



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 of the Following Components in a Nitrogen or Air Balance Gas:
 Dichlorodifluoromethane, 0.0005-2.0%; Trichlorofluoromethane, 0.0005-2.0%;
 1,1,2-Trichloro-1,1,2-trifluoroethane, 0.0005-2.0%; Tetrafluoroethane, 0.0005-2.0%

SYNONYMS: Not Applicable

CHEMICAL FAMILY NAME: Not Applicable

FORMULA: Not Applicable

Document Number: 50040

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
SUPPLIER/MANUFACTURER'S NAME:	CALGAZ, LLC
ADDRESS:	821 Chesapeake Drive Cambridge, MD 21613
EMERGENCY PHONE:	CHEMTREC: 1-800-424-9300
BUSINESS PHONE:	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 ppm	OTHER ppm
			TWA ppm	STEL ppm	TWA ppm	STEL ppm		
Dichlorodifluoromethane (Freon 12)	75-71-8	0-2.0%	1000	NE	1000	NE	15,000	NIOSH REL:TWA = 1000 DFG MAKs:TWA = 1000 PEAK = 2•MAK 15 min., average value, 1 hr interval DFG MAK Pregnancy Risk Classification: C Carcinogenicity: TLV-A4
Trichlorofluoromethane (Freon 11)	75-69-4	0-2.0%	NE	1000 (ceiling)	1000	1000 [ceiling] (Vacated 1989 PEL)	2000	NIOSH REL: STEL = 1000 (ceiling) DFG MAKs: TWA = 1000 PEAK = 2•MAK, 15 min., average value, 1 hr interval DFG MAK Pregnancy Risk Classification: C Carcinogenicity: TLV-A4

CHEMICAL NAME	CAS #	mole %	EXPOSURE LIMITS IN AIR					
			ACGIH/TLV		OSHA-PEL		NIOSH IDLH ppm	OTHER ppm
			TWA ppm	STEL ppm	TWA ppm	STEL ppm		
1,1,2-Trichloro-1,1,2- trifluoroethane (Freon 113)	76-13-1	0-2.0%	1000	1250	1000	1250 (Vacated 1989 PEL)	2000	NIOSH RELs:TWA = 1000 STEL = 1250 DFG MAKs:TWA = 500 PEAK = 2•MAK 15 min., average value, 1 hr interval Carcinogenicity: TLV-A4
1,1,1,2- Tetrafluoroethane (HFC-134a)	811-97-2	0-2.0%	NE	NE	NE	NE	NE	DFG MAKs:TWA = 1000 PEAK = 8•MAK 15 min., average value, 1 hr interval DFG MAK Pregnancy Risk Classification: C
Nitrogen or Air	7727-37-9 132259- 10-0	Balance	There are no specific exposure limits for Nitrogen. Nitrogen is a simple asphyxiant (SA). The composition of Air is as follows: 79% Nitrogen and 21% Oxygen. These components and their concentrations have been incorporated into this MSDS. There are no specific exposure limits for Oxygen. 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, odorless gas. Releases of this gas mixture for which Nitrogen is the balance gas may produce oxygen-deficient atmospheres (especially in confined spaces or other poorly-ventilated environments); individuals in such atmospheres may be asphyxiated. Components of this gas mixture (1,1,2-Trichloro-1,1,2-trifluoroethane, Tetrafluoromethane, Trichlorofluoromethane, and Dichlorodifluoromethane) may cause drowsiness and other central nervous system effects in high concentrations; however, due to their low concentration in this gas mixture, this is unlikely to occur. If components of this gas mixture (1,1,2-Trichloro-1,1,2-trifluoroethane, Tetrafluoromethane, Trichlorofluoromethane, and Dichlorodifluoromethane) are exposed to fire, they may decompose yielding toxic products (i.e. hydrogen fluoride, phosgene, hydrogen chloride, carbonyl fluoride).

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 for which Nitrogen is the balance gas and is released in a small, poorly-ventilated area (i.e. an enclosed or confined space) is the development of an oxygen-deficient environment. 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%:

OBSERVED EFFECT

Breathing and pulse rate increased, muscular coordination slightly disturbed. Emotional upset, abnormal fatigue, disturbed respiration.

Nausea, vomiting, collapse, or loss of consciousness.

Convulsive movements, possible respiratory collapse, and death.

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. The most significant hazard associated with this gas mixture when it contains less than 19.5% oxygen is the potential for exposure to oxygen-deficient atmospheres. 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: Chronic exposure to oxygen-deficient atmospheres (below 18% oxygen in air) may effect the heart and nervous system.

TARGET ORGANS: ACUTE: Respiratory system, eyes. CHRONIC: Heart, cardiovascular system, central nervous system, reproductive system.

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH HAZARD	(BLUE)	1
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FLAMMABILITY HAZARD	(RED)	0
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PHYSICAL HAZARD	(YELLOW)	0
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PROTECTIVE EQUIPMENT

EYES RESPIRATORY HANDS BODY

See Section 8

For Routine Industrial Use and Handling Applications

4. FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO THIS GAS MIXTURE WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. If necessary, 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).

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. Note: Epinephrine increases the toxicity of Chlorodifluoromethane on the heart.

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.

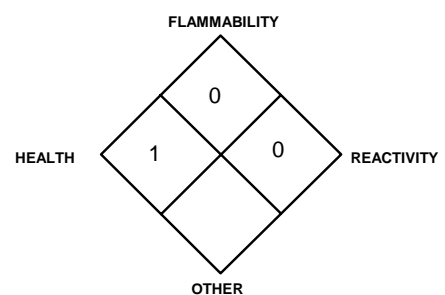
UNUSUAL FIRE AND EXPLOSION HAZARDS: This gas mixture is not flammable; however, containers, when involved in fire, may rupture or burst in the heat of the fire. Additionally, mixtures of this gas for which Air is the balance gas, can support combustion.

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. If water is not available for cooling or protection of cylinder exposures, evacuate the area.

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 aware of any signs of dizziness or fatigue, especially if work is done in a poorly-ventilated area; exposures to fatal concentrations of this gas mixture could occur without any significant warning symptoms, due to oxygen deficiency. 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 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 Phosphine and Oxygen.

RESPIRATORY PROTECTION: No special respiratory protection is required under normal circumstances of use. Maintain Phosphine levels below 50% of the TLV (TLV = 0.3 ppm) and oxygen levels above 19.5% in the workplace. Use supplied air respiratory protection when Phosphine levels exceed 50% of the TLV (TLV = 0.3 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 Phosphine 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/ft³ (1.153 kg/m³)

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 (ft³/lb): 13.8

The following information is for Air, a balance gas:

The following information is for Air, a balance gas:

BOILING POINT: -317.8°F (-194.3°C)

SOLUBILITY IN WATER Vol/Vol at 0°C (32°F): 0.0292

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

EVAPORATION RATE (nBuAc = 1): Not applicable.

ODOR THRESHOLD: Not applicable.

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

FREEZING/MELTING POINT (@ 10 psig): -216.2°C (-357.2°F)

MOLECULAR WEIGHT: 28.975

pH: Not applicable.

EXPANSION RATIO: Not applicable.

SPECIFIC VOLUME (ft³/lb): Not applicable for Air; 13.8 (for Nitrogen)

COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.

The following information is for the gas mixture:

APPEARANCE AND COLOR: This gas mixture is a colorless, odorless gas.

HOW TO DETECT THIS SUBSTANCE (warning properties): 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: Due to components of this gas mixture (1,1,2-Trichloro-1,1,2-trifluoroethane, Tetrafluoromethane, Trichlorofluoromethane, and Dichlorodifluoromethane), if exposed to fire, this gas mixture may decompose yielding toxic products (i.e. hydrogen fluoride, phosgene, hydrogen chloride, carbonyl fluoride). The other components of this gas mixture do 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 (a main component of this gas mixture). Lithium reacts slowly with Nitrogen at ambient temperatures. Components of this gas mixture (1,1,2-Trichloro-1,1,2-trifluoroethane, Tetrafluoromethane, Trichlorofluoromethane, and Dichlorodifluoromethane) are incompatible with sodium, potassium, calcium, zinc, and magnesium, powdered aluminum, and alloys of these metals.

HAZARDOUS POLYMERIZATION: Will not occur.

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

11. TOXICOLOGICAL INFORMATION

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

DICHLORODIFLUOROMETHANE:

LC (Inhalation-rat) > 80 pph/4 hours

LC₅₀ (Inhalation-mouse) 3348 gm/m³/3 hours: Behavioral: sleep, tremor, excitement

LC₅₀ (Inhalation-rabbit) 80 pph/30 minutes

LC₅₀ (Inhalation-guinea pig) 80 pph/30 minutes

TCLo (Inhalation-Human) 200000 ppm/30 minutes: conjunctive, fibrosing alveolitis, liver changes

TCLo (Inhalation-rat) 4136 mg/m³/8 hours/6 weeks-intermittent: chronic pulmonary edema; Related to Chronic Data: death

TCLo (Inhalation-rat) 3997 mg/m³/90 days-continuous: Lungs, Thorax, or Respiration: chronic pulmonary edema; death

TCLo (Inhalation-monkey) 3997 mg/m³/90 days-continuous: Lungs, Thorax, or Respiration: chronic pulmonary edema

TCLo (Inhalation-rabbit) 3997 mg/m³/90 days-continuous: Lungs, Thorax, or Respiration: chronic pulmonary edema

TCLo (Inhalation-guinea pig) 3997 mg/m³/90 days-continuous: Lungs, Thorax, or Respiration: chronic pulmonary edema; Liver: hepatitis (hepatocellular necrosis), diffuse; Related to Chronic Data: death

LD (Oral-rat) > 5600 µg/kg

TDLo (Oral-rat) 2548 mg/kg/26 weeks-intermittent: Behavioral: alteration of classical conditioning; Blood: changes

in erythrocyte (RBC) count; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: true cholinesterase

1,1,1,2-TETRAFLUOROETHANE:

LC₅₀ (Inhalation-Rat) 1500 gm/m³/4 hours

LC₅₀ (Inhalation-Mouse) 1700 gm/m³/2 hours

LC (Inhalation-Dog) > 32 pph/1 hour

TCLo (Inhalation-Rat) 50,000 ppm/6 hours/2 years-intermittent: Tumorigenic: neoplastic by RTECS criteria; Endocrine: tumors

TCLo (Inhalation-Rat) 30 pph/6 hours: female 6-15 day(s) after conception: Reproductive: Maternal Effects: other effects; Effects on Embryo or Fetus: fetotoxicity (except death, e.g., stunted fetus)

TRICHLOROFLUOROMETHANE:

TCLo (Inhalation-Human) 50,000 ppm/30 minutes: Sense Organs and Special Senses (Eye):conjunctive irritation;

Lungs, Thorax, or Respiration: fibrosing alveolitis; Liver: other changes

LD (Oral-Rat) > 352 mg/kg

LD₅₀ (Intraperitoneal-Mouse) 1743 mg/kg: Behavioral: convulsions or effect on seizure threshold

LC₅₀ (Inhalation-Rat) 13 pph/15 minutes:

Behavioral: tremor, convulsions or effect on seizure threshold; Lungs, Thorax, or Respiration: respiratory depression

LC₅₀ (Inhalation-Mouse) 10 pph/30 minutes

LC₅₀ (Inhalation-Rabbit) 25 pph/30

LC₅₀ (Inhalation-Guinea Pig) 25 pph/30 minutes

TCLo (Inhalation-Rat) 12,000 ppm/4 hours/days-intermittent: Brain and Coverings: other degenerative changes; Lungs, Thorax, or Respiration: chronic pulmonary edema

1,1,2-TRICHLORO-1,1,2-TRIFLUOROETHANE:

TCLo (Inhalation-Human) 4300 mg/m³/5 Days-intermittent: Brain and Coverings: recordings from specific areas of CNS

TCLo (Inhalation-Human) 178 mg/m³/10 years-intermittent: Behavioral: headache

Open Irritation Test (Skin-Rabbit) 500 mg: Mild

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

LD₅₀ (Oral-Rat) 43 gm/kg: Behavioral: somnolence (general depressed activity); Gastrointestinal: other changes; Skin and Appendages: hair

LD₅₀ (Intravenous-Mouse) 9 gm/kg: Autonomic Nervous System: other (direct) para-symphathomimetic;

Behavioral: altered sleep time (including change in righting reflex); Skin and Appendages: dermatitis, other (after systemic exposure)

LD₅₀ (Unreported-Mouse) 40 gm/kg

LDLo (Oral-Rabbit) 17 gm/kg

LC₅₀ (Inhalation-Rat) 38,500 ppm/4 hours: Behavioral: general anesthetic, excitement, ataxia

11. TOXICOLOGICAL INFORMATION

1,1,2-TRICHLORO-1,1,2-

TRIFLUOROETHANE (continued):

LC₅₀ (Inhalation-Mouse) 260 gm/m³/2 hours:
Behavioral: somnolence (general depressed activity), ataxia; Lungs, Thorax, or Respiration: cyanosis
LC₅₀ (Inhalation-Rabbit) 59,500 ppm/2 hours: Sense Organs and Special Senses (Eye): effect, not otherwise specified; Behavioral: excitement; Lungs, Thorax, or Respiration: respiratory stimulation
LC₅₀ (Inhalation-Guinea Pig) >12 pph/2 hours
LD (Skin-Rabbit) > 11 gm/kg
LDLo (Oral-Guinea Pig) > 10 gm/kg
TCLo (Inhalation-Rat) 20 pph/6 hours/2 years-intermittent: Kidney, Ureter,

Bladder: other changes in urine composition; Nutritional and Gross Metabolic: weight loss or decreased weight gain
TCLo (Inhalation-Rat) 2000 ppm/6 hours/2 weeks-intermittent: Liver: other changes; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: hepatic microsomal mixed oxidase (dealkylation, hydroxylation, etc.); Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: other transferases
TCLo (Inhalation-Guinea Pig) 70000 mg/m³/4 hours/16 weeks-intermittent: Brain and Coverings: recordings from specific areas of CNS; Lungs, Thorax, or Respiration: other changes;

Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: phosphatases
TCLo (Inhalation-Rabbit) 20 ppm: female 8-16 day(s) after conception: Reproductive: Maternal Effects: other effects; Effects on Newborn: physical
TDLo (Oral-Rabbit) 5 gm/kg: female 8 day(s) after conception: Reproductive: Maternal Effects: other effects; Fertility :abortion; Effects on Embryo or Fetus: fetal death

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:

DICHLORODIFLUOROMETHANE: ACGIH TLV-A4 (Not Classifiable as to Carcinogenicity in Humans)

TRICHLOROFLUOROMETHANE: ACGIH TLV-A4 (Not Classifiable as to Carcinogenicity in Humans)

1,1,2-TRICHLORO-1,1,2-TRIFLUOROETHANE: ACGIH TLV-A4 (Not Classifiable 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, they are not considered to be, nor suspected to be, cancer-causing agents by these agencies. Nitrous Oxide is listed as ACGIH-A4 (Not Classifiable as a Human Carcinogen).

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.

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 this gas mixture.

Teratogenicity: No teratogenicity effects have been described for the components of 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 gas will be dissipated rapidly in well-ventilated areas. 1,1,2-Trichloro-1,1,2-trifluoroethane, Trichlorofluoromethane, and Dichlorodifluoromethane are chlorofluorocarbon (CFC) compounds. Chlorofluorocarbon compounds have been implicated in the possible depletion of the stratospheric ozone, via a series of complex chemical reactions which occur in the upper atmosphere. Atmospheric ozone is essential in protecting plants and animals from potentially harmful ultraviolet-light exposures. All work practice must be directed at eliminating environmental contamination. The following environmental data are applicable to the components of this gas mixture.

DICHLORODIFLUOROMETHANE: Log Kow = 2.16; Water Solubility = 0.28 g/L 27 °C.

OXYGEN: Water Solubility = 1 volume Oxygen/32 volumes water at 20°C. Log K_{ow} = -0.65

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: No evidence is currently available on the effects of this gas mixture 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.

1,1,1,2-TETRAFLUOROETHANE:

EC₅₀ (*Daphnia magna*) 48 hours = 980 mg/L

LC₅₀ (*Daphnia magna*) 48 hours = 450 mg/L

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.

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: 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 (overpack). Pertinent shipping information goes on the outside of the overpack. 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. (*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 1046

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:

COMPOUND	SARA 302 (40 CFR 355, Appendix A)	SARA 304 (40 CFR Table 302.4)	SARA 313 (40 CFR 372.65)
Dichlorodifluoromethane	NO	NO	YES
Trichlorofluoromethane	NO	NO	YES
1,1,2-Trichloro-1,1,2-trifluoroethane	NO	NO	YES

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

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

U.S. CERCLA REPORTABLE QUANTITY (RQ): Dichlorodifluoromethane = 5000 lbs (2270 kg); Trichlorofluoromethane = 5000 lb (2270 kg). The 1,1,2-Trichloro-1,1,2-Trifluoromethane component is a CERCLA Hazardous Substance which has no specific RQ assigned.

U.S. OTHER U.S. FEDERAL REGULATIONS:

- 1,1,2-Trichloro-1,1,2-trifluoroethane, Trichlorofluoromethane, and Dichlorodifluoromethane are subject to the requirements of CFR 29 1910.1000. These gases are listed on Table Z.1.
- No component of this gas mixture is subject to the reporting requirements of Section 112(r) of the Clean Air Act.
- 1,1,2-Trichloro-1,1,2-trifluoroethane, Trichlorofluoromethane, and Dichlorodifluoromethane are listed as Class I ozone-depleting chemicals. This gas mixture is required to bear the following label:
Warning: Contains *Name of Chlorofluorocarbon*, a substance which harms public health and environment by destroying ozone in the upper atmosphere.
- Chlorodifluoromethane is subject to the reporting requirements under Title VI of the Clean Air Act Amendments of 1990: "Stratospheric Ozone Protection".
- The components of this gas mixture are not listed in Appendix A as a highly hazardous chemical, per 29 CFR 1910.119: Process Safety Management of Highly Hazardous Chemicals.
- Nitrogen, Oxygen, Tetrafluoromethane, 1,1,2-Trichloro-1,1,2-trifluoroethane, Trichlorofluoromethane, and Dichlorodifluoromethane are not listed as Regulated Substances, per 40 CFR, Part 68, of the Risk Management for Chemical Releases.

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: Trichlorofluoromethane, Dichlorodifluoro-methane, 1,1,2-Trichloro-1,1,2-trifluoroethane.

California - Permissible Exposure Limits for Chemical Contaminants: Trichlorofluoromethane, Dichlorodifluoro-methane, Nitrogen, 1,1,2-Trichloro-1,1,2-trifluoroethane.

Florida - Substance List: Oxygen, Trichlorofluoromethane, Dichlorodi-fluoromethane, 1,1,2-Trichloro-1,1,2-trifluoro-ethane.

Illinois - Toxic Substance List: Trichlorofluoromethane, Dichlorodi-fluoromethane, 1,1,2-Trichloro-1,1,2-trifluoro-ethane.

Kansas - Section 302/313 List: No.

Massachusetts - Substance List: Trichlorofluoromethane, Dichlorodi-fluoromethane, Oxygen, 1,1,2-Trichloro-1,1,2-trifluoroethane.

Minnesota - List of Hazardous Substances: Trichlorofluoromethane, Dichlorodifluoromethane, 1,1,2-Trichloro-1,1,2-trifluoroethane.

Missouri - Employer Information/Toxic Substance List: Trichlorofluoromethane, Dichlorodifluoromethane, 1,1,2-Trichloro-1,1,2-trifluoroethane.

New Jersey - Right to Know Hazardous Substance List: Trichlorofluoromethane, Dichlorodifluoromethane, Oxygen, Nitrogen, 1,1,2-Trichloro-1,1,2-trifluoroethane.

North Dakota - List of Hazardous Chemicals, Reportable Quantities: Trichlorofluoromethane, Dichlorodifluoro-methane.

Pennsylvania - Hazardous Substance List: Trichlorofluoromethane, Dichlorodi-fluoromethane, Oxygen, Nitrogen, 1,1,2-Trichloro-1,1,2-trifluoro-ethane.

Rhode Island - Hazardous Substance List: Trichlorofluoromethane, Dichlorodifluoromethane, Oxygen.

Texas - Hazardous Substance List: Trichlorofluoromethane, Dichlorodi-fluoromethane, 1,1,2-Trichloro-1,1,2-trifluoroethane.

West Virginia - Hazardous Substance List: Trichlorofluoromethane, Dichlorodifluoro-methane, 1,1,2-Trichloro-1,1,2-trifluoro-ethane.

Wisconsin - Toxic and Hazardous Substances: Trichlorofluoromethane, Dichlorodifluoromethane, 1,1,2-Trichloro-1,1,2-trifluoroethane

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 CLASSIFICATION: This gas mixture is categorized as a Controlled Product, Hazard Class A, 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, LLC 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"

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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, LLC's 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.