CHEMICAL NAME; CLASS: NON-FLAMMABLE GAS MIXTURE

Containing One or More of the Following Components in a Nitrogen Balance Gas:
- Oxygen, 0-23.5%;
- Methane, 0-2.5%;
- Propane, 0-1.1%;
- Carbon Monoxide, 0.0005-1.0%;
- Sulfur Dioxide, 0.0001-0.05%

SYNONYMS: Not Applicable
CHEMICAL FAMILY NAME: Not Applicable
FORMULA: Not Applicable

Document Number: 50056 (Replaces ISC MSDS No. 1810-9147, 1810-9148, 1810-9164, 1810-6771, 1810-6775)

Note: This MSDS has been developed for various gas mixtures with the composition of components within the ranges listed in Section 2 (Composition and Information on Ingredients). Refer to the product label for information on the actual composition of the product.

PRODUCT USE:
Calibration of Monitoring and Research Equipment

U.S. SUPPLIER/MANUFACTURER’S NAME:
CALGAZ

ADDRESS:
821 Chesapeake Drive
Cambridge, MD 21613

BUSINESS PHONE:
General MSDS Information: 1-713-868-0440
Fax on Demand: 1-800-231-1366

EMERGENCY PHONE:
Chemtrec: United States/Canada/Puerto Rico: 1-800-424-9300 [24-hours]
Chemtrec International: 1-703-527-3887 [24-hours]

2. COMPOSITION and INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>CHEMICAL NAME</th>
<th>CAS #</th>
<th>mole %</th>
<th>ACGIH-TLV TWA ppm</th>
<th>OSHA-PEL STEL ppm</th>
<th>NIOSH REL: TWA ppm</th>
<th>IDLH ppm</th>
<th>OTHER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfur Dioxide</td>
<td>7446-95</td>
<td>0.0001-0.05%</td>
<td>2</td>
<td>5</td>
<td>5</td>
<td>(Vacated 1989 PEL)</td>
<td>100</td>
</tr>
<tr>
<td>Carbon Monoxide</td>
<td>630-08</td>
<td>0.0005-1.0%</td>
<td>NE</td>
<td>50</td>
<td>200</td>
<td>(Vacated 1989 PEL)</td>
<td>1200</td>
</tr>
<tr>
<td>Propane</td>
<td>74-98-6</td>
<td>1-1.1%</td>
<td>2500 NIC = 1000</td>
<td>NE</td>
<td>1000</td>
<td>NE</td>
<td>2100</td>
</tr>
<tr>
<td>Methane</td>
<td>78-82-7</td>
<td>0-2.5%</td>
<td>There are no specific exposure limits for Methane. Methane is a simple asphyxiant (SA).</td>
<td>Oxygen</td>
<td>There are no specific exposure limits for Oxygen.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitrogen</td>
<td>7727-37</td>
<td>0-23.5%</td>
<td>There are no specific exposure limits for Nitrogen. Nitrogen is a simple asphyxiant (SA).</td>
<td>Oxygen levels should be maintained above 19.5%.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This gas mixture is colorless and has a slight sulfur-like odor (due to the presence of Sulfur Dioxide). The Carbon Monoxide component of this gas mixture, is a chemical asphyxiant and can produce significant, adverse health effects at relatively low concentrations. Depending on the duration and concentration of Carbon Monoxide, over-exposure to this gas mixture may cause nausea, dizziness, headaches, and collapse. Sulfur Dioxide can also produce adverse health effects in extremely low concentrations (i.e. skin and eye irritation, dry throat, lung damage). Additionally, releases of this gas mixture may produce oxygen-deficient atmospheres (especially in small, confined spaces or other poorly-ventilated environments); individuals in such atmospheres may be asphyxiated.

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: The most significant route of over-exposure for this gas mixture is by inhalation.

INHALATION: Due to the small size of an individual cylinder of this gas mixture, no unusual health effects from over-exposure to the product are anticipated under routine circumstances of use. Inhalation over-exposures to atmospheres containing more than the Threshold Limit Value of Carbon Monoxide (25 ppm) can result in serious health consequences. Carbon Monoxide is classified as a chemical asphyxiant, producing a toxic action by combining with the hemoglobin of the blood and replacing the available oxygen. Through this replacement, the body is deprived of the required oxygen, and asphyxiation occurs. Since the affinity of carbon monoxide for hemoglobin is about 200-300 times that of oxygen, only a small amount of Carbon Monoxide will cause a toxic reaction to occur. Carbon Monoxide exposures in excess of 50 ppm will produce symptoms of poisoning if breathed for a sufficiently long time. If this gas mixture is released in a small, poorly-ventilated area (i.e. an enclosed or confined space), symptoms which may develop include the following:

- Confusion
- Nausea
- Headache
- Fatigue
- Dizziness
- Collapse
- Sensory loss

Anyone who inhales this gas mixture and exhibits any of the above symptoms should immediately leave the contaminated area and seek medical treatment.

Manufactured for

INDUSTRIAL SCIENTIFIC CORPORATION

1001 Oakdale Road
Oakdale, PA 15071-1500

Phone (412) 788-4363
TOLL-FREE 800-DETECTS
Fax (412) 788-8353

MATERIAL SAFETY DATA SHEET
Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

Effective Date: December 10, 2012
Page 1 of 6

PN3587
CONCENTRATION OF CARBON MONOXIDE
All exposure levels:
200 ppm:  Slight symptoms (headache, discomfort) after several hours of exposure.
400 ppm:  Headache and discomfort experienced within 2-3 hours of exposure.
1,000 - 2,000 ppm:  Within 30 minutes, slight palpitations of the heart occurs.  Within 1.5 hours, there is a tendency to stagger.
200 - 2,500 ppm:  Within 2 hours, there is mental confusion, headaches, and nausea.  Unconsciousness within 30 minutes.
> 2,500 ppm:  Potential for collapse and death before warning symptoms are produced.

Another potential health hazard associated with this gas mixture is the potential for over-exposure to Sulfur Dioxide. Exposures to Sulfur Dioxide in low concentrations are irritating to the mucous membranes of the eyes, nose, throat, and lungs. Over-exposures to this gas mixture may also result in dryness and irritation of the nose and throat, choking, coughing, and bronchospasm. Severe over-exposure may cause pulmonary edema, airway obstruction, respiratory arrest, unconsciousness, and death through systemic acidosis. The symptoms associated with exposure to specific Sulfur Dioxide concentrations are as follows:

SULFUR DIOXIDE CONCENTRATION OF SULFUR DIOXIDE
1 ppm (1-6 hr duration):  Reversible decrease in lung function.
5 ppm (10-30 min duration):  Constriction of bronchiol tubes.
8 ppm (30 min duration):  Reddening of the throat and mild nose and throat irritation.
20 ppm:  For most persons exposed, this level is objectionably irritating.
500 ppm:  At this level, Sulfur Dioxide is so objectionable, that it is difficult to inhale a single deep breath without irritation.

Additionally, releases of this gas mixture may produce oxygen-deficient atmospheres (especially in small, confined spaces or other poorly-ventilated environments); individuals in such atmospheres may be asphyxiated. Individuals breathing such an atmosphere may experience symptoms which include headaches, ringing in ears, dizziness, droveness, unconsciousness, nausea, vomiting, and depression of all the senses. Under some circumstances of over-exposure, death may occur. The effects associated with various levels of oxygen are as follows:

CONCENTRATION OF OXYGEN
10-16% Oxygen:  Breathing rate increased, muscular coordination slightly disturbed.
10-14% Oxygen:  Emotional upset, abnormal fatigue, disturbed respiration.
6-10% Oxygen:  Nausea, vomiting, collapse, or loss of consciousness.
Below 6% Oxygen:  Convulsive movements, possible respiratory depression, and death.

SKIN and EYE CONTACT:  Due to the presence of Sulfur Dioxide, this gas mixture may be irritating to the skin (especially in a moist environment). Sulfur Dioxide may react with moisture on the skin to produce acidic solutions containing sulfuric acid. Symptoms of skin over-exposure may include scratching, pain, and redness. If this gas mixture contaminates the eyes, damage to eye tissue will result in pain, inflammation, and potentially, blindness.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms. Over-exposure to this gas mixture may cause the following health effects:

ACUTE:  Due to the small size of the individual cylinder of this gas mixture, no unusual health effects from exposure to the product are anticipated under routine circumstances of use. However, the Carbon Monoxide component of this gas mixture is toxic to humans. Symptoms of Carbon Monoxide poisoning can develop gradually, or can arise suddenly, depending on the concentration and duration of exposure. Lips and fingernails will turn bright red, which is a significant sign of Carbon Monoxide over-exposure. Other symptoms of over-exposure can include respiratory difficulty, headaches, shortness of breath, wheezing, headache, blurred vision, memory loss, dizziness, indigestion, nausea, unconsciousness, and death. Under certain circumstances, over-exposure to this gas may be fatal. Another potential health hazard associated with this gas mixture is the potential for over-exposure to Sulfur Dioxide, which can cause irritation and damage to the respiratory system, the skin, and eyes. Sulfur Dioxide may react with moisture on the skin to produce sulfuric acid; contact with the acid can produce scratches, pain, and redness of contaminated areas. Depending on the duration of over-exposure, contact with eye tissue may result in pain, inflammation, and blindness. Symptoms of oxygen deficiency include respiratory difficulty, ringing in ears, headaches, shortness of breath, wheezing, headache, dizziness, indigestion, nausea, unconsciousness, and death. The skin of a victim of over-exposure may have a blue color.

CHRONIC:  Prolonged or repeated over-exposures to Sulfur Dioxide, a component of this gas mixture, may cause respiratory problems, bronchial irritation, hacking cough, nasal irritation and discharge, increased fatigue, alteration in the senses of taste and smell. Repeated over-exposures to Sulfur Dioxide can also result in dental erosion and gum disorders. Propane (another component of this gas mixture) can cause sensitization of the heart to epinephrine, based on animal tests. Refer to Section 11 (Toxicology Information) for additional data on this gas mixture’s components. Chronic exposure to oxygen-deficient atmospheres (below 18% oxygen in air) may affect the heart and nervous system.

TARGET ORGANS:  ACUTE:  Respiratory system, blood system, skin and eyes. CHRONIC:  Cardiovascular system, heart, reproductive system, teeth, skin, and eyes.

4. FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO THIS GAS MIXTURE WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus must be worn. No unusual health effects are anticipated after exposure to this gas mixture, due to the small cylinder size. If any adverse symptom develops after over-exposure to this gas mixture, remove victim(s) to fresh air as quickly as possible. Only trained personnel should administer supplemental oxygen and cardio-pulmonary resuscitation if necessary. Victim(s) who experience any adverse effect after over-exposure to this gas mixture must be taken for medical attention. Rescuers should be taken for medical attention if necessary. Take a copy of the label and the MSDS to physician or other health professional with victim(s).

SKIN EXPOSURE:  If irritation of the skin develops after exposure to this gas mixture, immediately begin decontamination with running water. Minimum flushing is for 15 minutes. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Victim must seek immediate medical attention.

EYE EXPOSURE:  If irritation of the eye develops after exposure to this gas mixture, open victim's eyes while under gentle running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes. Seek medical assistance immediately, preferably an ophthalmologist.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing respiratory conditions may be aggravated by over-exposure to this gas mixture. Carbon Monoxide, a component of this gas mixture, can aggravate some diseases of the cardiovascular system, such as coronary artery disease and angina pectoris. Additionally, due to the presence of Sulfur Dioxide, skin, eye and dental conditions may be aggravated by over-exposure to this gas mixture.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and eliminate over-exposure. If necessary, the use of hyperbaric oxygen is the most effective antidote to Carbon Monoxide poisoning, the optimum range being 2.25 atm. A special mask, or preferably, a compression chamber to utilize oxygen at these pressures is required. Avoid administering stimulant drugs. Additionally, be observant for the signs of pulmonary edema (due to the presence of Sulfur Dioxide).

HIGHLIGHTS OF INHALATION HAZARDS

HEALTH HAZARD
FLAMMABILITY HAZARD
PHYSICAL HAZARD
PROTECTIVE EQUIPMENT

For Routine Industrial Use and Handling Applications
5. FIREFIGHTING MEASURES

FLASH POINT: Not applicable.
AUTOIGNITION TEMPERATURE: Not applicable.
FLAMMABLE LIMITS (% by volume, %):
Lower LEL: Not applicable.
Upper UEL: Not applicable.

NFPA RATING
FLAMMABILITY 1
HEALTH 3
REACTIVITY 0

UNUSUAL FIRE AND EXPLOSION HAZARDS: Due to the presence of Sulfur Dioxide, this gas mixture is irritating to the respiratory system, skin, and eyes; this mixture may pose a health hazard to firefighters. Sulfur Dioxide can react with water to form a corrosive solution of sulfurous acid. This acidic solution may corrode metal and cause injury to firefighters. This gas mixture is not flammable; however, containers, when involved in fire, may rupture or burst in the heat.

Escape:
Up to 50 ppm: Gas mask with canister or escape-type SCBA.
Up to 20 ppm: SAR operated in a continuous-flow mode.
Up to 1200 ppm: Gas mask with canister to protect against carbon monoxide or full-facepiece Self-Contained Breathing Apparatus (SCBA) or full-facepiece SAR.

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS: WARNING! Compressed gases can present significant safety hazards. During cylinder use, use equipment designed for these specific cylinders. Ensure all lines and equipment are rated for proper service pressure.

PRACTICABLE PROTECTIVE MEASURES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain that application equipment is locked and tagged-out safely. Always use product in areas where adequate ventilation is provided.

6. ACCIDENTAL RELEASE MEASURES

LEAK RESPONSE: Due to the small size and content of the cylinder, an accidental release of this gas mixture presents significantly less risk of overexposure to Carbon Monoxide and Sulfur Dioxide and exposure to an oxygen deficient environment and other safety hazards than a similar release from a larger cylinder. However, as with any chemical release, extreme caution must be used during emergency response procedures. In the event of a release in which the atmosphere is unknown, and in which other chemicals are potentially involved, evacuate immediate area. Such releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a leak, clear the affected area, protect people, and respond with trained personnel.

For emergency disposal, secure the cylinder and slowly discharge the gas to the atmosphere in a well-ventilated area or outdoors. Allow the gas mixture to dissipate. If necessary, monitor the surrounding area (and the original area of the release) for oxygen, Carbon Monoxide, and Sulfur Dioxide. Carbon Monoxide and Sulfur Dioxide levels must be below exposure level listed in Section 2 (Composition and Information on Ingredients) before non-emergency personnel are allowed to re-enter area. If leaking incidentally from the cylinder or its valve, contact your supplier.

7. HANDLING AND USE

WORK PRACTICES AND HYGIENE PRACTICES: Be observant for the odor of sulfur; this odor is indicative of a potential over-exposure to this gas mixture. Employees should also be aware of any signs of dizziness or fatigue; exposures to fatal concentrations of Carbon Monoxide could occur rapidly. Do not attempt to repair, adjust, or in any other way modify the cylinders or mixtures containing Carbon Monoxide or Sulfur Dioxide. If there is a malfunction or another type of operational problem, contact nearest distributor immediately.

STORAGE AND HANDLING PRACTICES: Cylinders should be firmly secured to prevent falling or being knocked-over. Cylinders must be protected from the environment and preferably kept at room temperature (approximately 21°C [70°F]). Cylinders should be stored in dry, well-ventilated areas, away from sources of heat, ignition, and direct sunlight. Protect cylinders against physical damage. Full and empty cylinders should be segregated. Use a first-in, first-out inventory system to prevent full containers from being stored for long periods of time. These cylinders are not refillable. IMPORTANT! Do not refill DOT 39 cylinders. To MINIMIZE OR AVOID POSSIBLE PERSONAL INJURY, IN CASE OF A LEAK OR MALFUNCTION:

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS:

- WARNING! Compressed gases can present significant safety hazards. During cylinder use, use equipment designed for these specific cylinders. Ensure all lines and equipment are rated for proper service pressure.
- PRACTICABLE PROTECTIVE MEASURES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain that application equipment is locked and tagged-out safely. Always use product in areas where adequate ventilation is provided.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: No special ventilation systems or engineering controls are needed under normal circumstances of use. As with all chemicals, use this gas mixture in well-ventilated areas. If this gas mixture is used in a poorly-ventilated area, install automatic monitoring equipment to detect the levels of Carbon Monoxide, Sulfur Dioxide, and oxygen.

RESPIRATORY PROTECTION: No special respiratory protection is required under normal circumstances of use. Use supplied air respiratory protection if Carbon Monoxide and Sulfur Dioxide levels exceed limits given in Section 2 (Composition Information on Ingredients) and oxygen levels are below 19.5% or unknown during emergency response to a release of this gas mixture. If respiratory protection is needed, use only protection authorized in the U.S. Federal OSHA Standard (29 CFR 1910.134), applicable U.S. State regulations, or the Canadian CSA Standard Z94.4-93 and applicable standards of Canadian Provinces. 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). If respiratory protection is needed, use only protection authorized in the U.S. Federal OSHA Standard (29 CFR 1910.134), applicable U.S. State regulations, or the Canadian CSA Standard Z94.4-93 and applicable standards of Canadian Provinces. 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). The following NIOSH respiratory protection recommendations for Carbon Monoxide and Sulfur Dioxide are provided for further information.

CARBON MONOXIDE

CONCENTRATION Up to 350 ppm: SAR operated in a continuous-flow mode.
Up to 500ppm: Gas mask with canister to protect against carbon monoxide or full-facepiece Self-Contained Breathing Apparatus (SCBA) or full-facepiece SAR.
Up to 1200 ppm: Gas mask with canister to protect against carbon monoxide or full-facepiece Self-Contained Breathing Apparatus (SCBA) or full-facepiece SAR.

SAR operated in a continuous-flow mode.

Emergency or Planned Entry into Unknown Concentration or IDLH Conditions: Positive pressure, full-facepiece SCBA or positive pressure, full-facepiece SAR with an auxiliary positive pressure SCBA.

Escape: Gas mask with canister to protect against carbon monoxide or escape-type SCBA. NOTE: End of Service Life Indicator (ESLI) required for gas masks.

SULFUR DIOXIDE

CONCENTRATION Up to 20 ppm: Chemical cartridge respirator with cartridge(s); or Supplied Air Respirator (SAR). Up to 875 ppm: SAR operated in a continuous-flow mode. Up to 1000 ppm: Full-Facepiece chemical cartridge respirator with cartridge(s); or gas mask with canister; or powered air-purifying respirator with a tight-fitting facepiece and cartridge(s); or full-facepiece SCBA; or full-facepiece SAR; or SAR with a tight-fitting facepiece operated in a continuous-flow mode.

Emergency or Planned Entry Into Unknown Concentration or IDLH Conditions: Positive pressure, full-facepiece SCBA; or positive pressure, full-facepiece SAR with an auxiliary positive pressure SCBA. The IDLH concentration for Sulfur Dioxide is 100 ppm.

Escape: Gas mask with appropriate canister or escape-type SCBA.

EYE PROTECTION: Safety glasses. If necessary, refer to U.S. OSHA 29 CFR 1910.133 or appropriate Canadian Standards.

HAND PROTECTION: Wear leather gloves when handling cylinders. Chemically resistant gloves should be worn when using this gas mixture. If necessary, refer to U.S. OSHA 29 CFR 1910.133 or appropriate Canadian Standards.

BODY PROTECTION: No special protection is needed under normal circumstances of use. 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.
The following is the toxicology data for a component of this gas mixture:

**CARBON MONOXIDE**

- LCLo (inhalation, guinea pig) = 1039 ppm/24 hours
- LCLo (inhalation, human) = 3000 ppm/5 minutes
- TCLo (inhalation, human) = 12 ppm/1 hour;
  - LCLo (inhalation, human) = 1000 ppm/10 minutes;
  - LCLo (inhalation, human) = 5000 ppm/20 minutes

**SULFUR DIOXIDE**

- Mouse) 2444 ppm/4 hours
- Mouse) 5718 ppm/4 hours

**PROPANE**

- Oxygen in this mixture, no effects are anticipated.
- The gas mixture contains propane, which is a flammable gas mixture with the following characteristics: high flammability, high explosion limits, and high thermal conductivity.

**OXYGEN**

- Nitrogen is a simple asphyxiant, which acts to displace oxygen in the environment.
- The gas mixture contains nitrogen, which is a non-flammable gas mixture with the following characteristics: low flammability, low explosion limits, and low thermal conductivity.

**SOLVENTS**

- The gas mixture contains solvents, which are flammable gas mixtures with the following characteristics: high flammability, high explosion limits, and high thermal conductivity.

**FLAMMABLE GAS MIXTURE**

- The gas mixture contains flammable gas mixtures with the following characteristics: high flammability, high explosion limits, and high thermal conductivity.

**HARMFUL SUBSTANCES**

- The gas mixture contains harmful substances, which are flammable gas mixtures with the following characteristics: high flammability, high explosion limits, and high thermal conductivity.

**UNSTABLE OR VISIBLE SUBSTANCES**

- The gas mixture contains unstable or visible substances, which are flammable gas mixtures with the following characteristics: high flammability, high explosion limits, and high thermal conductivity.

**NOXIOUS SUBSTANCES**

- The gas mixture contains noxious substances, which are flammable gas mixtures with the following characteristics: high flammability, high explosion limits, and high thermal conductivity.

**UNDESIRABLE SUBSTANCES**

- The gas mixture contains undesirable substances, which are flammable gas mixtures with the following characteristics: high flammability, high explosion limits, and high thermal conductivity.

**ADVERSE SUBSTANCES**

- The gas mixture contains adverse substances, which are flammable gas mixtures with the following characteristics: high flammability, high explosion limits, and high thermal conductivity.

**POISONOUS SUBSTANCES**

- The gas mixture contains poisonous substances, which are flammable gas mixtures with the following characteristics: high flammability, high explosion limits, and high thermal conductivity.

**PESTICIDES**

- The gas mixture contains pesticides, which are flammable gas mixtures with the following characteristics: high flammability, high explosion limits, and high thermal conductivity.

**WEAPON SUBSTANCES**

- The gas mixture contains weapon substances, which are flammable gas mixtures with the following characteristics: high flammability, high explosion limits, and high thermal conductivity.

**PBS TOXINS**

- The gas mixture contains PBS toxins, which are flammable gas mixtures with the following characteristics: high flammability, high explosion limits, and high thermal conductivity.

**OTHER SUBSTANCES**

- The gas mixture contains other substances, which are flammable gas mixtures with the following characteristics: high flammability, high explosion limits, and high thermal conductivity.

**NON-FLAMMABLE GAS MIXTURE**

- The gas mixture contains non-flammable gas mixtures with the following characteristics: low flammability, low explosion limits, and low thermal conductivity.

**FLAMMABLE SUBSTANCES**

- The gas mixture contains flammable substances, which are flammable gas mixtures with the following characteristics: high flammability, high explosion limits, and high thermal conductivity.

**UNSTABLE OR VISIBLE SUBSTANCES**

- The gas mixture contains unstable or visible substances, which are flammable gas mixtures with the following characteristics: high flammability, high explosion limits, and high thermal conductivity.

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**PESTICIDES**

- The gas mixture contains pesticides, which are flammable gas mixtures with the following characteristics: high flammability, high explosion limits, and high thermal conductivity.

**WEAPON SUBSTANCES**

- The gas mixture contains weapon substances, which are flammable gas mixtures with the following characteristics: high flammability, high explosion limits, and high thermal conductivity.

**PBS TOXINS**

- The gas mixture contains PBS toxins, which are flammable gas mixtures with the following characteristics: high flammability, high explosion limits, and high thermal conductivity.

**OTHER SUBSTANCES**

- The gas mixture contains other substances, which are flammable gas mixtures with the following characteristics: high flammability, high explosion limits, and high thermal conductivity.

**NON-FLAMMABLE GAS MIXTURE**

- The gas mixture contains non-flammable gas mixtures with the following characteristics: low flammability, low explosion limits, and low thermal conductivity.

**FLAMMABLE SUBSTANCES**

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**PESTICIDES**

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**WEAPON SUBSTANCES**

- The gas mixture contains weapon substances, which are flammable gas mixtures with the following characteristics: high flammability, high explosion limits, and high thermal conductivity.

**PBS TOXINS**

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**OTHER SUBSTANCES**

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**NON-FLAMMABLE GAS MIXTURE**

- The gas mixture contains non-flammable gas mixtures with the following characteristics: low flammability, low explosion limits, and low thermal conductivity.

**FLAMMABLE SUBSTANCES**

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**OTHER SUBSTANCES**

- The gas mixture contains other substances, which are flammable gas mixtures with the following characteristics: high flammability, high explosion limits, and high thermal conductivity.

**NON-FLAMMABLE GAS MIXTURE**

- The gas mixture contains non-flammable gas mixtures with the following characteristics: low flammability, low explosion limits, and low thermal conductivity.

**FLAMMABLE SUBSTANCES**

- The gas mixture contains flammable substances, which are flammable gas mixtures with the following characteristics: high flammability, high explosion limits, and high thermal conductivity.

**UNSTABLE OR VISIBLE SUBSTANCES**

- The gas mixture contains unstable or visible substances, which are flammable gas mixtures with the following characteristics: high flammability, high explosion limits, and high thermal conductivity.

**NOXIOUS SUBSTANCES**

- The gas mixture contains noxious substances, which are flammable gas mixtures with the following characteristics: high flammability, high explosion limits, and high thermal conductivity.

**UNDESIRABLE SUBSTANCES**

- The gas mixture contains undesirable substances, which are flammable gas mixtures with the following characteristics: high flammability, high explosion limits, and high thermal conductivity.

**ADVERSE SUBSTANCES**

- The gas mixture contains adverse substances, which are flammable gas mixtures with the following characteristics: high flammability, high explosion limits, and high thermal conductivity.

**POISONOUS SUBSTANCES**

- The gas mixture contains poisonous substances, which are flammable gas mixtures with the following characteristics: high flammability, high explosion limits, and high thermal conductivity.

**PESTICIDES**

- The gas mixture contains pesticides, which are flammable gas mixtures with the following characteristics: high flammability, high explosion limits, and high thermal conductivity.

**WEAPON SUBSTANCES**

- The gas mixture contains weapon substances, which are flammable gas mixtures with the following characteristics: high flammability, high explosion limits, and high thermal conductivity.

**PBS TOXINS**

- The gas mixture contains PBS toxins, which are flammable gas mixtures with the following characteristics: high flammability, high explosion limits, and high thermal conductivity.

**OTHER SUBSTANCES**

- The gas mixture contains other substances, which are flammable gas mixtures with the following characteristics: high flammability, high explosion limits, and high thermal conductivity.
11. TOXICOLOGICAL INFORMATION (Continued)

SUSPECTED CANCER AGENT: The components of this gas mixture are listed by agencies tracking the carcinogenic potential of chemical compounds, as follows:

SULFUR DIOXIDE: ACGIH TLV-A4 (Not Classifiable as a Human Carcinogen); IARC-3 (Unclassifiable as to Carcinogenicity in Humans)

The remaining components of this gas mixture are not found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, and IARC; therefore, are not considered to be, nor suspected to be, cancer-causing agents by these agencies.

IRRITANT OF PRODUCT: Due to the presence of Sulfur Dioxide, this gas mixture can be very irritation and potentially damaging to the skin, eyes, and respiratory system, especially in the presence of moisture.

SEMITOXIC PRODUCT: The components of this gas mixture are not known to be skin or respiratory sensitizers. Based on animal tests, the Propane component of this gas mixture may cause cardiac sensitization to epinephrine.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects 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. The Sulfur Dioxide component of this gas mixture has produced mutagenic effects on specific animal tissues exposed to relatively large doses.

Embryotoxicity: The components of this gas mixture are not reported to cause embryotoxic effects in humans. Sulfur Dioxide has produced embryotoxic effects during clinical studies on test animals exposed to relatively large doses.

Teratogenicity: The components of this gas mixture are not reported to cause teratogenic effects in humans due to the small cylinder size and amount of chemicals component of this gas mixture which exists up to 1%, can cause teratogenic effects in humans. Severe exposure to Carbon Monoxide during pregnancy has caused adverse effects and the death of the fetus. In general, maternal symptoms are an indicator of the potential risk to the fetus before it is toxic to the fetus. Sulfur Dioxide has induced teratogenic effects during clinical studies on test animals exposed to relatively large doses.

Reproductive Toxicity: The components of this gas mixture are not reported to cause adverse reproductive effects in humans.

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generations. An embryotox is a chemical which causes damage to the developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the effects do not propagate across generational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.

BIOLOGICAL EXPOSURE INDICES (BEIs): Biological Exposure Indices (BEIs) have been determined for the components of this gas mixture, as follows:

<table>
<thead>
<tr>
<th>CHEMICAL DETERMINANT</th>
<th>SAMPLING TIME</th>
<th>BEI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Monoxide:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carboxyhemoglobin in Blood</td>
<td></td>
<td>3.5% of Hemoglobin</td>
</tr>
<tr>
<td>Carbon monoxide in End-Exhaled Air</td>
<td>16-19 ppm; lethal to Sunfish</td>
<td>20 ppm</td>
</tr>
<tr>
<td></td>
<td>0.5 ppm for 1 hour; toxic to fish</td>
<td>0.5 ppm for 1 hour; toxic to fish</td>
</tr>
<tr>
<td></td>
<td>0.5 ppm for 1 hour; Trout float helplessly</td>
<td>1 ppm for 2 hours; lethal to Trench</td>
</tr>
</tbody>
</table>

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: The components of this gas mixture occur naturally in the atmosphere. The gas will be dissipated rapidly in well-ventilated areas. Complex reactions of Sulfur Dioxide (a component of this gas mixture) occur in the atmosphere can contribute to air pollution. The following environmental data are applicable to the components of this gas mixture.

CARBON MONOXIDE: Water solubility = 3.3 ml/100 cc at 0°C, 2.3 ml at 20°C.

NITROGEN: Water Solubility = 2.4 volumes Nitrogen/100 volumes water at 0°C, 1.6 volumes Nitrogen/100 volumes water at 20°C.

OXYGEN: Water Solubility = 1 volume Oxygen/32 volumes water at 20°C. Log Kow = 0.85.


SULFUR DIOXIDE: Sulfur Dioxide is extremely stable to heat (up to 2000°C). Complex reactions of Sulfur Dioxide occur in the atmosphere, producing sulfuric acid aerosol. Ammonium compounds which contribute to air pollution, and the aquatic biota they support, are susceptible to acidification from atmospheric sulfur. Soil adsorption is dependent on pH and moisture content.

EFFECT OF MATERIAL ON PLANTS OR ANIMALS: No evidence is currently available on the effects of this gas mixture on plant and animal life. Carbon Monoxide, a component of this gas mixture, can be deadly when exposed animal life, producing symptoms similar to those experienced by humans. Carbon Monoxide may also be harmful to plant life. Due to the presence of Sulfur Dioxide in this gas mixture, over-exposed animals could develop respiratory system damage, as well as skin and eye disorders. Because Sulfur Dioxide produces corrosive solutions, it can be harmful to animal life and aquatic life. Sulfur Dioxide, a component of this gas mixture, hydrolyzes to sulfuric acid solution when in contact with water. Sulfuric acid is very soluble in water, and even low concentrations of Sulfur Dioxide or sulfuric acid in water are detrimental to aquatic life. The presence of more than a trace of Carbon Monoxide (another component of this gas mixture) is also a hazard to fish. The following aquatic toxicity data are available for the components of this gas mixture:

<table>
<thead>
<tr>
<th>CARBON MONOXIDE:</th>
<th>SULFUR DIOXIDE:</th>
<th>SULFUR DIOXIDE (Continued):</th>
</tr>
</thead>
<tbody>
<tr>
<td>LD (surf) = 1.5 ppm/1-6 hours, fresh water.</td>
<td>16-19 ppm; lethal to Sunfish</td>
<td>16-19 ppm; lethal to Sunfish</td>
</tr>
<tr>
<td></td>
<td>0.5 ppm for 1 hour; toxic to fish</td>
<td>0.5 ppm for 1 hour; toxic to fish</td>
</tr>
<tr>
<td></td>
<td>0.5 ppm for 1 hour; Trout float helplessly</td>
<td>0.5 ppm for 1 hour; Trout float helplessly</td>
</tr>
<tr>
<td></td>
<td>0ppm for 2 hours; lethal to Trench</td>
<td>0ppm for 2 hours; lethal to Trench</td>
</tr>
</tbody>
</table>

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Cylinders with undesired residual product may be safely vented outdoors with the proper ventilation. More information is available to the Section 16 (Other Information).

14. TRANSPORTATION INFORMATION

THIS GAS MIXTURE IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Compressed gases, n.o.s. ("Oxygen, Nitrogen") or the gas component with the next highest concentration next to Nitrogen.

HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas)

UN IDENTIFICATION NUMBER: UN 1956

PACKING GROUP: Not applicable.

DOT LABEL(S) REQUIRED: Class 2.2 (Non-Flammable Gas)

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2000): 126

MARINE POLLUTANT: The components of this gas mixture are not classified by the DOT as 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 can present serious safety hazards. If transporting these cylinders in vehicles, ensure that these cylinders are not exposed to extremely high temperatures (as may occur in an enclosed vehicle on a hot day). Additionally, the vehicle should be well-ventilated during transportation.

Note: DOT 39 Cylinders ship in a strong outer carton (outer package). Pertinent shipping information goes on the outside of the outer package. DOT 39 Cylinders do not have transportation information on the cylinder itself.

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This gas is considered as Dangerous Goods, per the regulations of Transport Canada.

PROPER SHIPPING NAME: Compressed gases, n.o.s. ("Oxygen, Nitrogen") or the gas component with the next highest concentration next to Nitrogen.

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 PRECAUTIONS: 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 (2000): 126
ADDITIONAL U.S. REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: This gas mixture is subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act, as follows:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>SARA 302</th>
<th>SARA 304</th>
<th>SARA 313</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfur Dioxide</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

U.S. SARA SECTION 302 EXTREMELY HAZARDOUS THRESHOLD PLANNING QUANTITY (TPQ): Sulfur Dioxide = 500 lb (227 kg)

U.S. SARA SECTION 304 EXTREMELY HAZARDOUS REPORTABLE QUANTITY (TPQ): Sulfur Dioxide = 500 lb (227 kg)

U.S. TSCA INVENTORY STATUS: The components of this gas mixture are listed on the TSCA Inventory.

U.S. CHEMICAL HAZARD REPORTABLE QUANTITY (RQ): Not applicable.

OTHER U.S. FEDERAL REGULATIONS:

- Carbon Monoxide, Propane, and Sulfur Dioxide are subject to the reporting requirements of CFR 29 1910.1000; these compounds are listed on Table 2.1.
- Methane, Propane, and Sulfur Dioxide are subject to the reporting requirements of Section 112(v) of the Clean Air Act. The Threshold Quantity for Sulfur Dioxide (anhydrous form only) is 5,000 lb (2270 kg). The Threshold Quantity for each of other gases is 10,000 lb (4540 kg) and so this mixture will not be affected by the regulation.
- Sulfur Dioxide is listed in Appendix A as a highly hazardous chemical, per 29 CFR 1910.119: Process Safety Management of Highly Hazardous Chemicals. The threshold quantity for Sulfur Dioxide under this regulation is 1000 lb (454 kg).
- This gas mixture does not contain any Class I or Class II ozone depleting chemicals (40 CFR part 85).
- Nitrogen and Oxygen are not listed as Regulated Substances, per 40 CFR, Part 68, of the Risk Management for Chemical Releases. Sulfur Dioxide is listed under this regulation in Table 1, as a Regulated Substance (Toxic Substance), in quantities of 5,000 pounds (4,554 kg) or greater. Carbon Monoxide, Methane, and Propane are listed under this regulation in Table 3, as Regulated Substances (Flammable Substances), in quantities of 10,000 lbs (4,554 kg) or greater, and so this mixture will not be affected by the regulation.

U.S. STATE REGULATORY INFORMATION:

The components of this gas mixture are covered under the following specific State regulations:

- Kansas - Section 802/311 List: Sulfur Dioxide.
- Massachusetts - Substance List: Oxygen, Carbon Monoxide, Methane, Propane, Sulfur Dioxide.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65):

This gas mixture is categorized as a Controlled Product, Hazard Classes A D2A and D2B, as per the Controlled Product Regulations.

California Environmental Protection Act (CEPA) PRIORITIES SUBSTANCES LISTS:

The components of this gas mixture are not on the CEPA Priorities Substances Lists.

CANADIAN WHMIS REGULATIONS:

This gas mixture is categorized as a Controlled Product, Hazard Classes A D2A and D2B, as per the Controlled Product Regulations.

16. OTHER INFORMATION

INFORMATION ABOUT DOT-39 NRC (Non-Refillable Cylinder) PRODUCTS

DOT 39 cylinders ship as hazardous materials when full. Once the cylinders are relieved of pressure (empty) they are not considered hazardous material or waste. Residual gas in this type of cylinder is not an issue because toxic gas mixtures are prohibited. Calibration gas mixtures typically packaged in these cylinders are Nonflammable n.o.s., UN 1956. A small percentage of calibration gases packaged in DOT 39 cylinders are flammable or oxidizing gas mixtures.

For disposal of used DOT-39 cylinders, it is acceptable to place them in a landfill if local laws permit. Their disposal is no different than that employed with other DOT containers such as spray paint cans, household aerosols, or disposable cylinders of propane (for camping, torch etc.). When feasible, we recommended recycling for scrap metal content. CALGAZ will do this for any customer who wishes to return cylinders to us prepaid. All that is required is a phone call to arrange for pick up and we may proceed with the return. Scraping cylinders involves some preparation before the metal dealer may accept them. We perform this operation as a service to valued customers who want to participate.

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 produce 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 about the handling of compressed gases can be found in the following pamphlets published by: Compressed Gas Association Inc. (CGA), 1725 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202-4102. Telephone: (703) 412-0900.

P-1 “Safe Handling of Compressed Gases in Containers”

AV-1 “Safe Handling and Storage of Compressed Gases”

“Handbook of Compressed Gases”

This Material Safety Data Sheet is offered pursuant to OSHA’s Hazard Communication Standard, 29 CFR, 1910.1200. Other government regulations must be reviewed for applicability to this gas mixture. To the best of CALGAZ knowledge, the information contained herein is reliable and accurate as of this date; however, accuracy, suitability or completeness are not guaranteed and no warranties of any type, either express or implied, are provided. The information contained herein relates only to this specific product. If this gas mixture is combined with other materials, all component properties must be considered. Data may be changed from time to time. Be sure to consult the latest edition.

NON-FIgMABLE GAS MIXTURE MSDS - 50056 EFFECTIVE DATE: DECEMBER 10, 2012

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