1. PRODUCT AND COMPANY IDENTIFICATION

- **Product Name**: 50% NITROUS OXIDE, 50% OXYGEN
- **Product Code(s)**: G-407
- **UN-Number**: UN3156
- **Recommended Use**: Medical.
- **Trade Name**: ENTONOX®
- **Supplier Address***: Linde Gas North America LLC - Linde Merchant Production Inc. - Linde LLC
  575 Mountain Ave.
  Murray Hill, NJ 07974
  Phone: 908-464-8100
  www.lindeus.com

  Linde Gas Puerto Rico, Inc.
  Las Palmas Village
  Road No. 869, Street No. 7
  Catano, Puerto Rico 00962
  Phone: 787-641-7445
  www.pr.lindegas.com

  Linde Canada Limited
  5860 Chedworth Way
  Mississauga, Ontario L5R 0A2
  Phone: 905-501-1700
  www.lindecanada.com

* May include subsidiaries or affiliate companies/divisions.

For additional product information contact your local customer service.

- **Chemical Emergency Phone Number**: Chemtrec: 1-800-424-9300 for US/ 703-527-3887 outside US

2. HAZARDS IDENTIFICATION
2. HAZARDS IDENTIFICATION

**Emergency Overview**

<table>
<thead>
<tr>
<th>Appearance</th>
<th>Colorless</th>
<th>Physical State</th>
<th>Compressed gas.</th>
<th>Odor</th>
<th>Slight sweet</th>
</tr>
</thead>
</table>

OSHA Regulatory Status

This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Potential Health Effects

Principle Routes of Exposure

Inhalation

Inhalation

Anesthetic effects may occur when mixed with oxygen at a ratio of 80% nitrous oxide to 20% oxygen. Laughter effects seem to occur after incipient asphyxia accompanied by the sudden return of oxygen. Nitrous oxide is a slight narcotic. Intentional misuse by deliberately concentrating and inhaling contents may be harmful or fatal.

Eyes

Contact with rapidly expanding gas near the point of release may cause frostbite.

Skin

Contact with rapidly expanding gas near the point of release may cause frostbite.

Skin Absorption Hazard

No known hazard in contact with skin.

Ingestion

Not an expected route of exposure.

Chronic Effects

Repeated exposure over time may affect the liver, kidneys, nervous system, and blood. Repeated abuse can have long-term health effects.

Aggravated Medical Conditions


Due to the effects nitrous oxide has on volume and pressure characteristic of air containing spaces, it should not be used as an anesthetic for patients with pneumothorax, sinus and middle ear disease, bowel obstruction, and following cerebral air contrast studies.

Interactions with Other Chemicals

Use of alcoholic beverages may enhance toxic effects.

Environmental Hazard

See Section 12 for additional Ecological Information.

3. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS-No</th>
<th>Volume %</th>
<th>Chemical Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrous oxide</td>
<td>10024-97-2</td>
<td>50</td>
<td>N₂O</td>
</tr>
<tr>
<td>Oxygen</td>
<td>7782-44-7</td>
<td>50</td>
<td>O₂</td>
</tr>
</tbody>
</table>
4. FIRST AID MEASURES

**Eye Contact**
None required for gas. If frostbite is suspected, flush eyes with cool water for 15 minutes and obtain immediate medical attention.

**Skin Contact**
None under normal use. Get medical attention if symptoms occur. None required for gas. For dermal contact or suspected frostbite, remove contaminated clothing and flush affected areas with lukewarm water. DO NOT USE HOT WATER. A physician should see the patient promptly if contact with the product has resulted in blistering of the dermal surface or in deep tissue freezing.

**Inhalation**
PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF INHALATION OVEREXPOSURE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS. Conscious inhalation victims should be assisted to an uncontaminated area and inhale fresh air. If breathing is difficult, administer oxygen. Unconscious persons should be moved to an uncontaminated area and, as necessary, given artificial resuscitation and supplemental oxygen. Treatment should be symptomatic and supportive.

**Ingestion**
None under normal use. Get medical attention if symptoms occur.

**Notes to Physician**
Treat symptomatically.

5. FIRE-FIGHTING MEASURES

**Flammable Properties**
Oxidizer. May vigorously accelerate combustion.

**Suitable Extinguishing Media**
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

**Explosion Data**

**Sensitivity to Mechanical Impact**
None

**Sensitivity to Static Discharge**
None

**Specific Hazards Arising from the Chemical**
May ignite combustibles (wood, paper, oil, clothing, etc.). May decompose violently at temperatures above 1112°F (600°C). Cylinders may rupture under extreme heat. Continue to cool fire exposed cylinders until flames are extinguished. Damaged cylinders should be handled only by specialists.

**Protective Equipment and Precautions for Firefighters**
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

**Personal Precautions**
Ensure adequate ventilation. Evacuate personnel to safe areas. Use personal protective equipment.

**Environmental Precautions**
Prevent spreading of vapors through sewers, ventilation systems and confined areas.

**Methods for Containment**
Stop the flow of gas or remove cylinder to outdoor location if this can be done without risk. If leak is in container or container valve, contact the appropriate emergency telephone number in Section 1 or call your closest Linde location.

**Methods for Cleaning Up**
Return cylinder to Linde or an authorized distributor.

**Other Information**
Keep combustibles (wood, paper, oil, etc) away from spilled material.
7. HANDLING AND STORAGE

Handling

Use only in ventilated areas. Never attempt to lift a cylinder by its valve protection cap. Protect cylinders from physical damage; do not drag, roll, slide or drop. When moving cylinders, even for short distance, use a cart designed to transport cylinders. Use equipment rated for cylinder pressure. Use backflow preventive device in piping. Never insert an object (e.g. wrench, screwdriver, pry bar, etc.) into valve cap openings. Doing so may damage valve, causing leak to occur. "NO SMOKING" signs should be posted in storage and use areas.

Equipment able to use oxygen must be “cleaned for oxygen service”. Check with the equipment supplier to verify oxygen compatibility for the service conditions.

Use an adjustable strap wrench to remove over-tight or rusted caps. Close valve after each use and when empty. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier.

Never put cylinders into trunks of cars or unventilated areas of passenger vehicles. Never attempt to refill a compressed gas cylinder without the owner’s written consent. Never strike an arc on a compressed gas cylinder or make a cylinder a part of an electrical circuit.

For additional recommendations, consult Compressed Gas Association’s Pamphlet G-8.1 and SB-6.

Storage

Protect from physical damage. Cylinders should be stored upright with valve protection cap in place and firmly secured to prevent falling. Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Keep at temperatures below 52°C / 125°F. Full and empty cylinders should be segregated. Use a “first in-first out” inventory system to prevent full cylinders from being stored for excessive periods of time. Always store and handle compressed gas cylinders in accordance with Compressed Gas Association, pamphlet CGA-P1, Safe Handling of Compressed Gases in Containers.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines

Immediately Dangerous to Life or Health. ACGIH TLV: American Conference of Governmental Industrial Hygienists - Threshold Limit Value. OSHA PEL: Occupational Safety and Health Administration - Permissible Exposure Limits.

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>ACGIH TLV</th>
<th>OSHA PEL</th>
<th>NIOSH IDLH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrous oxide</td>
<td>TWA: 50 ppm</td>
<td>TWA: 46 mg/m³</td>
<td>TWA: 25 ppm</td>
</tr>
</tbody>
</table>

Engineering Measures

Showers. Eyewash stations. Ventilation systems.

Ventilation

Use ventilation adequate to keep exposures below recommended exposure limits.

Personal Protective Equipment

Eye/Face Protection

Wear protective eyewear (safety glasses).

Skin and Body Protection

Work gloves and safety shoes are recommended when handling cylinders. Gloves must be clean and free from grease or oil.

Respiratory Protection
General Use
If exposure limits are exceeded or irritation is experienced, NIOSH/MSHA approved respiratory protection should be worn. Positive-pressure supplied air respirators may be required for high airborne contaminant concentrations. Respiratory protection must be provided in accordance with current local regulations.

Emergency Use
Use positive pressure air line respirator or self-contained breathing apparatus for exposure over exposure limits or emergency use. For exposures above IDLH, an additional escape bottle is required.

Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

9. PHYSICAL AND CHEMICAL PROPERTIES

Product Information

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Boiling Point</th>
<th>Melting Point</th>
<th>Molecular Weight</th>
<th>Evaporation Rate</th>
<th>Water Solubility</th>
<th>Vapor Pressure</th>
<th>Vapor Density (Air=1)</th>
<th>Gas Density Kg/m³@20°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxygen</td>
<td>-183 °C</td>
<td>-219 °C</td>
<td>31.99</td>
<td>-</td>
<td>Slightly soluble</td>
<td>Above critical temperature</td>
<td>1.11</td>
<td>1.331</td>
</tr>
<tr>
<td>Nitrous oxide</td>
<td>-88.5 °C</td>
<td>-90.8 °C</td>
<td>44.01</td>
<td>-</td>
<td>No information available</td>
<td>50.599 kPa @ 20 °C</td>
<td>1.529</td>
<td>1.8122</td>
</tr>
</tbody>
</table>

10. STABILITY AND REACTIVITY

Stability
Stable.

Incompatible Products

Conditions to Avoid
Nitrous oxide will serve as the oxidant for most flammable materials. Some flammables will have a lower flammable limit in nitrous oxide than in pure oxygen. Keep away from open flames, hot surfaces and sources of ignition.

Hazardous Decomposition Products
At elevated temperatures, nitrous oxide decomposes into nitrogen and oxygen, the rate of decomposition being appreciable at about 1112°F (600°C). Nitrous oxide exposed to fire or other intense heat source may decompose violently.

Hazardous Polymerization
Hazardous polymerization does not occur.

11. TOXICOLOGICAL INFORMATION

Acute Toxicity

Product Information

LD50 Oral: No information available.
LD50 Dermal: No information available.
LC50 Inhalation: No information available.
Repeated Dose Toxicity: No information available.

Component Information

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>LD50 Oral</th>
<th>LD50 Dermal</th>
<th>LC50 Inhalation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrous oxide</td>
<td></td>
<td></td>
<td>250 ppm (Rat) 4 h</td>
</tr>
</tbody>
</table>

Chronic Toxicity

Repeated exposure over time may affect the liver, kidneys, nervous system, and blood. Repeated abuse can have long-term health effects.

Carcinogenicity

Three carcinogenic bioassays with nitrous oxide yielded negative results. Three epidemiologic studies reported a small increase in the incidence of cancer in women, but not in men, occupationally exposed to anesthetic gases.

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>ACGIH</th>
<th>IARC</th>
<th>NTP</th>
<th>OSHA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrous oxide</td>
<td></td>
<td>Group 3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

IARC: (International Agency for Research on Cancer)
Group 3: Not Classifiable as to its Carcinogenicity to Humans

Irritation: No information available.

Sensitization: No information available.

Neurological Effects: Neurological impairment from nitrous oxide exposure has been reported at concentrations of several hundred to several thousand ppm; however, decrements in human cognitive and psychomotor functions have been reported at much lower concentrations. Dentists exposed to nitrous oxide longer than 3000 hours within the prior 10 years exhibited neurologic symptoms such as weakness, tingling and numbness.

Reproductive Toxicity: No information available.

Developmental Toxicity: Fetal mortality increased at all concentrations in pregnant rats exposed to 0, 100, 1000, or 15,000 ppm nitrous oxide (8 or 24 H/day for 5-9 days, 2-3 week of pregnancy) and teratogenic effects (skeletal abnormalities) were seen at 1000 ppm.

Synergistic Materials: None known.

Target Organ Effects: Central nervous system (CNS). Reproductive system. Respiratory system.

12. ECOLOGICAL INFORMATION

Ecotoxicity

The environmental impact of this product has not been fully investigated.

Ozone depletion potential; ODP; (R-11 = 1): Does not contain ozone depleting chemical (40 CFR Part 82).
13. DISPOSAL CONSIDERATIONS

Waste Disposal Methods
Do not attempt to dispose of residual waste or unused quantities. Return in the shipping container PROPERLY LABELED WITH ANY VALVE OUTLET PLUGS OR CAPS SECURED AND VALVE PROTECTION CAP IN PLACE to Linde for proper disposal.

Contaminated Packaging
Do not re-use empty containers.

14. TRANSPORT INFORMATION

**DOT**

Proper shipping name: Compressed gas, oxidizing, n.o.s.
Hazard Class: 2.2
Subsidiary Class: 5.1
UN-Number: UN3156
Description: UN3156, Compressed gas, oxidizing, n.o.s. (Oxygen, Nitrous Oxide), 2.2(5.1)
Emergency Response Guide Number: 122

**TDG**

Proper Shipping Name: Compressed gas, oxidizing, n.o.s.
Hazard Class: 2.2
Subsidiary Class: (5.1)
UN-Number: UN3156
Description: UN3156, COMPRESSED GAS, OXIDIZING, N.O.S. (Oxygen, Nitrous Oxide), 2.2(5.1)

**MEX**

Proper Shipping Name: Compressed gas, oxidizing, n.o.s.
Hazard Class: 2.2
Subsidiary Class: 5.1
UN-Number: UN3156
Description: UN3156 Compressed gas, oxidizing, n.o.s. (Oxygen, Nitrous Oxide), 2.2(5.1)

**IATA**

UN-Number: UN3156
Proper Shipping Name: Compressed gas, oxidizing, n.o.s.
Hazard Class: 2.2
Subsidiary Class: 5.1
ERG Code: 2X
Description: UN3156, Compressed gas, oxidizing, n.o.s. (Oxygen, Nitrous Oxide), 2.2(5.1)
Maximum Quantity for Passenger: 75 kg
Maximum Quantity for Cargo Only: 150 kg
Limited Quantity: Forbidden

**IMDG/IMO**

Proper Shipping Name: Compressed gas, oxidizing, n.o.s.
Hazard Class: 2.2
Subsidiary Class: 5.1
UN-Number: UN3156
EmS No.: F-C, S-W
Description: UN3156, Compressed gas, oxidizing, n.o.s. (Oxygen, Nitrous Oxide), 2.2(5.1)

ADR
Proper Shipping Name: Compressed gas, oxidizing, n.o.s.
Hazard Class: 2.2
UN-Number: UN3156
Classification Code: 1O
Description: UN3156 Compressed gas, oxidizing, n.o.s. (Oxygen, Nitrous Oxide), 2.2(5.1), 5.1

15. REGULATORY INFORMATION

International Inventories

<table>
<thead>
<tr>
<th>TSCA</th>
<th>Complies</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSL</td>
<td>Complies</td>
</tr>
<tr>
<td>EINECS/ELINCS</td>
<td>Complies</td>
</tr>
</tbody>
</table>

Legend

- TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
- DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
- EINECS/ELINCS - European Inventory of Existing Commercial Chemical Substances/EU List of Notified Chemical Substances

U.S. Federal Regulations

SARA 313
Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372.

SARA 311/312 Hazard Categories

- Acute Health Hazard: Yes
- Chronic Health Hazard: Yes
- Fire Hazard: Yes
- Sudden Release of Pressure Hazard: Yes
- Reactive Hazard: No

Clean Water Act
This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42).

Risk and Process Safety Management Programs
This material, as supplied, does not contain any regulated substances with specified thresholds under 40 CFR Part 68.
This product does not contain any substances regulated as Highly Hazardous Chemicals pursuant to the 29 CFR Part 1910.110.
Clean Air Act, Section 112 Hazardous Air Pollutants (HAPs) (see 40 CFR 61)
This product does not contain any substances regulated as hazardous air pollutants (HAPS) under Section 112 of the Clean Air Act Amendments of 1990.

CERCLA/SARA
This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material.

U.S. State Regulations

California Proposition 65
This product contains the following Proposition 65 chemicals:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS-No</th>
<th>California Prop. 65</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrous oxide</td>
<td>10024-97-2</td>
<td>Developmental</td>
</tr>
</tbody>
</table>

U.S. State Right-to-Know Regulations

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Massachusetts</th>
<th>New Jersey</th>
<th>Pennsylvania</th>
<th>Illinois</th>
<th>Rhode Island</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxygen</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>X</td>
</tr>
<tr>
<td>Nitrous oxide</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>X</td>
</tr>
</tbody>
</table>

International Regulations

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Hazard Class
A Compressed gases
C Oxidizing materials
D2A Very toxic materials

16. OTHER INFORMATION

Prepared By
Product Stewardship
23 British American Blvd.
Latham, NY 12110
1-800-572-6501

Issuing Date
10-Feb-2011

Revision Date

Revision Number
0
Revision Note

Initial Release.

<table>
<thead>
<tr>
<th>NFPA</th>
<th>Health Hazard</th>
<th>Flammability</th>
<th>Stability</th>
<th>Physical and Chemical Hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>OX</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HMIS</th>
<th>Health Hazard</th>
<th>Flammability</th>
<th>Physical Hazard</th>
<th>Personal Protection</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>-</td>
</tr>
</tbody>
</table>

**Note:** Ratings were assigned in accordance with Compressed Gas Association (CGA) guidelines as published in CGA Pamphlet P-19-2009, CGA Recommended Hazard Ratings for Compressed Gases, 3rd Edition.

**General Disclaimer**

For terms and conditions, including limitation of liability, please refer to the purchase agreement in effect between Linde LLC, Linde Merchant Production, Inc. or Linde Gas North America LLC (or any of their affiliates and subsidiaries) and the purchaser.

**DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES**

Although reasonable care has been taken in the preparation of this document, we extend no warranties and make no representations as to the accuracy or completeness of the information contained herein, and assume no responsibility regarding the suitability of this information for the user's intended purposes or for the consequences of its use. Each individual should make a determination as to the suitability of the information for their particular purpose(s).

End of Safety Data Sheet