



AIR LIQUIDE

# MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

## 1. PRODUCT IDENTIFICATION

**CHEMICAL NAME; CLASS:** NON-FLAMMABLE GAS MIXTURE

Containing One or More of the Following Components in a Nitrogen Balance Gas:  
Oxygen 0-23.5%; Ethanol, 0.0005-2.0%

**SYNONYMS:** Not Applicable

**CHEMICAL FAMILY NAME:** Not Applicable

**FORMULA:** Not Applicable

**Document Number:** 50032

**Note:** The Material Safety Data Sheet is for this gas mixture supplied in cylinders with 33 cubic feet (935 liters) or less gas capacity (DOT - 39 cylinders). 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.

<b>PRODUCT USE:</b>	Calibration of Monitoring and Research Equipment
<b>SUPPLIER/MANUFACTURER'S NAME:</b>	CALGAZ
<b>ADDRESS:</b>	821 Chesapeake Drive Cambridge, MD 21613
<b>EMERGENCY PHONE:</b>	CHEMTREC: 1-800-424-9300
<b>BUSINESS PHONE:</b>	1-410-228-6400
	General MSDS Information 1-713/868-0440
	Fax on Demand: 1-800/231-1366

## 2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	mole %	EXPOSURE LIMITS IN AIR					
			ACGIH-TLV		OSHA-PEL		NIOSH IDLH	OTHER
			TWA ppm	STEL ppm	TWA ppm	STEL ppm		
Ethanol	74-98-6	0.0005-2.0%	1000	NE	1000	NE	3300	NIOSH REL: TWA = 1000 DFG MAKs: TWA = 1000 PEAK = 2•MAK, 15 min. average value, 1 hr interval Carcinogen: MAK-5, TLV-A4
Oxygen	7782-44-7	0-23.5%	There are no specific exposure limits for Oxygen. Oxygen levels should be maintained above 19.5%.					
Nitrogen	7727-37-9	Balance	There are no specific exposure limits for Nitrogen. Nitrogen is a simple asphyxiant (SA). Oxygen levels should be maintained above 19.5%.					

NE = Not Established.

See Section 16 for Definitions of Terms Used.

NOTE: All WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-1998 format.

## 3. HAZARD IDENTIFICATION

**EMERGENCY OVERVIEW:** This gas mixture is a colorless gas which is odorless, or which has a slight, alcohol-like odor. Releases of this gas mixture may produce oxygen-deficient atmospheres (especially in confined spaces or other poorly-ventilated environments); individuals in such atmospheres may be asphyxiated. Inhalation of Ethanol, a component of this gas mixture, may cause drowsiness and other central nervous system effects at concentrations above 1000 ppm (0.1%).

**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. The chief health hazard associated with this gas mixture is when this gas mixture contains less than 19.5% Oxygen and is released in a small, poorly-ventilated area (i.e. an enclosed or confined space). Under this circumstance, an oxygen-deficient environment may occur. 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 over-exposure, death may occur. The effects associated with various levels of oxygen are as follows:

### CONCENTRATION OF OXYGEN

12-16% Oxygen:

10-14% Oxygen:

6-10% Oxygen:

Below 6%:

Additionally, there is a potential for over-exposure to Ethanol vapors. Inhalation of concentrations below 1,000 ppm (0.1%) of Ethanol usually produces no signs of intoxication. Exposure to concentrations over 1,000 ppm may cause headache, irritation of the eyes, nose, and throat, and, if continued for an hour, drowsiness and lassitude, loss of appetite, and inability to concentrate. Currently, there is no concrete evidence that repeated exposure to ethanol vapor results in cirrhosis of the liver.

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

no unusual health effects from exposure to the product are anticipated less than 19.5% oxygen is the

#### 4. FIRST-AID MEASURES (Continued)

**MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:** Acute or chronic respiratory conditions may be aggravated by over-exposure to the components of this gas mixture.

**RECOMMENDATIONS TO PHYSICIANS:** Administer oxygen, if necessary; treat symptoms; eliminate exposure.

#### 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:** Non-flammable gas mixture. Use extinguishing media appropriate for surrounding fire.

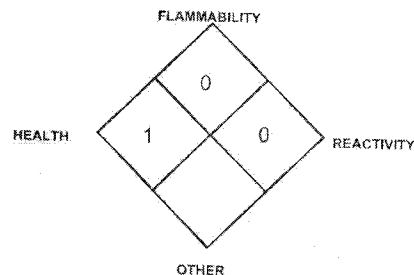
**UNUSUAL FIRE AND EXPLOSION HAZARDS:** This gas mixture is not flammable; however, containers, when involved in fire, may rupture or burst in the heat of the fire.

**Explosion Sensitivity to Mechanical Impact:** Not sensitive.

**Explosion Sensitivity to Static Discharge:** Not sensitive.

**SPECIAL FIRE-FIGHTING PROCEDURES:** Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment.

#### NFPA RATING



#### 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 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. Allow the gas mixture to dissipate. If necessary, monitor the surrounding area (and the original area of the release) for oxygen. Oxygen levels must be above 19.5% before non-emergency personnel are allowed to re-enter area. If leaking incidentally from the cylinder, 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 the Sulfur Dioxide of this gas mixture. Do not attempt to repair, adjust, or in any other way modify cylinders containing this gas mixture. If there is a malfunction or another type of operational problem, contact the nearest distributor immediately. Eye wash stations/safety showers should be near areas where this gas mixture is used or stored. All work operations should be monitored in such a way that emergency personnel can be immediately contacted in the event of a release. All work practices should minimize releases of Sulfur Dioxide and Nitrogen Monoxide-containing gas mixtures.

**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. **WARNING! Do not refill DOT 39 cylinders. To do so may cause personal injury or property damage.**

**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.

**PROTECTIVE PRACTICES 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 Ethanol and Oxygen.

**RESPIRATORY PROTECTION:** No special respiratory protection is required under normal circumstances of use. Maintain Ethanol levels below 50% of the TLV (TLV = 1000 ppm) and oxygen levels above 19.5% in the workplace. Use supplied air respiratory protection when Ethanol levels exceed 50% of the TLV (TLV = 1000 ppm), oxygen levels are below 19.5%, or during emergency response to a release of this gas mixture. During an emergency situation, before entering the area, check the concentration of Ethanol and Oxygen. If respiratory protection is required, follow the requirements of the Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), or equivalent State standards.

**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 1910.138 or appropriate Standards of Canada.

**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.

#### 9. PHYSICAL and CHEMICAL PROPERTIES

The following information is for Nitrogen, the main component of this gas mixture.

**GAS DENSITY @ 32°F (0°C) and 1 atm:** .072 lbs/ft<sup>3</sup> (1.153 kg/m<sup>3</sup>)

**FREEZING/MELTING POINT @ 10 psig:** -345.8°F (-210°C)

**SPECIFIC GRAVITY (air = 1) @ 70°F (21.1°C):** 0.906

**SOLUBILITY IN WATER vol/vol @ 32°F (0°C) and 1 atm:** 0.023

**EVAPORATION RATE (nBuAc = 1):** Not applicable.

**VAPOR PRESSURE @ 70°F (21.1°C) (psig):** Not applicable.

**COEFFICIENT WATER/OIL DISTRIBUTION:** Not applicable.

**BOILING POINT:** -320.4°F (-195.8°C)

**pH:** Not applicable.

**MOLECULAR WEIGHT:** 28.01

**EXPANSION RATIO:** Not applicable.

**SPECIFIC VOLUME (ft<sup>3</sup>/lb):** 13.8

The following information is for this gas mixture.

**APPEARANCE AND COLOR:** This gas mixture is a colorless gas which is odorless, or which has a slight, alcohol-like odor.

**HOW TO DETECT THIS SUBSTANCE (warning properties):** The odor may act as a warning property associated with a release 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.

## 11. TOXICOLOGICAL INFORMATION

**TOXICITY DATA:** The following toxicology data are available for the components of this gas mixture:

### ETHANOL:

Open Irritation Test (Skin-Rabbit) 400 mg: Mild  
Standard Draize Test (Skin-Rabbit) 20 mg/24  
hours: Moderate

Standard Draize Test (Eye-Rabbit) 500 mg:  
Severe

Standard Draize Test (Eye-Rabbit) 500 mg/24  
hours: Mild

Rinsed with Water (Eye-Rabbit): 100 mg/4  
seconds: Moderate

TDLo (Oral-Infant) 11712  $\mu$ L/kg: Behavioral:  
general anesthetic; Cardiac: arrhythmias  
(including changes in conduction); Lungs,  
Thorax, or Respiration: dyspnea

TDLo (Oral-Woman) 1200 mg/kg/3 hours:  
Endocrine: changes in gonadotropins, other  
changes; Blood: other changes

TDLo (Oral-Woman) 256 gm/kg/12 weeks:  
Behavioral: hallucinations, distorted  
perceptions; Endocrine: effect on menstrual  
cycle

### ETHANOL (continued):

TDLo (Oral-Man) 22,500 mg/kg/4 weeks-  
intermittent: Endocrine: other changes;  
Blood: other changes

TDLo (Oral-Man) 3371  $\mu$ L/kg: Behavioral:  
altered sleep time (including change in  
righting reflex); Behavioral: excitement, coma

TDLo (Oral-Man) 700 mg/kg: Behavioral:  
changes in psychophysiological tests

TDLo (Oral-Man) 50 mg/kg: Gastrointestinal:  
alteration in gastric secretion;  
Gastrointestinal: other changes

TDLo (Oral-Man) 1430  $\mu$ g/kg: Behavioral:  
changes in motor activity (specific assay),  
ataxia, antipsychotic

TDLo (Oral-Child) 14400 mg/kg/30 minutes-  
intermittent: Behavioral: coma; Lungs,  
Thorax, or Respiration: dyspnea;  
Gastrointestinal: nausea or vomiting

### ETHANOL (continued):

LDLo (Oral-Child) 2 gm/kg: Lungs, Thorax, or  
Respiration: other changes; Liver: fatty liver  
degeneration; Blood: other changes

LDLo (Oral-Human) 1400 mg/kg: Behavioral:  
sleep, headache; Gastrointestinal: nausea or  
vomiting

LDLo (Oral-Infant) 19,440 mg/kg: Behavioral:  
convulsions or effect on seizure threshold,  
coma; Nutritional and Gross Metabolic: body  
temperature decrease

LD<sub>50</sub> (Oral-Rat) 7060 mg/kg: Lungs, Thorax, or  
Respiration: other changes

LC<sub>50</sub> (Inhalation-Rat) 20,000 ppm/10 hours

**NITROGEN:** There are no specific toxicology  
data for Nitrogen. Nitrogen is a simple  
asphyxiant, which acts to displace oxygen in  
the environment.

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

**ETHANOL:** ACGIH TLV-A4 (Not Suspected as a Human Carcinogen-the agent is not suspected to be a human carcinogen on the basis of properly conducted epidemiologic studies in humans); MAK-5 (Substances With Carcinogenic and Genotoxic Effects, the Potency of Which is Considered to Be So Low that, provided the MAK and BAT values are observed, no significant contribution to cancer risk is to be expected.)

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

**IRRITANCY OF PRODUCT:** Contact with rapidly expanding gases can be irritating to exposed skin and eyes.

**SENSITIZATION TO THE PRODUCT:** This gas mixture is not known to cause sensitization in humans; however, some animals studies indicate that exposure to Butane, a component of this gas mixture, can cause weak cardiac sensitization.

**REPRODUCTIVE TOXICITY INFORMATION:** Listed below is information concerning the effects of this gas mixture and its components on the human reproductive system.

**Mutagenicity:** No mutagenicity effects have been described for the components of this gas mixture.

**Embryotoxicity:** No embryotoxic effects have been described for the components of this gas mixture.

**Teratogenicity:** No teratogenicity effects have been described for the components of this gas mixture. Human teratogenic effects are reported for Ethanol, when alcoholic beverages are consumed during pregnancy; however, this type of exposure is not pertinent to this gas mixture,

**Reproductive Toxicity:** No reproductive toxicity effects have been described for the components of gas mixture.

A **mutagen** is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generation lines. An **embryotoxin** is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does 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):** Currently, Biological Exposure Indices (BEIs) have not been determined for the components of this gas mixture.

## 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. The following environmental data are applicable to the components of this gas mixture.

### ETHANOL:

Log  $K_{ow}$  = 0.31; Water Solubility = 100% in water; BOD = 37%-86%/5 days (theoretical). This compound occurs naturally in the environment.

Bioconcentration: The low octanol/water partition coefficient indicates that Ethanol will not bioconcentrate in fish.

Aquatic Fate: When released into water, ethanol will volatilize (estimated half life is 6 days) and biodegrade. It will not sorb to sediment or bioconcentrate in aquatic organisms. Although it readily biodegrades in laboratory tests, no data on its rate of degradation in natural waters could be found.

Atmospheric Fate: When released into the atmosphere, ethanol will photodegrade with a half-life ranging from hours in polluted urban atmospheres to approximately 6 days in cleaner atmospheres (based on a hydroxyl radical concentration of  $8 \times 10^6$  moles/cu cm). Due to its solubility in water, rainout may be an important process.

Terrestrial Fate: When spilled on soil, Ethanol will both evaporate and leach into the ground due to the relatively high vapor pressure and low adsorption in soil. Ethanol will biodegrade in soil, probably to acetic acid and formaldehyde. If degradation is not rapid, it will leach into groundwater.

**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  $K_{ow}$  = -0.65

**EFFECT OF MATERIAL ON PLANTS or ANIMALS:** No evidence is currently available on this gas mixture's effects on plant and animal life.

**EFFECT OF CHEMICAL ON AQUATIC LIFE:** No evidence is currently available on this gas mixture's effects on aquatic life. The following aquatic toxicity data are available for the components of this gas mixture.

### ETHANOL:

LC<sub>50</sub> (*Palaemonetes pugio*, grass shrimp) = 250 mg/L/96 hour

LC<sub>50</sub> (*Salmo gairdneri*, rainbow trout) = 13000 mg/L/96 hour

LC<sub>50</sub> (*Pimephales promelas*, fathead minnow) = 15.3 mg/L/96 hour

EC<sub>50</sub> (*Pimephales promelas*, fathead minnow) = 12.9 mg/L/96 hour

LC<sub>50</sub> (*Pimephales promelas*, fathead minnow) = 14.2 mg/L/96 hour

### ETHANOL (Continued):

Cell Multiplication Inhibition Test:

*Microcystis aeruginosa*, algae = 1450 mg/L

*Scenedesmus quadricauda*, green algae = 5000 mg/L

*Entosiphon sulcatum*, protozoa = 65 mg/L

*Uronema parduczi*, protozoa = 6120 mg/L

*Pseudomonas putida*, bacteria = 6500 mg/L

## 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