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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 the Following Component in a Nitrogen Balance Gas:
Nitric Oxide: 0.0005 - 0.02 %

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

Document Number: 50026 (Replaces ISC MSDS No.1810-2153, 1810-7508, 1810-7722, 1810-4216)

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.

PRODUCT USE:	Calibration of Monitoring and Research Equipment
U.S. SUPPLIER/MANUFACTURER'S NAME:	CALGAZ
ADDRESS:	821 Chesapeake Drive Cambridge, MD 21613
BUSINESS PHONE:	1-410-228-6400 (8 a.m. to 5 p.m. U.S. EST)
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

CHEMICAL NAME	CAS #	mole %	EXPOSURE LIMITS IN AIR					
			ACGIH-TLV		OSHA-PEL		NIOSH	OTHER
			TWA ppm	STEL ppm	TWA ppm	STEL ppm	IDLH ppm	ppm
Nitric Oxide (Nitrogen Monoxide)	10102-43-9	0.0005-0.02%	25	NE	25	NE	100	NIOSH REL: TWA = 25
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 (1): ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-1998 format. This gas mixture has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This gas mixture is a colorless gas with an irritating odor. Nitric Oxide (Nitrogen Monoxide), a component of this gas mixture, can produce brownish Nitrogen Dioxide after reaction with oxygen. Nitric Oxide can produce adverse health effects in extremely low concentrations (i.e. skin and eye irritation, dry throat); symptoms of over-exposure may not become apparent for up to 72 hours. 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.

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. If this gas mixture is released in a small, poorly-ventilated area (i.e. an enclosed or confined space), over-exposure to Nitric Oxide or an oxygen-deficient environment may occur. Exposure to Nitric Oxide gas in low concentrations produces an irritating effect on the mucous membranes of the eyes, nose, throat, and lungs. Acute exposure through inhalation may result in dryness and irritation of the nose and throat, choking, coughing, and bronchospasm. Severe over-exposure may cause death through systemic, delayed pulmonary edema. Heath effects observed after over-exposures to Nitric Oxide include the following:

CONCENTRATION OF NITRIC OXIDE	**OBSERVED EFFECT**
25 ppm for 8 hours	Delayed pulmonary irritation (5 - 72 hours).
100 - 150 ppm	Delayed pulmonary edema and for 30 - 60 minutes symptoms of pulmonary dysfunction.
200 - 700 ppm	Severe pulmonary damage may result after a delay any exposure of 5-8 hours.
NOTE:	This gas mixture contains 5-200 ppm Nitric Oxide. Data pertinent to higher concentrations of Nitric Oxide are provided to give complete information on effects observed in humans after over-exposures have occurred.

A typical Nitric Oxide over-exposure incident follows the course described in the next paragraph:

After inhalation of a few breaths of Nitric Oxide, there is no immediate reaction, or only a very slight respiratory discomfort, headache, dizziness, or lassitude. Within 5-8 hours of exposure (frequently after the employee has left the workplace and returned home), it is noticed that the victim's lips and ears have a blue (cyanotic) color. There then follows rapidly increasing symptoms of breathing difficulty, irregular respiration, choking, dizziness, headache, increasing cyanosis, tightness in the chest, nausea, vomiting, lassitude, and palpitations. Left untreated, death frequently occurs. Physical examination immediately following over-exposure reveals an accelerated respiratory rate, decreased vital capacity, generally suppressed breathing sounds, low blood pressure, and a platelet count elevated by 10-100%.

Additionally, when this gas mixture is released in a small, poorly-ventilated area (i.e. an enclosed or confined space, 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	**OBSERVED EFFECT**
12-16% Oxygen:	Breathing and pulse 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%:	Convulsive movements, possible respiratory collapse, and death.

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH HAZARD	(BLUE)	3
FLAMMABILITY HAZARD	(RED)	0
PHYSICAL HAZARD	(YELLOW)	0

PROTECTIVE EQUIPMENT

EYES	RESPIRATORY	HANDS	BODY
See Section 8			

For Routine Industrial Use and Handling Applications

3. HAZARD IDENTIFICATION (Continued)

SKIN and EYE CONTACT: Prolonged exposure may cause potentially harmful amounts of Nitric Oxide, a component of this gas mixture, to enter the body via absorption through the skin. The gas may be irritating to the skin, especially in a moist environment, for prolonged periods. Symptoms of skin over-exposure may include scratchiness, pain, and redness. If Nitric Oxide contaminates the eyes, severe injury and swelling of the eye tissue may occur.

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. If this gas mixture is released in a small, poorly-ventilated area (i.e. an enclosed or confined space), over-exposure to Nitric Oxide or an oxygen-deficient environment may occur. Over-exposures to Nitric Oxide, a component of this gas mixture, may result in severe irritation and burns of eyes, skin, mucous membranes, and any other exposed tissue. If Nitric Oxide is inhaled, delayed pulmonary damage and breathing difficulty may occur. Medical care is essential, as symptoms will rapidly worsen, possibly leading to death.

CHRONIC: Prolonged or repeated over-exposures may cause respiratory problems, bronchitis, hacking cough, nasal irritation and discharge, increased fatigue, alteration in the senses of taste and smell. Repeated over exposures to Nitric Oxide can also result in dental erosion and gum disorders.

TARGET ORGANS: ACUTE: Respiratory system, skin and eyes. CHRONIC: Skin, respiratory system, teeth, heart, central nervous system.

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/or 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: Acute or chronic respiratory conditions, skin conditions, or eye disorders may be aggravated by over-exposure to Nitric Oxide, a component of this gas mixture.

RECOMMENDATIONS TO PHYSICIANS: Administer oxygen as soon as possible, following exposure. If possible, have victim breathe as deeply and rapidly as possible to help flush gas from the lungs. IN THE EVENT OF SEVERE OVER-EXPOSURES TO THIS GAS MIXTURE: Enforce bed rest for 24 - 48 hours, whether or not symptoms have appeared. Start oxygen therapy at the first sign of symptoms. Provide medication to reduce anxiety and dyspnea, as needed. Keep respiratory tract clear of mucous and exudate. Atropine, epinephrine, expectorants, emetics, most sedatives and most cardiac glycosides are usually ineffective and possibly harmful. Surgical intervention to assist breathing may be necessary. Respiratory infection should be controlled as soon as it is detected. Prednisone has been reported to be effective during recovery, in amounts of 3-8 x 10-6 kg daily, in divided doses. If Nitric Oxide contaminates the eye, use an optic anesthetic to reduce pain. The victim should be promptly examined by an ophthalmologist.

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.

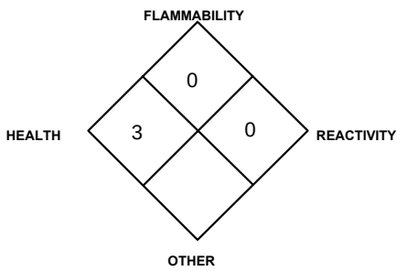
UNUSUAL FIRE AND EXPLOSION HAZARDS: Nitric Oxide, a component of this gas mixture, can produce severe irritation and health effects at low concentrations; therefore, this gas mixture presents significant heath hazards to firefighters. This gas mixture is not flammable; however, containers, when involved 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 over-exposure to Nitric Oxide, the toxic component of this gas mixture, and other safety hazards related to the remaining components of this gas mixture, 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 levels of Nitric Oxide and Oxygen. The level of Nitric Oxide must be at acceptable levels (see Section 2, Composition on Information on Ingredients) and the atmosphere must have at least 19.5 percent oxygen before personnel can be allowed in the area without Self-Contained Breathing Apparatus.

If leaking incidentally from the cylinder, contact your supplier.

7. HANDLING and USE

WORK PRACTICES AND HYGIENE PRACTICES: Be aware of any signs of dizziness or fatigue; exposures to fatal concentrations of this gas mixture could occur without any significant warning symptoms, due to over-exposure to Nitric Oxide or oxygen deficiency. All work practices should minimize the release of Nitric Oxide. 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. Do not attempt to repair, adjust, or in any other way modify the cylinders containing this gas mixture. 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. **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 Nitric Oxide and oxygen.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION (Continued)

RESPIRATORY PROTECTION: No special respiratory protection is required under normal circumstances of use. Use supplied air respiratory protection if 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 19.16.33% 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 Nitric Oxide concentrations in air are in place.

NITRIC OXIDE

CONCENTRATION	RESPIRATORY PROTECTION
Up to 100 ppm:	Any Supplied-Air Respirator (SAR) operated in a continuous-flow mode or any Chemical Cartridge Respirator with a full facepiece and cartridge(s), providing protection against Nitric Oxide. Only non-oxidizable sorbents are allowed (not charcoal), or any Powered, Air-Purifying Respirator (PAPR) with cartridge(s) providing protection against Nitric Oxide, or any Air-Purifying, Full-Facepiece Respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against Nitric Oxide, or any SAR, or any Self-Contained Breathing Apparatus (SCBA) with a full facepiece.
Emergency or Planned Entry into Unknown Concentrations or IDLH Conditions:	Any SCBA that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode, or any SAR that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-SCBA operated in pressure-demand or other positive-pressure mode.
Escape:	Any Air-Purifying, Full-Facepiece Respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against Nitric Oxide. Only non-oxidizable sorbents are allowed (not charcoal), or any appropriate 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 1910.138 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^3 (1.153 kg/m^3)

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^3/lb): 13.8

The following information is for this gas mixture.

APPEARANCE,ODOR AND COLOR: This gas mixture is a colorless gas with an irritating odor, based on the presence of Nitric Oxide. Nitric Oxide can produce brownish Nitrogen Dioxide after reaction with oxygen.

HOW TO DETECT THIS SUBS TANCE (warning properties): There are no unusual warning properties 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.

10. STABILITY and REACTIVITY

STABILITY: Normally stable in gaseous state.

DECOMPOSITION PRODUCTS: Nitric Oxide will react with water or moist air to form nitrogen dioxide and other oxides of nitrogen. Nitric Oxide can produce brownish Nitrogen Dioxide after reaction with oxygen. Nitrogen does not decompose, per se, but can react with other compounds in the heat of a fire.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Titanium will burn in Nitrogen (the main component of this gas mixture). Lithium reacts slowly with Nitrogen at ambient temperatures. Though Nitric Oxide is an oxidizer, the concentration of this component in the product is too low for this to be a significant hazard associated with this gas mixture.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Contact with moisture and incompatible materials. Cylinders exposed to high temperatures or direct flame can rupture or burst.

11. TOXICOLOGICAL INFORMATION

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

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

NITRIC OXIDE:

LC_{50} (Inhalation-Rat) 1068 mg/m^3/4 hours

LCLo (Inhalation-Mouse) 320 ppm: Behavioral: convulsions or effect on seizure threshold; Lungs, Thorax, or Respiration: cyanosis; Blood: methemoglobinemia-carboxyhemoglobin

LCLo (Inhalation-Dog) 5000 ppm/25 minutes: Lungs, Thorax, or Respiration: acute pulmonary edema; Blood: methemoglobinemia-carboxyhemoglobin

NITRIC OXIDE (continued):

TCLo (Inhalation-Rat) 200 ppm/6 hours/7 days-intermittent: Lungs, Thorax, or Respiration: acute pulmonary edema; Blood: methemoglobinemia-carboxyhemoglobin

TCLo (Inhalation-Rat) 50 mg/m^3/6 hours/7 weeks-intermittent: Lungs, Thorax, or Respiration: changes in lung weight; Liver: changes in liver weight; Nutritional and Gross Metabolic: weight loss or decreased weight gain

TCLo (Inhalation-Rat) 3 mg/m^3/24 hours/16 days-continuous: Brain and Coverings: recordings from specific areas of CNS; Blood: methemoglobinemia-carboxyhemoglobin; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: true cholinesterase

NITRIC OXIDE (continued):

TCLo (Inhalation-Rat) 160 ppm/6 hours/4 weeks-intermittent: Blood: methemoglobinemia-carboxyhemoglobin

TCLo (Inhalation-Mouse) 10 ppm/2 hours/30 weeks-intermittent: Lungs, Thorax, or Respiration: emphysema; Blood: pigmented or nucleated red blood cells, changes in leukocyte (WBC) count

Mutation in Microorganisms (Bacteria-Salmonella typhimurium) 30 ppm

Mutation in Mammalian Somatic Cells (Inhalation-Rat) 27 ppm/3 hours-continuous

Mutation in Mammalian Somatic Cells (Hamster-Fibroblast) 10 ppm

SUSPECTED CANCER AGENT: The 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: Due to the presence of Nitric Oxide this gas mixture is irritating to the eyes, and may be irritating to the skin.

SENSITIZATION OF PRODUCT: One study involving guinea pigs exposed to 4.3 ppm Nitric Oxide, 8 hours/day for 5 days enhanced an allergic reaction to ovalbumin (a known allergen).

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 this gas mixture. Nitric Oxide, a component of this gas mixture, has been shown to cause genetic damage in bacterial studies.

Embryotoxcity: No embryotoxic effects have been described for this gas mixture.

Teratogenicity: No teratogenicity effects have been described for this gas mixture.

Reproductive Toxicity: No reproductive toxicity effects have been described for gas mixture. Nitric Oxide, a component of this gas mixture, has been shown to cause and fetal toxicity in animal studies.

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) are not applicable for the components of this gas mixture.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: The gas will be dissipated rapidly in well-ventilated areas. Complex reactions of Nitric Oxide, a component of this gas mixture, occur in the atmosphere, which contribute to air pollution. The following environmental data are applicable to the components of this gas mixture.

NITRIC OXIDE:

Nitric Oxide is converted spontaneously in air to nitrogen dioxide, hence some of latter gas is invariably present whenever Nitric Oxide is found in air. At concentrations below 50 ppm, this reaction is slow. At higher concentration this reaction may occur when only quantities of nitrogen dioxide are present. Photochemical air pollution arises from a series of atmospheric reactions. The main components are ozone, oxides of nitrogen (such as Nitric Oxide), aldehydes, peroxyacetyl nitrates, and hydrocarbons. Nitric Oxide can enter into the chemical reactions that lead to formation of photochemical smog.

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

EFFECT OF MATERIAL ON PLANTS or ANIMALS: Due to the presence of Nitric Oxide in this gas mixture, over-exposed animals would develop respiratory system damage, as well as skin and eye disorders. Because Nitric Oxide produces corrosive solutions upon contact with moisture, plants may be damaged or destroyed.

EFFECT OF CHEMICAL ON AQUATIC LIFE: Nitric Oxide can react with water or moisture to generate soluble nitrogen dioxide and other corrosive nitrogen oxide compounds. If a release this gas mixture occurs near a body water, the release may be harmful or fatal to fish and other aquatic life. The following are aquatic toxicity data for the Nitric Oxide component of this gas mixture.

NITRIC OXIDE:

Lethal (*Lepomis macrochirus* bluegill sunfish) 48 hours = 3.6 mg/L/Conditions of bioassay not specified

TLm (*Gambusia affinis* mosquito fish) 282 ppm/96 hr (fresh water) /Conditions of bioassay not specified

LC_{100} (Trout) 24 hours = 10 mg/L Conditions of bioassay not specified

NITRIC OXIDE:

LC_{50} (Shrimp) 48 hours = 100 to 330 ppm/(salt water) /Conditions of bioassay not specified

LC_{50} (Starfish) 48 hours = 100 to 330 mg/L/Conditions of bioassay not specified

LC_{50} (Cockle) 48 hours = 330 to 1,000 mg/L/Conditions of bioassay not specified

LC_{50} (Shore crab) 48 hours = 240 mg/L/Conditions of bioassay not specified

NITRIC OXIDE:

LC_{50} (*Carassius auratus* goldfish) 178 mg/L (1 to 2 hr survival time)/Conditions of bioassay not specified

LC_{50} (*Lepomis macrochirus* bluegill sunfish) 96 hours = at pH between 3.5 and 3.0/hydrogen ion concentration/Conditions of bioassay not specified

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL 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 regulator. For further information, refer to 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. (Nitric Oxide, Nitrogen)
HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas)
UN IDENTIFICATION NUMBER: UN 1956
PACKING GROUP: Not applicable.
DOT LABEL(S) REQUIRED: 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 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 regulations of Transport Canada.

PROPER SHIPPING NAME: Compressed gases, n.o.s. (Nitric Oxide, 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 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 (2000): 121
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: 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:

CHEMICAL NAME	SARA 302 (40 CFR 355, Appendix A)	SARA 304 (40 CFR Table 302.4)	SARA 313 (40 CFR 372.65)
Nitric Oxide	YES	YES	YES

U.S. SARA SECTION 302 EXTREMELY HAZARDOUS SUBSTANCE THRESHOLD PLANNING QUANTITY: Nitric Oxide = 100 lb (45.4 kg)
U.S. SARA SECTION 304 EXTREMELY HAZARDOUS SUBSTANCE REPORTABLE QUANTITY: Nitric Oxide = 10 lb (4.54kg)
U.S. TSCA INVENTORY STATUS: The components of this gas mixture are listed on the TSCA Inventory.
U.S. CERCLA REPORTABLE QUANTITY (RQ): Nitric Oxide: 10 lb (4.54 kg).
OTHER U.S. FEDERAL REGULATIONS:

- Nitric Oxide is subject to the reporting requirements of CFR 29 1910.1000. Nitric Oxide is listed on Table Z.1.
- Depending on specific operations involving the use of this gas mixture, the regulations of the Process Safety Management of Highly Hazardous Chemicals may be applicable (29 CFR 1910.119). Under this regulation Nitric Oxide is listed in Appendix A. The threshold quantity for Nitric Oxide under this regulation is 250 lbs.
- Nitric Oxide is subject to the reporting requirements of Section 112(r) of the Clean Air Act. The Threshold Quantity for this gas is 10,000 lb (4554 kg).
- This gas mixture does not contain any Class I or Class II ozone depleting chemicals (40 CFR part 82).
- Nitrogen is not listed as a Regulated Substance, per 40 CFR, Part 68, of the Risk Management for Chemical Releases. Nitric Oxide is listed under this regulation in Table 1 as a Regulated Substance (Toxic Substance) in quantities of 250 lbs or greater. The basis for listing is that it is an extremely hazardous substance, with a vapor pressure of 10 mmHg or greater.

U.S. STATE REGULATORY INFORMATION: The components of this gas mixture are covered under the following specific State regulations:

Alaska - Designated Toxic and Hazardous Substances: Nitric Oxide.
California - Permissible Exposure Limits for Chemical Contaminants: Nitrogen, Nitric Oxide.
Florida - Substance List: Nitric Oxide.
Illinois - Toxic Substance List: Nitric Oxide.
Kansas - Section 302/313 List: Nitric Oxide.
Massachusetts - Substance List: Nitric Oxide.
Minnesota - List of Hazardous Substances: Nitric Oxide.
Michigan - Critical Materials Register: No.
Missouri - Employer Information/Toxic Substance List: Nitric Oxide.
New Jersey - Right to Know Hazardous Substance List: Nitrogen, Nitric Oxide.
North Dakota - List of Hazardous Chemicals, Reportable Quantities: Nitric Oxide.
Pennsylvania - Hazardous Substance List: Nitrogen, Nitric Oxide.
Rhode Island - Hazardous Substance List: Nitrogen, Nitric Oxide.
Texas - Hazardous Substance List: Nitric Oxide.
West Virginia - Hazardous Substance List: Nitric Oxide.
Wisconsin - Toxic and Hazardous Substances: Nitric Oxide.

15. REGULATORY INFORMATION (Continued)

ADDITIONAL U.S. REGULATIONS (continued):
CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): No component of this gas mixture is on the California Proposition 65 lists.
ADDITIONAL CANADIAN REGULATIONS:
CANADIAN DSL/NDSL INVENTORY STATUS: The components of this gas mixture are listed on the DSL Inventory.
CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: The components of this gas mixture are not on the CEPA Priorities Substances Lists.
CANADIAN WHMIS CLA SSIFICATION: This gas mixture is categorized as a Controlled Product, Hazard Classes A 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 that wishes to return cylinders to us prepaid. All that is required is a phone call to make arrangements so we may anticipate arrival. Scrapping 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"

AIR LIQUIDE™

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.