liquid may cause cold burns/frostbite.
<b>Ingestion</b>	Not an expected route of exposure.

### Information on toxicological effects

<b>Symptoms</b>	Simple asphyxiant. May cause suffocation by displacing the oxygen in the air. Exposure to oxygen-deficient atmosphere ( $\leq 19.5\%$ ) 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

<b>Irritation</b>	Not classified.
<b>Sensitization</b>	Not classified.
<b>Germ cell mutagenicity</b>	Not classified.
<b>Carcinogenicity</b>	This product does not contain any carcinogens or potential carcinogens listed by OSHA, IARC or NTP.
<b>Reproductive toxicity</b>	Not classified.
<b>STOT - single exposure</b>	Not classified.
<b>STOT - repeated exposure</b>	Not classified.
<b>Chronic toxicity</b>	None known.
<b>Aspiration hazard</b>	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**

<b>Oral LD50</b>	No information available
<b>Dermal LD50</b>	No information available.
<b>Inhalation LC50</b>	No information available

## 12. ECOLOGICAL INFORMATION

### Ecotoxicity

No known acute aquatic toxicity.

### Persistence and degradability

Not applicable.

### Bioaccumulation

No information available.

### Other adverse effects

Can cause frost damage to vegetation.



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**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.

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**14. TRANSPORT INFORMATION****DOT**

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

**TDG**

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

**IATA**

Forbidden

**IMDG**

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

## 15. REGULATORY INFORMATION

### INTERNATIONAL INVENTORIES

<b>TSCA</b>	Complies
<b>DSL/NDSL</b>	Complies
<b>EINECS/ELINCS</b>	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

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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-19-2009, CGA Recommended Hazard Ratings for Compressed Gases, 3rd Edition.

**Issue Date**    24-Feb-2015  
**Revision Date**    01-Mar-2019  
**Revision Note**    SDS sections updated; 1

LIND-P067

**General Disclaimer**

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**End of Safety Data Sheet**