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		Date: 3/18/2020
MSDS V1.1	Hydrogen Gas	DG009G



1 Chemical product

Product Name	: Hydrogen, Compressed
Chemical Formula	: H ₂
Chemical Family	: Permanent Gas
MSDS No	: DG009G
Company Identification	: Aldakheel Industrial Gases Plant (<i>DIGAS</i>)
Emergency Phone Number	: 014-8455-101


2 COMPOSITION / INFORMATION ON INGREDIENTS

COMPONENT	CAS NUMBER	CONCENTRATION
Hydrogen	1333-74-0	>99%*

*The symbol > means "greater than"

3 HAZARDS IDENTIFICATION

Emergency Overview	: Danger! Flammable high-pressure gas. Can form explosive mixtures with air. May ignite if valve is opened to air. Burns with invisible flame. May cause dizziness and drowsiness. Self-contained breathing apparatus may be required by rescue workers. Under ambient conditions, this is colorless, odorless, tasteless gas.
Effects of a Single (Acute) Overexposure	: Inhalation. Asphyxiate. Effects are due to lack of oxygen. Moderate concentration may cause of headache, drowsiness, dizziness, excitation, excess salivation, vomiting and unconsciousness. Lack of oxygen can kill.
Skin Contact	: No harm expected.
Swallowing	: An unlikely route of exposure. This product is a gas at normal temperature and pressure.
Eye Contact	: No harm expected.
Effects of Repeated (Chronic) Overexposure	: No harm expected.
Other Effects of Overexposure	: Hydrogen is an Asphyxiant. Lack of oxygen can kill.
Medical Conditions Aggravated by Overexposure	: The toxicology and the physical and chemical properties of nitrogen suggest that overexposure is unlikely to aggravate existing medical conditions.
Potential Environmental Effects	: None known.

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4 FIRST AID MEASURES

Inhalation	: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, qualified personnel may give oxygen. Call a physician.
Skin Contact	: An unlikely route of exposure. This product is a gas at normal temperature and pressure.
Swallowing	: An unlikely route of exposure. This product is a gas at normal temperature and pressure.
Eye Contact	: An unlikely route of exposure. This product is a gas at normal temperature and pressure.
Notes to Physician	: There is no specific antidote. Treatment of overexposure should be directed at the control of symptoms and the clinical condition of the patient.

5 FIRE-FIGHTING MEASURES


Flammable properties	: Flammable gas. Flame is nearly invisible. Escaping gas may ignite spontaneously. Hydrogen has a low ignition energy. Fireball forms if gas cloud ignites immediately after release. Forms explosive mixtures with air and oxidizing agents.
Suitable extinguishing media	: CO2 dry chemical, water spray for fog.
Products of combustion	: Water (H ₂ O)
Protection of fire fighters	: Danger! Flammable high-pressure gas. Evacuate all personnel from danger area. Immediately deluge cylinders with water from maximum distance until cool; then move them away from fire area if without risk. Continue cooling water spray while moving cylinders. Do not extinguish flames emitted from cylinders; allow them to burn out. If flames are accidentally extinguished, explosive re-ignition may occur. All personnel including, fire and rescue workers, should leave the area immediately. Self-contained breathing apparatus may be required by rescue workers.
Specific physical and chemical hazards	: Heat of fire can build pressure in cylinder and cause it to rupture. Hydrogen cylinders are equipped with a pressure relief device. (Exceptions may exist where authorized by DOT.) No part of cylinder should be subjected to a temperature higher than 125°F (52°C). If venting or leaking hydrogen catches fire, do not extinguish flames. Flammable gas may spread from leak, creating an explosive re-ignition hazard. Vapors can be ignited by pilot lights, other flames, smoking, sparks, heaters, electrical point. Explosive atmospheres may linger. Before entering area, especially confined areas, check atmosphere with approved explosion meter.
Protective equipment and precautions for firefighters	: Firefighters should wear self contained breathing apparatus and full fire-fighting turnout gear.

6 ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:

DANGER! Flammable high-pressure gas.

Personal precautions	: Forms explosive mixtures with air. (see section 5.) Immediately evacuate all personnel from danger area. Use self-contained breathing apparatus where needed. Approach suspected leak area with caution. Remove all sources of ignition if without risk. Reduce gas with fog or fine water spray. Shut off flow if without risk. Ventilate area or move cylinder to a well-ventilated area. Flammable gas may spread from leak. Before entering area, especially confined areas, check atmosphere with an appropriate device.
Environmental precautions	: Prevent waste from contaminating the surrounding environment. Discard any product, residue, disposable container, or liner in an environmentally acceptable manner, in full compliance with deferral, state, and local regulations. If necessary, call your local supplier for assistance.

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7 HANDLING AND STORAGE

Precautions to be taken in handling

: **Keep away from heat, sparks, and open flame.** Use only spark-proof tools and explosion-proof equipment. **Protect cylinders from damage.** Use a suitable hand truck to move cylinders; do not drag, roll, slide, or drop. **Hydrogen is the lightest known gas.** It may leak out of systems that are air-tight for other gases and may collect in poorly ventilated upper reaches of buildings. Leak check system with soapy water; never use a flame. **All piped hydrogen systems and associated equipment must be grounded.** Electrical equipment must be non-sparking or explosion-proof. **Do not crack or open hydrogen cylinder valves unless connected to utilization equipment;** escaping gas may ignite spontaneously. Open valve slowly. If valve is hard to open discontinue use and contact your supplier. Close cylinder valve after each use; keep closed even when empty. **Never attempt to lift a cylinder by its cap;** the cap is intended solely to protect the valve. Never insert an object (e.g., wrench, screwdriver, pry bar) into cap openings; doing so may damage the valve and cause a leak. Use an adjustable strap wrench to remove over-tight or rusted caps.

Precautions to be taken in storage

: Store and use with adequate ventilation. Store only where temperature will not exceed 125°F (52°C). Post "No Smoking or Open Flames" signs in storage and use areas. There must be no sources of ignition. Separate packages and protect against potential fire and/or explosion damage following appropriate codes and requirements (e.g., NFPA 30, NFPA 55, NFPA 70, and/or NFPA 221 in the U.S.) Always secure cylinders upright to keep them from falling or being knocked over. Install valve protection cap, if provided, firmly in place by hand when the cylinder is not in use. Store full and empty cylinders separately. Use a first-in, first-out inventory system to prevent storing full cylinders for long periods.

8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering controls	: Local exhaust; An explosion-proof local exhaust system is acceptable.
Mechanical (General)	: Inadequate.
Special	: Use only in a closed system.
Other	: See special
Personal protective equipment:	
Skin Protection	: Wear work gloves for cylinder handling and metatarsal shoes for cylinder handling.
Eye/Face protection	: Wear safety glasses when handling cylinders.
Respiratory protection	: None required under normal use. Air-supplied respirators must be used in confined spaces.

9 PHYSICAL AND CHEMICAL PROPERTIES

Appearance	: Colorless gas.
Odor	: Odorless.
Odor Threshold	: Not available.
Physical State	: Gas at normal temperature and pressure.
pH	: Not applicable.
Melting Point at 1 atm	: -434.56°F (-259.2°C)
Boiling Point at 1 atm	: -422.97°F (-252.76°C)
Flash Point (test method)	: Not applicable.
Evaporation Rate (Butyl Acetate = 1)	: Not applicable.
Flammability	: Flammable

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Flammable Limits in Air, % by volume	: Lower 4.0%	Upper 75.0%
Vapor Pressure at 20°C (68°F)	: Not applicable.	
Vapor Density at 21.1°C (70°F) at 1atm	: 0.0052 lb/ft3 (0.083 kg/m3)	
Liquid Density at boiling point and 1 atm	: 4.43 lb/ft3 (70.96 kg/m3)	
Specific Gravity (H₂O = 1) at -7°C (19.4°F)	: Not available.	
Specific Gravity (Air = 1) at 32°F (0°C) and 1 atm	: 0.07	
Solubility in Water, vol/vol at 60°F (15.6°C)	: 0.019	
Partition Coefficient: n-octanol/water	: Not available.	
Autoignition Temperature	: 962°F (500°C)	
Decomposition Temperature	: Not available.	
Percent Volatiles by Volume	: 100	
Molecular Weight	: 2.016	
Molecular Formula	: H ₂	

10 STABILITY AND REACTIVITY

Chemical Stability : Unstable Stable
Conditions to Avoid : None known.
Incompatible Materials : Oxidizing agents, lithium, halogens
Hazardous Decomposition Products : None
Possibility Of Hazardous Reactions : May Occur Will Not Occur
 Flammable gas. Forms explosive mixtures with air and oxidizing agents.

11 TOXICOLOGICAL INFORMATION

Acute Dose Effect : Hydrogen is a simple asphyxiant.
Study Results : None known.

12 ECOLOGICAL INFORMATION

Ecotoxicity : No adverse ecological effects expected.
Other Adverse Effects : Hydrogen does not contain any Class I or Class II ozonedepleting chemicals.

13 DISPOSAL CONSIDERATION

Waste Disposal Method : Do not attempt to dispose of residual or unused quantities. Return cylinder to supplier.

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14 TRANSPORT INFORMATION

SPECIAL SHIPPING INFORMATION

- : Avoid transport on vehicles where the load space is not separated from the driver's compartment.
- : Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency.
- : Before transporting product containers:
 - Ensure that containers are firmly secured.
 - Ensure cylinder valve is closed and not leaking.
 - Ensure valve outlet cap nut or plug (where provided) is correctly fitted.
 - Ensure valve protection device (where provided) is correctly fitted.
 - Ensure there is adequate ventilation.
 - Compliance with applicable regulations.

15 OTHER INFORMATION

**Asphyxiant in high concentrations.
 Keep container in a well-ventilated place.
 Do not breathe the gas.
 The hazard of asphyxiation is often overlooked and must be stressed during operator training.**

16 OTHER INFORMATION (Continued)

HAZARD RATING SYSTEMS:

NFPA Ratings:

Health	=0	HMIS Ratings:	
Flammability	=4	Health	=0
Instability	=0	Flammability	=4
Special	= SA (CGA recommends this to designate Simple Asphyxiant).	Physical Hazard	=3

STANDARD VALVE CONNECTIONS:

THREADED	: 0-3000 psig	CGA-350
	: 3001-5500 psig	CGA-695
	: 5501-7500 psig	CGA-703
PIN-INDEX YOKE	: Not applicable	

Use the proper CGA connections. **DO NOT USE ADAPTERS.**

This Material Safety Data Sheet has been established for the best knowledge of DIGAS.

Details given in this document are believed to be correct at the best of DIGAS knowledge. Whilst proper care has been taken in the preparation of this document, no liability for injury or damage resulting from its use can be accepted.

End of Documents.