



AIR LIQUIDE

MATERIAL SAFETY DATA SHEET

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

1. PRODUCT IDENTIFICATION

CHEMICAL NAME; CLASS: FLAMMABLE GAS MIXTURE

Containing in 5.5 - 11.0% Isobutane in a Nitrogen Balance Gas

SYNONYMS: Not Applicable

CHEMICAL FAMILY NAME: Not Applicable

FORMULA: Not Applicable

Document Number: 50063

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
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		OSHA		IDLH ppm	OTHER ppm
			TLV ppm	STEL ppm	PEL ppm	STEL ppm		
Isobutane	75-28-5	5.5 - 11.0%	Simple Asphyxiant	NE	800 (Vacated 1989 PEL)	NE	NE	NIOSH REL: 800 ppm DFG MAK: 1000 ppm
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. C = Ceiling Limit. 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 Z400.1-1993 format.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This is a flammable, colorless, odorless gas mixture. 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. Provide adequate fire protection during emergency response situations.

SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE:

The most significant route of overexposure for this product is by inhalation.

INHALATION: Due to the small size of an individual cylinder of this product, no unusual health effects from overexposure to the product are anticipated under routine circumstances of use. Releases of this product may produce oxygen-deficient atmospheres (especially in small confined spaces or other poorly-ventilated environments); individuals in such atmospheres may be asphyxiated.

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

ACUTE: Due to the small size of the individual cylinder of this product, no unusual health effects from exposure to the product are anticipated under routine circumstances of use. Depending on the concentration and duration of exposure, inhalation of this gas

HAZARDOUS MATERIAL INFORMATION SYSTEM			
HEALTH	(BLUE)	1	
FLAMMABILITY	(RED)	4	
REACTIVITY	(YELLOW)	0	
PROTECTIVE EQUIPMENT	B		
EYES	RESPIRATORY	HANDS	BODY
See Section 8			
For routine industrial applications			

3. HAZARD IDENTIFICATION (Continued)

mixture may cause an oxygen-deficient atmosphere

CHRONIC: Isobutane (a component of this gas mixture) is not known to cause sensitization in humans; however, Isobutane is considered a weak heart sensitizing agent, based on animal tests. See Section 11, Toxicological Information for additional information.

TARGET ORGANS: Respiratory system.

4. FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO THIS PRODUCT 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 product, due to the small cylinder size. If any adverse symptom develops after overexposure to this product, 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 overexposure to this product 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).

5. FIRE-FIGHTING MEASURES

FLASH POINT: -159°C (-254°F) [for Isobutane].

AUTOIGNITION TEMPERATURE: 462°C (864°F) [for Isobutane]

FLAMMABLE LIMITS (by volume, %):

Lower (LEL): 5.5% in Nitrogen. 1.8% in air.

Upper (UEL): Not established in Nitrogen. 8.4% in air.

FIRE EXTINGUISHING MATERIALS: Extinguish fires of this gas mixture by shutting-off the source of the gas. Use water spray to cool fire-exposed containers, structures, and equipment.

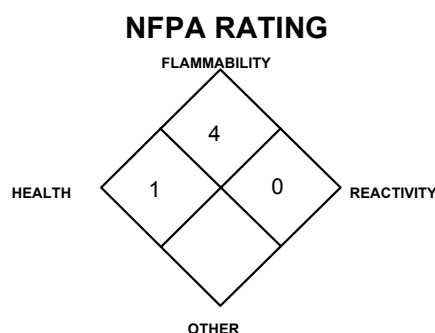
UNUSUAL FIRE AND EXPLOSION HAZARDS: When involved in a fire, Isobutane (the flammable component of this gas mixture) will ignite and decompose to produce toxic gases including carbon monoxide and carbon dioxide.

DANGER! Fires impinging (direct flame) on the outside surface of unprotected cylinders of this product can be very dangerous. Exposure to fire could cause a catastrophic failure of the cylinder releasing the contents into a fireball and explosion of released gas. The resulting fire and explosion can result in severe equipment damage and personnel injury or death over a large area around the cylinder. For massive fires in large areas, use unmanned hose holder or monitor nozzles; if this is not possible, withdraw from area and allow fire to burn.

Explosion Sensitivity to Mechanical Impact: Not sensitive.

Explosion Sensitivity to Static Discharge: Static discharge may cause this product to ignite explosively, if released.

SPECIAL FIRE-FIGHTING PROCEDURES: Structural fire-fighters must wear Self-Contained Breathing Apparatus and full protective equipment. Because of the potential for a fire, evacuation of non-emergency personnel is essential. If water is not available for cooling or protection of cylinder exposures, evacuate the area. Refer to the North American Emergency Response Guidebook (Guide #115).



6. ACCIDENTAL RELEASE MEASURES

LEAK RESPONSE: Due to the small size and content of the cylinder, an accidental release of this product presents significantly less risk of a flammability and 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. Uncontrolled releases should be responded to by

6. ACCIDENTAL RELEASE MEASURES (Continued)

trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a gas release, clear the affected area, protect people, and respond with trained personnel.

Eliminate any possible sources of ignition, and provide maximum explosion-proof ventilation. If the gas is leaking from cylinder contact the supplier. Adequate fire protection must be provided. Use only non-sparking tools and equipment during the response.

Allow the gas mixture to dissipate. If necessary, monitor the surrounding area (and the original area of the release) for the flammable gas concentration, and the level of Oxygen. Combustible gas concentration must be below 10% of the LEL (See Section 5, Fire-Fighting Measures) prior to entry. Additionally, 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.

THIS IS AN EXTREMELY FLAMMABLE GAS. Protection of all personnel and the area must be maintained.

7. HANDLING and USE

WORK PRACTICES AND HYGIENE PRACTICES: Be aware of any signs of dizziness or fatigue; exposures to fatal concentrations of this product could occur without any significant warning symptoms, due to oxygen deficiency. Use non-sparking tools when working with this gas mixture. 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.

7. HANDLING and USE (Continued)

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. Keep storage area clear of materials which can burn. Protect cylinders against physical damage.

Cylinders should be separated from oxygen cylinders, or other oxidizers, by a minimum distance of 20 ft., or by a barrier of non-combustible material at least 5 ft. high, having a fire-resistance rating of at least 0.5 hours. Isolate from other incompatible chemicals (refer to Section 10, Stability and Reactivity).

Storage areas must meet national electrical codes for Class 1 Hazardous Areas. Post "No Smoking or Open Flames" signs in storage or use areas. Consider installation of leak detection for combustible gas levels and alarm for storage and use areas. Have appropriate extinguishing equipment in the storage area (i.e. sprinkler system, portable fire extinguishers). 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 application equipment is locked and tagged-out safely. Purge gas handling equipment with inert gas (i.e. nitrogen) before attempting repairs. 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 product in well-ventilated areas. If this product is used in a poorly-ventilated area, install automatic monitoring equipment to detect the levels of Isobutane and oxygen.

RESPIRATORY PROTECTION: No special respiratory protection is required under normal circumstances of use. Use supplied air respiratory protection if the levels of Isobutane exceeds exposure limits presented in Section 2 (Composition and Information of Ingredients) and Oxygen levels are below 19.5%, or unknown, during emergency response to a release of this product. If respiratory protection is required for emergency response to this product, follow the requirements of the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), equivalent U.S. State standards, or the appropriate requirements of Canada and its Provinces.

EYE PROTECTION: Safety glasses.

HAND PROTECTION: No special protection is needed under normal circumstances of use.

BODY PROTECTION: No special protection is needed under normal circumstances of use.

9. PHYSICAL and CHEMICAL PROPERTIES

Unless otherwise specified, the following information is for Isobutane, a main component of this gas mixture.

GAS DENSITY @ 21.1°C (70°F) and 1 atm: 0.114 74 lb/ft³ (2.4787 kg/m³)

BOILING POINT: -11.72°C (10.9°F)

FREEZING/MELTING POINT @ 10 psig: -159°C (-255.3°F)

SPECIFIC GRAVITY (air = 1) @ 21.1°C (70°F): 2.006 36

SOLUBILITY IN WATER vol/vol at 37.8°C (100°F): 0.052

EVAPORATION RATE (nBuAc = 1): Not applicable.

ODOR THRESHOLD: 1800 mg/m³

VAPOR PRESSURE @ 21.1°C (70°F) psig: 30.58

COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.

pH: Not applicable.

MOLECULAR WEIGHT: 58.12

EXPANSION RATIO: Not applicable.

SPECIFIC VOLUME (ft³/lb): 6.33

Unless otherwise specified, the following information is for Nitrogen, a main component of this gas mixture.

GAS DENSITY @ 0°C (32°F) and 1 atm: .072 lb./ ft³ (1.153 kg/m³)

BOILING POINT: -320.4°F (-195.8°C)

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

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

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

EVAPORATION RATE (nBuAc = 1): Not applicable.

ODOR THRESHOLD: Not applicable. Odorless.

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

COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.

pH: Not applicable.

MOLECULAR WEIGHT: 28.01

EXPANSION RATIO: Not applicable.

SPECIFIC VOLUME (ft³/lb): 13.8

The following information is for this gas mixture.

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

HOW TO DETECT THIS SUBSTANCE (warning properties): There are no unusual warning properties associated with a release of this gas mixture.

10. STABILITY and REACTIVITY

STABILITY: Normally stable in gaseous state.

DECOMPOSITION PRODUCTS: The thermal decomposition products of Isobutane include carbon oxides. 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 (a main component of this product). Lithium reacts slowly with Nitrogen at ambient temperatures. Isobutane is incompatible with strong oxidizers (i.e. chlorine, bromine pentafluoride, oxygen, oxygen difluoride, and nitrogen trifluoride).

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 product:

ISOBUTANE:

Inhalation-Rat LC₅₀: 57 pph/ 15 minute
Inhalation-Mouse LCLo: 1041 g/m³/ 2 hour

NITROGEN: There are no specific toxicology data for Nitrogen.
Nitrogen is a simple asphyxiant.

SUSPECTED CANCER AGENT: The components of this gas mixture are not found on the following lists: U.S. 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.

IRRITANCY OF PRODUCT: Isobutane (a component of this gas mixture) can cause some irritation to mucus membranes.

SENSITIZATION OF PRODUCT: Isobutane (a component of this gas mixture) is not known to cause sensitization in humans; however, Isobutane is considered a weak heart sensitizing agent, based on animal tests.

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

Mutagenicity: This gas mixture is not expected to cause mutagenic effects in humans.

Embryotoxicity: This gas mixture is not expected to cause embryotoxic effects in humans.

Teratogenicity: This gas mixture is not expected to cause teratogenic effects in humans.

Reproductive Toxicity: This gas mixture is not expected 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 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.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing respiratory conditions and other disorders involving the "Target Organs" (See Section 3, Hazard Identification) may be aggravated by overexposure to this product.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and eliminate overexposure.

ACGIH BIOLOGICAL EXPOSURE INDICES (BEIs): Currently there are no ACGIH Biological Exposure Indices (BEIs) applicable for this gas mixture's components.

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 product.

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 this product's effects on plants or animals. See Section 11 (Toxicology Information) for additional data for components of this product.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on this product's effects on aquatic life.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate U.S. Federal, State, and local regulations, or the applicable standards of Canada and its Provinces. 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 MATERIAL IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Compressed gases, flammable, n.o.s. (Isobutane, Nitrogen)

HAZARD CLASS NUMBER and DESCRIPTION: 2.1 (Flammable Gas)

UN IDENTIFICATION NUMBER: UN 1954

PACKING GROUP: Not applicable.

DOT LABEL(S) REQUIRED: Flammable Gas

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (1996): 115

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 MATERIAL IS CONSIDERED AS DANGEROUS GOODS. Use the above information for the preparation of Canadian Shipments.

15. REGULATORY INFORMATION

ADDITIONAL U.S. REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: The components of this product are not subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act.

15. REGULATORY INFORMATION (Continued)

U.S. SARA THRESHOLD PLANNING QUANTITY: Not applicable.

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

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

OTHER U.S. FEDERAL REGULATIONS:

- The components of this gas mixture are not subject to the reporting requirements of CFR 29 1910.1000.
- Isobutane is subject to the reporting requirements of Section 112(r) of the Clean Air Act. The Threshold Quantity for each of this gas is 10,000 pounds and so this mixture will not be affected by the regulation.
- 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. Isobutane is listed under this regulation in Table 3 as Regulated Substances (Flammable Substances), in quantities of 10,000 lb. (4,553 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:

Alaska - Designated Toxic and Hazardous Substances: Isobutane.

California - Permissible Exposure Limits for Chemical Contaminants: Nitrogen, Isobutane.

Florida - Substance List: Isobutane.

Illinois - Toxic Substance List: Isobutane.

Kansas - Section 302/313 List: No.

Massachusetts - Substance List: Isobutane.

Michigan - Critical Materials Register: No.

Minnesota - List of Hazardous Substances: Isobutane.

Missouri - Employer Information/Toxic Substance List: Isobutane.

New Jersey - Right to Know Hazardous Substance List: Nitrogen, Isobutane.

North Dakota - List of Hazardous Chemicals, Reportable Quantities: No.

Pennsylvania - Hazardous Substance List: Nitrogen, Isobutane.

Rhode Island - Hazardous Substance List: Nitrogen, Isobutane.

Texas - Hazardous Substance List: No.

West Virginia - Hazardous Substance List: No.

Wisconsin - Toxic and Hazardous Substances: No.

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/NDL INVENTORY STATUS: The components of this product are on the Canadian DSL Inventory.

OTHER CANADIAN REGULATIONS: Not applicable.

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

CANADIAN WHMIS CLASSIFICATION: This gas mixture is categorized as a Controlled Product, Hazard Classes A and B1, 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"

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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 product. 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 product 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.