SAFETY DATA SHEET

This SDS adheres to the standards and regulatory requirements of Canada and may not meet the regulatory requirements in other countries.

1. Identification

Product identifier	**Hydrogen, (Less than 30 psi)**
Other means of identification	Dihydrogen, H_2
Chemical family	Flammable gas
Recommended use	Fuel, chemical feedstock
Recommended restrictions	None known
Manufacturer/Importer/Supplier/Distributor information	
Manufacturer	
Company name	ERCO Worldwide LP
Address	5050 Satellite Drive Mississauga, ON L4W 0G1 Canada
Telephone	(416) 239-7111 (M- F: 8:00 am – 5:00pm EST)
Website	http://www.ercoworldwide.com
E-mail	productinfo@ercoworldwide.com
Emergency phone number	Canada & USA: 1-800-424-9300 (CHEMTREC)
Supplier	Refer to Manufacturer

2. Hazard(s) Identification

Physical hazards	Flammable Gases	Category 1A
Health hazards	None	
Environmental hazards	Not currently regulated by the Canadian Hazardous Products Regulation (WHMIS 2015), refer to Section 12 for additional information.	
Label elements		
Signal word	Danger	
Hazard statement	Extremely flammable gas	
Precautionary statement		
Prevention	Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.	

Response	Leaking gas fire: Do not extinguish unless leak can be stopped safely. In case of leakage, eliminate all ignition sources.
Storage	Does not apply.
Disposal	Does not apply.
Hazard(s) not otherwise classified (HNOC)	None.
Supplemental information	Not applicable.

3. Composition/Information on Ingredients

Chemical name	Common name and synonyms	CAS number	Conc. % By Weight
Hydrogen	Dihydrogen	1333-74-0	54.8 w/w%
Water Vapor	None	7732-18-5	43.5 w/w%
Oxygen	None	7782-44-7	1.7w/w%

Chemical name of impurities, stabilizing solvents and/or additives: None

4. First-Aid Measures

Inhalation	In general, this gas has very low toxicity, but it can act as an asphyxiant at high concentrations. If the victim has been knocked down, wear appropriate protective equipment. If it is safe to do so, move victim to fresh air. If breathing is difficult, trained personnel should administer emergency oxygen. If breathing has stopped, trained personnel should begin artificial respiration (AR) or, if the heart has stopped, cardiopulmonary resuscitation (CPR) or automated external defibrillation (AED) immediately. Quickly transport victim to an emergency care facility.
Skin Contact	Hydrogen gas is not irritating. No effects expected.
Eye Contact	Immediately flush eyes thoroughly with water for at least 15 minutes. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. Remove contact lenses, if present and easy to do. Continue rinsing Contact an ophthalmologist immediately. Get immediate medical attention.
Ingestion	Ingestion is not an applicable route of exposure for gases.
Most important symptoms/effects, acute and delayed	Effects of oxygen deficiency are – 12-16%: breathing and pulse rate are increased, with slight muscular incoordination; 10-14%: emotional upsets, abnormal fatigue from exertion, disturbed respiration; 6-10%: nausea and vomiting, inability to

	move freely, collapse, possible lack of consciousness; below 6%: convulsive movements, gasping, possible respiratory collapse and death. Since exercise increases the body's need for oxygen, symptoms will occur more quickly during exertion in an oxygen-deficient environment. In survivors of oxygen deprivation, some or all organs, including the central nervous system and the brain, may have damage from low oxygen. These effects may or may not be reversible with time, depending on the degree and duration of the low oxygen and the amount of tissue injury.
Indication of immediate medical attention and special treatment needed	None.
General information	No additional information available.

5. Fire-Fighting Measures

Suitable extinguishing media	Carbon dioxide, dry chemical extinguishers, water spray, fog or foam. If leaking from piping, purging by use of nitrogen or steam may be effective in extinguishing and avoiding risk of flash-back when source of hydrogen is shut off. Cool surroundings with water to minimize likelihood of re-ignition.
Unsuitable extinguishing media	DO NOT extinguish a fire unless the source of hydrogen can be shut off and vessels and piping purged, because of the risk of explosive re-ignition/back flash.
Specific hazards arising from the chemical	Highly explosive or flammable if mixed with air, oxygen or oxidizing gases such as chlorine. Hydrogen has a low ignition energy, so that escaping gas may ignite without obvious source of ignition. Flame may be virtually invisible.
Special protective equipment and precautions for firefighters	Standard protective clothing and equipment (Self Contained Breathing Apparatus).
Firefighting equipment/instructions	If venting or leaking gas catches fire, do not extinguish flames. Flammable vapours may spread from leak, creating an explosive reigniting hazard. Vapours can be ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharge, or other ignition sources at locations distant from product handling point. Explosive atmospheres may linger. Before entering an area, especially a confined area, check the atmosphere with an appropriate device. Evacuate all personnel from the danger area. Use self-contained breathing apparatus and protective clothing. Immediately cool containers with water from maximum distance.

	Stop flow of gas if safe to do so, while continuing cooling water spray. Remove ignition sources if safe to do so. Remove containers from area of fire if safe to do so.
Specific methods	Use fire control measures appropriate for the surrounding fire. Exposure to fire and heat radiation may cause gas containers to rupture. Cool endangered containers with water spray jet from a protected position. Prevent water used in emergency cases from entering sewers and drainage systems. Stop flow of product if safe to do so. Use water spray or fog to knock down fire fumes if possible.
General fire hazards	Extremely flammable gas, posing a very serious fire hazard.
Hazardous combustion products	None (combustion product is water).

6. Accidental Release Measures

Personal precautions, protective equipment and emergency procedures	Forms explosive mixtures with air and oxidizing agents. Ventilate, but keep all sources of ignition away. Conduct air monitoring for flammability. Allow access only to necessary personnel, and use a buddy system. Wear flame-resistant clothing and face shield, or SCBA when necessary. Seek to purge out lines and to work remote from the leak to stop the flow of hydrogen at the source. If already ignited do not extinguish unless equipment can be purged and hydrogen flow stopped.
Methods and materials for containment and cleaning up	No additional information available. For waste disposal, see section 13 of the SDS.
Environmental precautions	Not applicable.

7. Handling and Storage

Precautions for safe handling	Establish and follow appropriate operating procedures for equipment, and controls for maintenance operations including all hot work in the vicinity. Hydrogen is a flammable material and hot work should be avoided.
Conditions for safe storage, including any incompatibilities	As supplied, hydrogen is used directly as generated without intermediate storage.

8. Exposure Controls/ Personal Protection

Occupational exposure limits No exposure limits noted for ingredient(s). Simple asphyxiant.

Biological limit values No biological exposure limits noted for the ingredient(s).

Appropriate engineering controls Maintain leak tight systems. Provide means to purge with inert gas and safely vent closed systems which have potential for accidental mixing with O2 gas and exceeding the UEL. Ensure good ventilation, especially at building high points, to keep hydrogen levels below 4000 ppm by volume (10% of LEL). Use approved instruments to monitor concentration levels and if necessary control ventilation equipment. In areas where the LEL is exceeded under normal operating conditions, provide electrical equipment in compliance with the Hazardous Locations requirements of the CEC (Canadian Electrical code).
WARNING: Hot wire or catalytic bead type LEL instruments will not work in oxygen deficient atmosphere.

Individual protection measures, such as personal protective equipment:

Eye/face protection No specific protective equipment required against contact with this material.

Skin protection

Hand protection No specific protective equipment required against contact with this material.

Other In the event of a fire, use fire protective firefighting gear (including consideration of any other hazardous materials which may be present).

Respiratory protection No specific protective equipment required against contact with this material.

General hygiene considerations No additional information available.

9. Physical and Chemical Properties

Appearance	Colourless gas
Physical state	Gas, at an absolute pressure less than 2.7 atmospheres and saturated with water vapour.
Form	Gas
Color	Not applicable
Odor	None if pure. As supplied may have a distinctive slight "rusty" or chlorine odor
Odor threshold	Not applicable.
pH	Not applicable.
Melting point/freezing point	- 259°C

Initial boiling point/ Boiling Range	- 253°C @ 1 atm./ Range not available
Flash point	Flammable gas (burns at all ambient temperatures).
Evaporation rate	Not applicable for gas.
Flammability (solid, gas)	Extremely flammable gas
Upper/lower flammability or explosive limits	
Explosive limit - lower (%)	4
Explosive limit - upper (%)	75
Vapor pressure	Not applicable.
Vapor density	0.069 (Air=1), 90g/m3 @ 0°C and 1 atm. (14.5 times lighter than air)
Relative density	Not available.
Solubility (ies)	
Solubility (water)	1.8% v/v @ 20°C
Partition coefficient (N-octanol/water)	Not available.
Coefficient of Water/Oil Distribution	Log P(oct) = 0.45 (estimated)
Auto-ignition temperature	520°C (100% Hydrogen)
Mechanical Impact Sensitivity	Not Sensitive
Static Discharge Sensitivity	Sensitive (can accumulate static charge by flow, friction in pipes)
Decomposition temperature	Not available.
Viscosity	Not applicable.
Other information	
Molecular formula	H_2
Oxidizing properties	None.
Specific gravity	Not applicable.

10. Stability and Reactivity

Reactivity	May form explosive gas mixture with air, oxygen, halogens, nitrogen trifluoride or oxygen difluoride, and other oxidizing gases or vapours.
Chemical stability	Stable under normal conditions.
Possibility of hazardous reactions	Can form explosive mixture with air. May react violently with oxidants.
Conditions to avoid	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
Incompatible materials	Will react explosively or burn with air, oxygen, chlorine, bromine, fluorine, nitrogen trifluoride or oxygen difluoride, with minimal or no ignition source. Platinum and some other metals will catalyse reaction with oxygen or air in absence of an ignition source. Hydrogen embrittlement of some metals can occur at high temperatures and pressures and can seriously weaken or embrittle the metal. This can lead to hydrogen leaks. Alloys and metals that resist hydrogen embrittlement at room temperature include

aluminum (types 3003, 6061-T6 and 7075-T73), stainless steel (e.g. types 304, 316, 321, 347, 410, 440 series), oxygen-free copper and its alloys, brass, bronze, naval brass, and silicon bronze, nickel and nickel-base alloys, Monel, Hastelloy and Inconel, and titanium. Decarburization happens in ferritic steels and alloys that contain carbon on contact with hydrogen, at temperatures greater than 200°C and causes these metals to weaken. Decarburization can be prevented by alloying metals such as chromium, molybdenum, tungsten, vanadium, titanium, and niobium.

Hazardous decomposition products None under normal conditions of storage and use.

11. Toxicological Information

Information on likely routes of exposure

Inhalation No toxic effect. A simple asphyxiant.

Skin contact No effect.

Eye contact No effect.

Ingestion Not applicable.

Most important symptoms/effects, acute and delayed Effects of oxygen deficiency are –
12-16%: breathing and pulse rate are increased, with slight muscular incoordination; 10-14%: emotional upsets, abnormal fatigue from exertion, disturbed respiration; 6-10%: nausea and vomiting, inability to move freely, collapse, possible lack of consciousness; below 6%: convulsive movements, gasping, possible respiratory collapse and death. Since exercise increases the body's need for oxygen, symptoms will occur more quickly during exertion in an oxygen-deficient environment. In survivors of oxygen deprivation, some or all organs, including the central nervous system and the brain, may have damage from low oxygen. These effects may or may not be reversible with time, depending on the degree and duration of the low oxygen and the amount of tissue injury.

Information on toxicological effects Not applicable.

Acute toxicity Not applicable.

Skin corrosion/irritation Not an irritant.

Serious eye damage/eye irritation Not an irritant.

Respiratory or skin sensitization

Respiratory sensitization Not expected to be a respiratory sensitizer.

Skin sensitizer Not expected to be a skin sensitizer.

Germ cell mutagenicity	Not expected to be mutagenic.
Carcinogenicity	This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.
OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)	Not listed.
Reproductive toxicity	Not classified as a reproductive toxin.
Specific target organ toxicity - single exposure	Not classified as a specific target organ toxicity - single exposure.
Specific target organ toxicity - repeated exposure	Not classified as a specific target organ toxicity - repeated exposure.
Aspiration toxicity	Simple asphyxiant.
Chronic effects	No additional information available.

12. Ecological Information

Ecotoxicity	Not applicable.
Persistence and degradability	Not applicable.
Bio accumulative potential	Not applicable.
Mobility in soil	Not available
Other adverse effects	No other adverse environmental effects.

13. Disposal Considerations

Disposal instructions	May be vented to atmosphere.
Local disposal regulations	Dispose in accordance with all applicable regulations.

14. Transport Information

ERCO does not ship this product other than by pipeline direct to the end user.

15. Regulatory Information

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s).
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other Information

Issue date 1/7/2022
Revision # 9
Revision Indicator Boiling range information added.
List of abbreviations
ACGIH: American Conference of Governmental Industrial Hygienists
CAS: Chemical Abstract Services
CFR: Code of Federal Regulations
ERG: Emergency Response Guidebook
IARC: International Agency for Research on Cancer
IATA: International Air Transport Association
IBC Code: International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk
IMDG: International Maritime Dangerous Goods
LC: Lethal Concentration
LD: Lethal Dose
MARPOL: Marine Pollution
MSHA: Mine Safety and Health Administration
NFPA: National Fire Protection Association
NIOSH: National Institute of Occupational Safety and Health
NTP: National Toxicology Program

OSHA: Occupational Safety and Health Administration
PPE: Personal Protective Equipment
SDS: Safety Data Sheet
TDGR: Transport of Dangerous Goods Regulations
TSCA: Toxic Substances Control Act
UN: United Nations
WHMIS: Workplace Hazardous Materials Information System

Disclaimer

Information presented in this SDS is furnished in accordance with the Workplace Hazardous Materials Information System (WHMIS).

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