1. Identification

Product identifier: Hydrogen, (Less than 30 psi)
Other means of identification: Dihydrogen, H₂
Chemical family: Flammable gas
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: (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: 613-996-6666 (CANUTEC)
   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.
Hydrogen

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

<table>
<thead>
<tr>
<th>Chemical name</th>
<th>Common name and synonyms</th>
<th>CAS number</th>
<th>Conc. % By Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrogen</td>
<td>Dihydrogen</td>
<td>1333-74-0</td>
<td>54.8 w/w%</td>
</tr>
<tr>
<td>Water Vapor</td>
<td></td>
<td>7732-18-5</td>
<td>43.5 w/w%</td>
</tr>
<tr>
<td>Oxygen</td>
<td></td>
<td>7782-44-7</td>
<td>1.7 w/w%</td>
</tr>
</tbody>
</table>

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**
-253°C @ 1 atm.
### 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

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

*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**: 3/13/2019
- **Revision #**: 5
- **Revision Indicator**: Revisions to text
- **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
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