

SAFETY DATA SHEET

REV. 2 Issued: July 25, 2016

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, Parahydrogen, Water gas
Chemical Family	Flammable gas
Formula	H ₂
Recommended use	Fuel, chemical feedstock
Recommended restrictions	None known.
Manufacturer/Importer/Supplier/Distributor information	
Manufacturer	
Company name	ERCO Worldwide, A division of Superior Plus LP
Address	302 The East Mall Suite 200 Toronto, ON M9B 6C7 Canada
Telephone	Information #: (416) 239-7111 (Monday-Friday 8:00 am – 5:00pm EST)
Website	http://www.ercoworldwide.com
E-mail	info@ercoworldwide.com
Emergency phone number	24 Hr. #: Canada: 613-996-6666 (CANUTEC) USA: 1-800-424-9300 (CHEMTREC)
Supplier	Refer to Manufacturer

2. HAZARD(S) IDENTIFICATION

Physical hazards	Flammable Gases	Category 1
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 May displace oxygen and cause rapid suffocation May form explosive mixtures with air Burns with an invisible flame	

Precautionary statement**Prevention**

Do not handle until all safety precautions have been read and understood
Keep away from Heat, Open Flames, Sparks, Hot Surfaces, No Smoking

Response

IF INHALED: 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.

IN CASE OF FIRE: 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. 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.

Storage

As supplied, hydrogen is used directly as generated without intermediate storage.

Disposal

Does not apply.

**Hazard(s) not otherwise
Classified (HNOC)**

None.

Supplemental information

Not applicable

3. COMPOSITION/INFORMATION ON INGREDIENTS

Mixtures

Chemical name	Common name and synonyms	CAS number	Conc. % By Weight
Hydrogen	Dihydrogen, Parahydrogen, Water gas	1333-74-0	45-98
Water Vapor		7732-18-5	Balance

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

4. FIRST-AID MEASURES

Inhalation

IF INHALED: 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. 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

Prevent waste from contaminating the surrounding environment. Prevent soil and water pollution. Dispose of contents/container in accordance with local/regional/national/international regulations.

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	- 253°C @ 1 atm.
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/m ³ @ 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	
Density	Not applicable.
Explosive properties	Not applicable.
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.

Reproductive toxicity

Not classifiable 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.

Bioaccumulative potential

No 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

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16. OTHER INFORMATION, INCLUDING DATE OF PREPARATION OR LAST REVISION

Issue date 07-25-2016

Revision # 2

Revision Indicator **New safety data sheet.**

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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