1. PRODUCT IDENTIFICATION

CHEMICAL NAME; CLASS: HYDROGEN IN ARGON/HELIUM/NITROGEN OR AIR GAS MIXTURE

TRADE NAMES: None
CHEMICAL FAMILY: Hydrogen/Inert Gas or Air Mixture
PRODUCT USE: Calibration Gas

MANUFACTURER

MATHESON TRI-GAS, INC.
150 ALLEN ROAD, Ste 302
BASKING RIDGE, NJ 07920
USA

Phone: 973/257-1100

EMERGENCY PHONE:
CHEMTREC (U.S. DOMESTIC): 1-800-424-9300
CHEMTREC INTERNATIONAL: 1-703-527-3887
CANUTEC (CANADA): 1-613-996-6666

NOTE: All WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-2004 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

2. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: Product Description: This is a colorless, odorless, non-flammable gas mixture. Health Hazards: The main health hazard associated with releases of this gas mixture is asphyxiation by displacement of oxygen, as each component of this mixture is a simple asphyxiant. Rapid release from the cylinder can cause frostbite. Rapid release can result in airborne objects which present a physical injury hazard. Flammability Hazards: This gas mixture is not flammable. A cylinder rupture hazard exists when this gas mixture, which is under pressure, is subject to heat or flames. Reactivity Hazards: This gas mixture is not reactive. Environmental Hazards: This gas mixture is not expected to cause significant harm if released to the environment. Plants and animals in immediate vicinity of a release may experience frostbite. Emergency Response Considerations: Persons responding to releases of this gas mixture must protect themselves appropriately.

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: The most significant route of over-exposure for this product is by inhalation.
INHALATION: High concentrations of this gas mixture can cause an oxygen-deficient environment, especially if released in a poorly-ventilated area (e.g., an enclosed or confined space). Individuals breathing such an atmosphere may experience symptoms which include headaches, ringing in ears, dizziness, drowsiness, unconsciousness, nausea, vomiting, and depression of all the senses. Under some circumstances of overexposure, death may occur. The effects associated with various levels of oxygen are as follows:

<table>
<thead>
<tr>
<th>CONCENTRATION OF OXYGEN</th>
<th>OBSERVED EFFECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-16% Oxygen:</td>
<td>Breathing and pulse rate increase, muscular coordination slightly disturbed.</td>
</tr>
<tr>
<td>10-14% Oxygen:</td>
<td>Emotional upset, abnormal fatigue, disturbed respiration.</td>
</tr>
<tr>
<td>6-10% Oxygen:</td>
<td>Nausea, vomiting, collapse, or loss of consciousness.</td>
</tr>
<tr>
<td>Below 6%:</td>
<td>Convulsive movements, possible respiratory collapse, and death.</td>
</tr>
</tbody>
</table>

WARNING: Exposure to atmospheres containing 8-10% or less oxygen will bring about unconsciousness without warning and so quickly that individuals cannot help or protect themselves. Lack of sufficient oxygen may cause serious injury or death.
2. HAZARD IDENTIFICATION (Continued)

CONTACT WITH SKIN or EYES: Contact with rapidly expanding gases (which are released under high pressure) may cause frostbite. In addition, the sudden release of a pressurized gas (such as may occur in the event of a valve failure) presents a severe hazard of mechanical injury.

SKIN ABSORPTION: No component of this gas mixture presents a hazard of skin absorption.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: Over-exposure to this gas mixture may cause the following health effects:

ACUTE: The most significant hazard associated with this gas is inhalation of oxygen-deficient atmospheres. Airborne objects may cause mechanical injury. Contact with rapidly expanding gases during accidental release may cause frostbite.

CHRONIC: Chronic exposure to oxygen-deficient atmospheres (below 18% oxygen in air) may affect the heart and nervous system.

TARGET ORGANS: ACUTE: Respiratory system. CHRONIC: Cardiac system, central nervous system.

HMIS RATING: HEALTH HAZARD = 0 FLAMMABILITY HAZARD = 0 PHYSICAL HAZARD = 0
Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

3. COMPOSITION and INFORMATION ON INGREDIENTS

(10,000 ppm = 1%)

<table>
<thead>
<tr>
<th>CHEMICAL NAME</th>
<th>CAS #</th>
<th>mole %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrogen</td>
<td>1333-74-0</td>
<td>≤ 1.0 In Air</td>
</tr>
<tr>
<td></td>
<td></td>
<td>≤ 2.93 In Argon</td>
</tr>
<tr>
<td></td>
<td></td>
<td>≤ 8.7 In Helium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>≤ 5.7 In Nitrogen</td>
</tr>
<tr>
<td>Air (compressed, atmospheric)</td>
<td>132259-10-0</td>
<td>Balance</td>
</tr>
<tr>
<td>Argon</td>
<td>7440-37-1</td>
<td></td>
</tr>
<tr>
<td>Helium</td>
<td>7440-59-7</td>
<td></td>
</tr>
<tr>
<td>Nitrogen</td>
<td>7727-37-9</td>
<td></td>
</tr>
</tbody>
</table>

The balance of this gas mixture consists of one of the following inert gases or Air.

4. FIRST-AID MEASURES

GENERAL INFORMATION: Remove to fresh air, as quickly as possible. Only trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation, if necessary. Seek medical attention immediately if adverse effect continues after removal to fresh air.

SKIN EXPOSURE: If release of this gas mixture has resulted in frostbite, warm affected area slowly. Seek immediate medical attention.

EYE EXPOSURE: If release of this gas mixture has affected the eyes, seek immediate medical attention.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing respiratory conditions may be aggravated by overexposure to this gas mixture.

RECOMMENDATIONS TO PHYSICIANS: Administer oxygen. Treat symptoms and eliminate overexposure.

5. FIRE-FIGHTING MEASURES

FLASH POINT: Not applicable.
AUTOIGNITION TEMPERATURE: Not applicable
FLAMMABLE LIMITS (in air by volume, %):
Lower (LEL): Not applicable. Upper (UEL): Not applicable.
FIRE EXTINGUISHING MATERIALS: Use extinguishing materials appropriate for surrounding materials involved in the fire. Water spray should be used to cool fire-exposed containers.
FIRE EXTINGUISHING MATERIALS NOT TO BE USED: None known.
UNUSUAL FIRE AND EXPLOSION HAZARD: This gas mixture does not burn; however, cylinders, when involved in a fire, may rupture or burst in the heat of the fire.
5. FIRE-FIGHTING MEASURES (Continued)

EXPLOSION SENSITIVITY TO MECHANICAL IMPACT: Not sensitive.

EXPLOSION SENSITIVITY TO STATIC DISCHARGE: Not sensitive.

SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural fire fighters must wear Self-Contained Breathing Apparatus and full protective equipment. Immediately cool the cylinders with water spray from a maximum distance. When cool, move cylinders from fire area if this can be done without risk to firefighters.

6. ACCIDENTAL RELEASE MEASURES

LEAK RESPONSE: Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used in the event of a significant release from a single cylinder. Call CHEMTREC (1-800-424-9300) for emergency assistance. Or if in Canada, call CANUTEC (613-996-6666). Attempt to close the main source valve prior to entering the area. If this does not stop the release (or if it is not possible to reach the valve), allow the gas to release in-place or remove it to a safe area and allow the gas to be released there. Monitor the surrounding area for the level of Oxygen. The atmosphere must have at least 19.5 percent Oxygen before personnel can be allowed in the area without Self-Contained Breathing Apparatus.

7. HANDLING and USE

WORK PRACTICES AND HYGIENE PRACTICES

Do not eat or drink while handling chemicals. Be aware of all potential exposure symptoms; exposures to a fatal oxygen-deficient atmosphere could occur without any significant warning symptoms. All work operations should be monitored in such a way that emergency personnel can be immediately contacted in the event of a release. Workers who handle this gas mixture should wear protective clothing, as listed in Section 8 (Exposure Controls and Personal Protection). If ventilation controls are not adequate to provide sufficient oxygen content, proper respiratory protection equipment should be provided and workers using such equipment should be carefully trained in its operation and limitations. Precautions must always be taken to prevent suck-back of foreign materials into the cylinder by using a check-valve, or vacuum break, since suck-back may cause dangerous pressure changes within the cylinder.

STORAGE AND HANDLING PRACTICES: Cylinders should be stored upright and be firmly secured to prevent falling or being knocked-over. Cylinders can be stored in the open, but in such cases, should be protected against extremes of weather and from the dampness of the ground to prevent rusting. Cylinders should be stored in dry, well-ventilated areas away from sources of heat or ignition. Do not allow the area where cylinders are stored to exceed 52°C (125°F).

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS: Compressed gases can present significant safety hazards. The following rules are applicable to work situations in which cylinders are being used.

Before Use: Move cylinders with a suitable hand-truck. Do not drag, slide or roll cylinders. Do not drop cylinders or permit them to strike each other. Secure cylinders firmly. Leave the valve protection cap (where provided) in-place until cylinder is ready for use.

During Use: Use designated CGA fittings and other support equipment. Do not use adapters. Do not use oils or grease on gas-handling fittings or equipment. Immediately contact the supplier if there are any difficulties associated with operating cylinder valve. Never insert an object (e.g. wrench, screwdriver, pry bar, etc.) into valve cap openings. Doing so may damage valve, causing a leak to occur. Use an adjustable strap wrench to remove over-tight or rusted caps. Never strike an arc, on a compressed gas cylinder or make a cylinder part of an electric circuit.

After Use: Close main cylinder valve. Replace valve protection cap. Close valve after each use and when empty. Mark empty cylinders “EMPTY”.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Refer to current CGA Guidelines for information on protective practices during maintenance of contaminated equipment.
8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation to ensure compliance with exposure limits described in this section. Local exhaust ventilation is preferred, because it prevents dispersion of this gas mixture into the workplace by eliminating it at its source. If appropriate, install automatic monitoring equipment to detect the level of Oxygen.

EXPOSURE LIMITS:

<table>
<thead>
<tr>
<th>CHEMICAL NAME</th>
<th>CAS #</th>
<th>ACGIH-TLVs</th>
<th>OSHA-STELs</th>
<th>NIOSH-RELs</th>
<th>NIOSH</th>
<th>OTHER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>TWA ppm</td>
<td>STEL ppm</td>
<td>TWA ppm</td>
<td>STEL ppm</td>
<td>IDLH ppm</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>1333-74-0</td>
<td>1000 NE</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
</tr>
</tbody>
</table>

The balance of this gas mixture consists of one of the following inert gases or Air.

Air (compressed, atmospheric) 132259-10-0 Compressed air is a mixture of approximately 79% Nitrogen, approximately 21% Oxygen and other trace gases. No exposure limits are applicable to Air, Nitrogen or Oxygen.

Argon 7440-37-1 There are no specific exposure limits for Argon. Argon is a simple asphyxiant (SA). Oxygen levels should be maintained above 19.5%.

Helium 7440-59-7 There are no specific exposure limits for Helium. Helium is a simple asphyxiant (SA). Oxygen levels should be maintained above 19.5%.

Nitrogen 7727-37-9 There are no specific exposure limits for Nitrogen. Nitrogen is a simple asphyxiant (SA). Oxygen levels should be maintained above 19.5%.

RESPIRATORY PROTECTION: Maintain the Oxygen level above 19.5% in the workplace. If necessary, use only respiratory protection authorized in the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), or equivalent U.S. State standards and Canadian CSA Standard Z94.4-93. Oxygen levels below 19.5% are considered IDLH by OSHA. In such atmospheres, use of a full-facepiece pressure/demand SCBA or a full facepiece, supplied air respirator with auxiliary self-contained air supply is required under OSHA's Respiratory Protection Standard (1910.134-1998).


BODY PROTECTION: Use body protection appropriate for task. Transfer of large quantities under pressure may require protective equipment appropriate to the task. If necessary, refer to the OSHA Technical Manual (Section VII: Personal Protective Equipment) or appropriate Standards of Canada. If a hazard of injury to the feet exists due to falling objects, rolling objects, where objects may pierce the soles of the feet or where employee’s feet may be exposed to electrical hazards, use foot protection, as described in U.S. OSHA 29 CFR 1910.136 and the Canadian CSA Standard Z195-02, Protective Footwear.

ENVIRONMENTAL EXPOSURE CONTROLS: Controls should be engineered to prevent release to the environment, including procedures to prevent spills, atmospheric release and release to waterways.

9. PHYSICAL and CHEMICAL PROPERTIES

The following information is for Air, a possible main component of this gas mixture:

GAS DENSITY: 0.07493 lb/cu ft (1.2 kg/m³) EVAPORATION RATE (nBuAc = 1): Not applicable.

SPECIFIC GRAVITY (air = 1): 1 FREEZING POINT: -216.2°C (-357.2°F)

SOLUBILITY IN WATER: 0.0292 BOILING POINT (@ 1 atmos.): -194.3°C (-316.7°F)

EXPANSION RATIO: Not applicable. SPECIFIC VOLUME (ft³/lb): 13.346

ODOR THRESHOLD: Not applicable. MOLECULAR WEIGHT: 28.975

VAPOR PRESSURE (psia): Not applicable.

COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.

The following information is for Argon, a possible main component of this gas mixture:

GAS DENSITY: 0.103 lb/cu ft (1.650 kg/m³) EVAPORATION RATE (nBuAc = 1): Not applicable.

SPECIFIC GRAVITY (air = 1): 1.38 FREEZING POINT: -189.2°C (-338.6°F)

SOLUBILITY IN WATER: 0.056 BOILING POINT (@ 1 atmos.): -185.9°C (-302.6°F)

EXPANSION RATIO: Not applicable. SPECIFIC VOLUME (ft³/lb): 9.71

ODOR THRESHOLD: Not applicable. MOLECULAR WEIGHT: 39.95

VAPOR PRESSURE (psia): Not applicable.

COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.
9. PHYSICAL and CHEMICAL PROPERTIES (Continued)

The following information is for Helium, a possible main component of this gas mixture:

- **GAS DENSITY:** 0.103 lb/cu ft (1.165 kg/m³)
- **SPECIFIC GRAVITY (air = 1):** 0.138
- **SOLUBILITY IN WATER:** 0.0094
- **EXPANSION RATIO:** Not applicable.
- **ODOR THRESHOLD:** Not applicable.
- **VAPOR PRESSURE (psia):** Not applicable.
- **COEFFICIENT WATER/OIL DISTRIBUTION:** Not applicable.

The following information is for Nitrogen, a possible main component of this gas mixture:

- **GAS DENSITY:** 0.072 lb/cu ft (1.153 kg/m³)
- **SPECIFIC GRAVITY (air = 1):** 0.967
- **SOLUBILITY IN WATER:** 0.023
- **EXPANSION RATIO:** Not applicable.
- **ODOR THRESHOLD:** Not applicable.
- **VAPOR PRESSURE (psia):** Not applicable.
- **COEFFICIENT WATER/OIL DISTRIBUTION:** Not applicable.

The following information is pertinent to this product:

- **APPEARANCE, ODOR AND COLOR:** This gas mixture is colorless and odorless.
- **HOW TO DETECT THIS SUBSTANCE (warning properties):** There are no distinct warning properties of this gas mixture. In terms of leak detection, fittings and joints can be painted with a soap solution to detect leaks, which will be indicated by a bubble formation.

10. STABILITY and REACTIVITY

- **STABILITY:** Stable at standard temperatures and pressures.
- **DECOMPOSITION PRODUCTS:** Combustion: None. Hydrolysis: None.
- **MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE:** The Hydrogen component is incompatible with strong oxidizers, halogen compounds (e.g. bromine, chlorine, fluorine), lithium, Argon trifluoride, oxygen difluoride. Finely divided platinum and some other metals will cause hydrogen to react explosively with oxygen in air.
- **HAZARDOUS POLYMERIZATION:** Will not occur.
- **CONDITIONS TO AVOID:** Contact with incompatible materials. Cylinders exposed to high temperatures or direct flame can rupture or burst.

11. TOXICOLOGICAL INFORMATION

- **TOXICITY DATA:** Argon, Helium, Nitrogen and Hydrogen are simple asphyxiants (SA), which act to displace oxygen in the environment.
- **SUSPECTED CANCER AGENT:** The components of this gas mixture are not found on the following lists: U.S. EPA, U.S. NTP, U.S. OSHA, U.S. NIOSH, GERMAN MAK, IARC, or ACGIH, and therefore is not considered to be, nor suspected to be a cancer-causing agent by these agencies.
- **IRRITANCY OF PRODUCT:** This gas mixture is not irritating to contaminated tissue.
- **SENSITIZATION TO THE PRODUCT:** The components of this product are not known to be skin or respiratory sensitizers.
- **REPRODUCTIVE TOXICITY INFORMATION:** Listed below is information concerning the effects of the components of this gas mixture on the human reproductive system.
  - **Mutagenicity:** The components of this gas mixture are not reported to cause mutagenic effects in humans.
  - **Embryotoxicity:** The components of this gas mixture are not reported to cause embryotoxic effects in humans.
  - **Teratogenicity:** The components of this gas mixture are not reported to cause teratogenic effects in humans.
  - **Reproductive Toxicity:** The components of this gas mixture are not reported to cause adverse reproductive effects in humans.
- **BIOLOGICAL EXPOSURE INDICES (BEIs):** Currently, there are no Biological Exposure Indices (BEIs) determined for the components of this gas mixture.
12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: This gas mixture will be dissipated rapidly in well-ventilated areas.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: Any adverse effect on animals would be related to oxygen deficient environments.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No an adverse effect from this gas mixture on aquatic life is expected.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Return cylinders with any residual product to Matheson Tri-Gas. Do not dispose of locally.

14. TRANSPORTATION INFORMATION

U.S. DEPARTMENT OF TRANSPORTATION REGULATIONS: This product is classified as dangerous goods, per U.S. DOT regulations, under 49 CFR 172.101.

   PROPER SHIPPING NAME: Compressed gases, n.o.s.
   (Hydrogen, Argon) or (Hydrogen, Helium) or (Hydrogen, Nitrogen) or (Hydrogen, Air)

   UN IDENTIFICATION NUMBER: UN 1956
   HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas)
   PACKING GROUP: Not applicable.
   D.O.T HAZARD LABEL: Class 2.2 (Non-Flammable Gas)

   NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2004): 126

MARINE POLLUTANT: The components of this gas mixture are not classified by the DOT as a Marine Pollutants (as defined by 49 CFR 172.101, Appendix B).

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position, in a well-ventilated vehicle. The transportation of compressed gas cylinders in automobiles or in closed-body vehicles present serious safety hazards and should be discouraged.

NOTE: Shipment of compressed gas cylinders which have not been filled with the owner’s consent is a violation of Federal law [49 CFR, Part 173.301 (b)].

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This gas mixture is considered as dangerous goods, per regulations of Transport Canada.

   PROPER SHIPPING NAME: Compressed gases, n.o.s.
   (Hydrogen, Argon) or (Hydrogen, Helium) or (Hydrogen, Nitrogen) or (Hydrogen, Air)

   HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas)
   UN IDENTIFICATION NUMBER: UN 1956
   PACKING GROUP: Not Applicable
   HAZARD LABEL: Class 2.2 (Non-Flammable Gas)
   SPECIAL PROVISIONS: None

EXPLOSIVE LIMIT AND LIMITED QUANTITY INDEX: 0.12
ERAP INDEX: None
PASSENGER CARRYING SHIP INDEX: None
PASSENGER CARRYING ROAD VEHICLE OR PASSENGER CARRYING RAILWAY VEHICLE INDEX: 75

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2004): 126

NOTE: Shipment of compressed gas cylinders via Public Passenger Road Vehicle is a violation of Canadian law (Transport Canada Transportation of Dangerous Goods Act, 1992).

15. REGULATORY INFORMATION

ADDITIONAL U.S. REGULATIONS:

   U.S. SARA REPORTING REQUIREMENTS: No component of this product is subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act.
15. REGULATORY INFORMATION (Continued)

ADDITIONAL U.S. REGULATIONS:

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for the components of this product. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lbs (4,540 kg) therefore applies, per 40 CFR 370.20.

U.S. SARA HAZARD CATEGORIES (SECTION 311/312, 40 CFR 370-21): ACUTE: No; CHRONIC: No; FIRE: No; REACTIVE: No; SUDDEN RELEASE: Yes

U.S. TSCA INVENTORY STATUS: Components of this product are listed on the TSCA Inventory.

U.S. CERCLA REPORTABLE QUANTITY (RQ): Not applicable.

OTHER U.S. FEDERAL REGULATIONS: Hydrogen is subject to the reporting requirements of Section 112(r) of the Clean Air Act. The threshold quantity for this gas is 10,000 lbs (4,540 kg). Hydrogen is listed as Regulated Substances in quantities of 10,000 lbs (4,540 kg) or greater, per 40 CFR, Part 68 of the Risk Management for Chemical Accidental Release. Any process that involves a flammable gas on-site, in one location, in quantities of 10,000 lbs (4,540 kg) or greater has requirements under the Process Safety Management of Highly Hazardous Chemicals (29 CFR 1910.119), unless the gas is used as a fuel.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): No component of this product is on the California Proposition 65 lists.

LABELING: Cylinders of this gas mixture should be labeled for precautionary information per the guidelines of the CGA. Refer to the CGA for further information.

ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY STATUS: The components of this product are listed on the DSL Inventory.

OTHER CANADIAN REGULATIONS: Not applicable.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: The components of this product are not on the CEPA Priorities Substances Lists.

CANADIAN WHMIS CLASSIFICATION AND SYMBOLS: This gas mixture would be categorized as a Controlled Product, Hazard Class: A (compressed gas). The following symbol is required for WHMIS compliance for this gas mixture.

16. OTHER INFORMATION

CREATION DATE: May 16, 2008

REVISION DATE: New

REVISION HISTORY: New

MIXTURES: When two or more gases or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you use the mixture. Consult an Industrial Hygienist or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

Further information can be found in the following pamphlets published by: Compressed Gas Association Inc. (CGA), 421 Walney Road, 5th Floor, Chantilly, VA 20151. Telephone: (703) 788-2700, Fax: (703) 961-1831.

“Safe Handling of Compressed Gases in Containers” (P-1, 1999)
“Safe Handling and Storage of Compressed Gases” (AV-1, 1999)
“Handbook of Compressed Gases” (1992)

PREPARED BY: CHEMICAL SAFETY ASSOCIATES, Inc.
PO Box 3519, La Mesa, CA 91944-3519
(800)441-3365 / (619) 441-3365
A large number of abbreviations and acronyms appear on a MSDS. Some of these which are commonly used include the following:

**DEFINITION OF TERMS**

CAS #: This is the Chemical Abstract Service Number that uniquely identifies each constituent.

**EXPOSURE LIMITS IN AIR:**

**CEILING LEVEL:** The concentration that shall not be exceeded during any part of the workday.

**DGF MAK Germ Cell Mutagen Categories:**

1. Germ cell mutagens which have been shown to increase the mutation frequency in the progeny of exposed humans.
2. Germ cell mutagens which have been shown to increase the mutation frequency in the progeny of exposed rodents.
3. Substances which have been shown to induce genotoxic effects in mammalian cell cultures, which are clearly mutagenic in vitro and structurally related to known in vivo mutagens.
4. Not applicable. Category 4 carcinogenic substances are those with non-genotoxic mechanisms of action. By definition, germ cell mutagens are genotoxic.

**TWA**—Time Weighted Average: exposure concentration for an 8-hour workday, even if the 8-hr TWA is within the TLV-TWA, PEL-TWA or REL-TWA. Substances which have been shown to induce genotoxic effects in mammalian cell cultures, which are clearly mutagenic in vitro and structurally related to known in vivo mutagens.

**DESTRUCTION OF OCULAR TISSUE; CORNEAL INVOLVEMENT OR IRRITATION PERSISTING FOR MORE THAN 21 DAYS:**

**CONVENTIONAL 8-HR (TLV, PEL) OR UP TO A 10-HR (REL) WORKDAY AND A 40-HR WORKWEEK:**

**TWA**—Time Weighted Average: exposure concentration for an 8-hour workday, even if the 8-hr TWA is within the TLV-TWA, PEL-TWA or REL-TWA. Substances which have been shown to induce genotoxic effects in mammalian cell cultures, which are clearly mutagenic in vitro and structurally related to known in vivo mutagens.

**STEL**—Short Term Exposure Limit, usually a 15-minute time-weighted average concentration for a conventional 8-hr (TLV) or up to a 10-hr (REL) workday and a 40-hr workweek.

**HAZARDOUS MATERIALS IDENTIFICATION SYSTEM HAZARD RATINGS (continued):**

**FLAMMABILITY HAZARD (continued):**

**1 (Slight Hazard—Materials that must be pre-identified and require consideration before use.):**

- Materials that will burn in air when exposed to a temperature of 815°C (1500°F) for a period of 5 minutes or less.
- Materials that will burn in air at 93°C (200°F) or below indefinitely, and will ignite at 190°C (375°F) or greater in the absence of a source of ignition.

**2 (Moderate Hazard—Materials that are the most hazardous and that are likely to generate a high degree of heat or pressure in the event of a fire, explosion, or other release.):**

- Materials that will burn in air at 371°C (700°F) or below indefinitely, and will ignite at 149°C (300°F) or greater in the absence of a source of ignition.

**3 (Serious Hazard—Materials that are flammable in air.):**

- Materials that burn in air at 371°C (700°F) or below indefinitely, and will ignite at 149°C (300°F) or greater in the absence of a source of ignition.

**4 (Severe Hazard—Materials that are explosive in air.):**

- Materials that burn in air at 371°C (700°F) or below indefinitely, and will ignite at 149°C (300°F) or greater in the absence of a source of ignition.

**PHYSICAL HAZARD:**

**0 (No Reactivity—Materials that do not react with water.):**

- Organic Peroxides: Materials that are normally stable, even under fire conditions and will not react with water.

**1 (Water Reactivity—Materials that change or decompose upon exposure to moisture.):**

- Oxidizers: Pressure-sensitivities of oxidizing substances are determined by the criteria for Packing Group I, II and III.

**2 (Water Reactivity—Materials that react violently with water.):**

- Organic Peroxides: Materials that react explosively with water.

**3 (Water Reactivity—Materials that react with water to produce a hazardous mixture.):**

- Oxidizers: Pressure-sensitivities of oxidizing substances are determined by the criteria for Packing Group I, II and III.

**4 (Water Reactivity—Materials that react with water to produce a hazardous mixture.):**

- Oxidizers: Pressure-sensitivities of oxidizing substances are determined by the criteria for Packing Group I, II and III.

**UNSTABLE REACTIVES:**

- Materials that may polymerize, decompose, condense, or self-react at ambient temperature and/or pressure and have a low potential for heat generation.

**3A:**

- Materials that will polymerize, decompose, condense, or self-react at ambient temperature and/or pressure and have a low potential for heat generation.

**3B:**

- Materials that will polymerize, decompose, condense, or self-react at ambient temperature and/or pressure and have a low potential for heat generation.

**3C:**

- Materials that will polymerize, decompose, condense, or self-react at ambient temperature and/or pressure and have a low potential for heat generation.

**3D:**

- Materials that will polymerize, decompose, condense, or self-react at ambient temperature and/or pressure and have a low potential for heat generation.

**4:**

- Materials that will polymerize, decompose, condense, or self-react at ambient temperature and/or pressure and have a high potential for heat generation.
NATIONAL FIRE PROTECTION ASSOCIATION HAZARD RATINGS:

16. OTHER INFORMATION (Continued)

DEFINITIONS OF TERMS (Continued):

- MATERIALS THAT WILL BURN UNDER TYPICAL FIRE CONDITIONS
- MATERIALS THAT WILL BURN UNDER EMERGENCY CONDITIONS
- MATERIALS THAT, ON ACCOUNT OF THEIR PHYSICAL OR CHEMICAL PROPERTIES, CAN FORM EXPLOSIVE MIXTURES IN AIR
- MATERIALS THAT, ON ACCOUNT OF THEIR PHYSICAL OR CHEMICAL PROPERTIES, CAN FORM EXPLOSIVE MIXTURES IN WATER
- MATERIALS THAT, ON ACCOUNT OF THEIR PHYSICAL OR CHEMICAL PROPERTIES, CAN FORM EXPLOSIVE MIXTURES IN OR CONTAIN WATER
- MATERIALS THAT, ON ACCOUNT OF THEIR PHYSICAL OR CHEMICAL PROPERTIES, CAN FORM EXPLOSIVE MIXTURES IN OR CONTAIN A WATER-CONTIGUOUS LIQUID
- MATERIALS THAT, ON ACCOUNT OF THEIR PHYSICAL OR CHEMICAL PROPERTIES, CAN FORM EXPLOSIVE MIXTURES IN OR CONTAIN A WATER-CONTIGUOUS SOLID
- MATERIALS THAT, ON ACCOUNT OF THEIR PHYSICAL OR CHEMICAL PROPERTIES, CAN FORM EXPLOSIVE MIXTURES IN OR CONTAIN A WATER-CONTIGUOUS LIQUID OR SOLID
- MATERIALS THAT, ON ACCOUNT OF THEIR PHYSICAL OR CHEMICAL PROPERTIES, CAN FORM EXPLOSIVE MIXTURES IN OR CONTAIN A WATER-CONTIGUOUS LIQUID AND SOLID
- MATERIALS THAT, ON ACCOUNT OF THEIR PHYSICAL OR CHEMICAL PROPERTIES, CAN FORM EXPLOSIVE MIXTURES IN OR CONTAIN A WATER-CONTIGUOUS LIQUID, SOLID, AND GAS
- MATERIALS THAT, ON ACCOUNT OF THEIR PHYSICAL OR CHEMICAL PROPERTIES, CAN FORM EXPLOSIVE MIXTURES IN OR CONTAIN A WATER-CONTIGUOUS LIQUID, SOLID, GAS, AND OTHER MATERIALS
- MATERIALS THAT, ON ACCOUNT OF THEIR PHYSICAL OR CHEMICAL PROPERTIES, CAN FORM EXPLOSIVE MIXTURES IN OR CONTAIN A WATER-CONTIGUOUS LIQUID, SOLID, GAS, AND OTHER MATERIALS THAT ARE LIQUID
- MATERIALS THAT, ON ACCOUNT OF THEIR PHYSICAL OR CHEMICAL PROPERTIES, CAN FORM EXPLOSIVE MIXTURES IN OR CONTAIN A WATER-CONTIGUOUS LIQUID, SOLID, GAS, AND OTHER MATERIALS THAT ARE LIQUID AND SOLID
- MATERIALS THAT, ON ACCOUNT OF THEIR PHYSICAL OR CHEMICAL PROPERTIES, CAN FORM EXPLOSIVE MIXTURES IN OR CONTAIN A WATER-CONTIGUOUS LIQUID, SOLID, GAS, AND OTHER MATERIALS THAT ARE LIQUID, SOLID, AND GAS
- MATERIALS THAT, ON ACCOUNT OF THEIR PHYSICAL OR CHEMICAL PROPERTIES, CAN FORM EXPLOSIVE MIXTURES IN OR CONTAIN A WATER-CONTIGUOUS LIQUID, SOLID, GAS, AND OTHER MATERIALS THAT ARE LIQUID, SOLID, GAS, AND OTHER MATERIALS

NATIONAL FIRE PROTECTION ASSOCIATION HAZARD RATINGS (continued):

- HEALTH HAZARD (continued): Materials that, on account of their physical or chemical properties, can form explosive mixtures in air, water, or other substances.
- HYDROGEN, AIR, ARGON, HELIUM, or NITROGEN GAS MIXTURE MSDS EFFECTIVE DATE: MAY 19, 2008