



NITROUS OXIDE, GAS

Material Safety Data Sheet

1. PRODUCT AND COMPANY IDENTIFICATION

| | |
|-------------------|---|
| Product Name | NITROUS OXIDE, GAS |
| Product Code(s) | G-3, 1023 |
| UN-No | UN1070 |
| Recommended Use | Compressed gas. |
| Synonyms | Dinitrogen Monoxide; Laughing Gas; Factitious Air; Hyponitrous Acid Anhydride; Nitrogen(I) Oxide |
| 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.lindecana.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

| | | |
|---|-----------------------|--------------|
| WARNING! | | |
| Emergency Overview | | |
| Oxidizer | | |
| Contact with combustible material may cause fire | | |
| Simple asphyxiant | | |
| Intentional misuse by deliberately concentrating and inhaling contents may be harmful or fatal | | |
| Causes central nervous system depression | | |
| Contents under pressure | | |
| Keep at temperatures below 52°C / 125°F | | |
| WARNING! This product contains a chemical known in the State of California to cause birth defects or other reproductive harm. | | |
| Appearance | Physical State | Odor |
| Colorless | Compressed gas. | Slight sweet |

| | |
|--|---|
| OSHA Regulatory Status | This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200). |
| <u>Potential Health Effects</u> | |
| Principle Routes of Exposure | Inhalation. |
| Acute Toxicity | |
| Inhalation | Simple asphyxiant. May cause suffocation by displacing the oxygen in the air. Exposure to oxygen-deficient atmosphere (<19.5%) may cause dizziness, drowsiness, nausea, vomiting, excess salivation, diminished mental alertness, loss of consciousness and death. Exposure to atmospheres containing 8-10% or less oxygen will bring about unconsciousness without warning and so quickly that the individuals cannot help or protect themselves. Lack of sufficient oxygen may cause serious injury or death. 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 | None known. Contact with rapidly expanding gas near the point of release may cause frostbite. |
| Skin | None known. Contact with rapidly expanding gas near the point of release may cause frostbite. |
| Skin Absorption Hazard | No known hazard in contact with skin. |
| Ingestion | None known. |
| 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 | Liver disorders. Kidney disorders. Central nervous system. Blood disorders. 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. |
| Environmental Hazard | See Section 12 for additional Ecological Information. |

3. COMPOSITION/INFORMATION ON INGREDIENTS

| Chemical Name | CAS-No | Volume % | Chemical Formula |
|---------------|------------|----------|------------------|
| Nitrous oxide | 10024-97-2 | >99 | N ₂ O |

4. FIRST AID MEASURES

| | |
|--------------------|--|
| Eye Contact | None under normal use. Get medical attention if symptoms occur. |
| Skin Contact | None under normal use. Get medical attention if symptoms occur. |
| 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

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|---|--|
| Flammable Properties | Oxidizer. May vigorously accelerate combustion. |
| Suitable Extinguishing Media | Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. |
| <u>Explosion Data</u> | |
| 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

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| Personal Precautions | Ensure adequate ventilation. Evacuate personnel to safe areas. Use personal protective equipment. Monitor oxygen level. |
| 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. |

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.

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.

Due to increased misuse and abuse of nitrous oxide, handling and storage precautions should be implemented to prevent theft and improper use. The following recommendations may not include all precautions which are necessary. Nitrous oxide systems should be installed in accordance with CGA G-8.1, "Standard for Nitrous Oxide Systems at Consumer Sites". Keep full and empty nitrous oxide containers and utilization equipment stored in a secured area. Allow only authorized personnel to remove containers, inventory and account for both full and empty containers and bulk product. Promptly report any theft of nitrous oxide to the police and the supplier. Establish other procedures as necessary to check for unusual use or loss of nitrous oxide.

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-8.2 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

| Chemical Name | ACGIH TLV | OSHA PEL | NIOSH IDLH |
|-----------------------------|-------------|----------|--|
| Nitrous oxide 10024-97-2 | TWA: 50 ppm | - | TWA: 46 mg/m ³ TWA: 25 ppm |

Engineering Measures

Eyewash stations. Showers. 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 | No protective equipment is needed under normal use conditions. If exposure limits are exceeded or irritation is experienced, ventilation and evacuation may be required. |
| Emergency Use | Use positive pressure airline respirator with escape cylinder or self contained breathing apparatus for oxygen-deficient atmospheres (<19.5%). |
| Hygiene Measures | Handle in accordance with good industrial hygiene and safety practice. |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | | | |
|--------------------------------|---|----------------------------|---------------------------|
| Appearance | Colorless. | Odor | Slight sweet. |
| Odor Threshold | No information available. | Physical State | Compressed gas |
| Flash Point | No information available. | Autoignition Temperature | No information available. |
| Decomposition Temperature | No information available. | Boiling Point/Range | -88.47°C / -127.2°F |
| Freezing Point | -90.81°C / -131.5°F | Molecular Weight | 44.013 |
| Water Solubility | Slightly soluble | Evaporation Rate | No information available |
| Vapor Pressure | 736 psig @ 68°F | Vapor Density | 1.529 (air = 1) |
| Gas Density | @ 25°C, 1 atm: 1.8122 kg/m ³ | VOC Content (%) | Not applicable. |
| Specific Vol. @ 21.1°C & 1 atm | 543.1 dm ³ /kg (8.7 ft ³ /lb) | Critical Pressure | 1052.2 psia |
| Critical Temperature | 36.4°C / 97.6°F | Flammability Limits in Air | |
| | | Upper | Not applicable |
| | | Lower | Not applicable |

10. STABILITY AND REACTIVITY

| | |
|----------------------------------|---|
| Stability | Stable. |
| Incompatible Products | Combustible materials. Organic material. Reducing agents. |
| 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

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

Chronic Toxicity

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

Carcinogenicity Contains no ingredient listed as a carcinogen. 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.

| Chemical Name | ACGIH | IARC | NTP | OSHA |
|---------------|-------|---------|-----|------|
| Nitrous oxide | | Group 3 | | |

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 Reproductive toxicity has been observed in humans and animals following exposure to nitrous oxide in concentrations in excess of the TLV. Exposure to nitrous oxide alone resulted in a 50% increase in congenital abnormalities and a 100% increase in spontaneous abortion in female dental assistants compared to nonusers of nitrous oxide.

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 None known.

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).

| Chemical Name | Log Pow |
|---------------|---------|
| Nitrous oxide | 0.4 |

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.

14. TRANSPORT INFORMATION

DOT

| | |
|---------------------------------|--------------------------------|
| Proper Shipping Name | Nitrous oxide |
| Hazard Class | 2.2 |
| Subsidiary Class | 5.1 |
| UN-No | UN1070 |
| Description | UN1070,Nitrous oxide,2.2,(5.1) |
| Emergency Response Guide Number | 122 |

TDG

| | |
|----------------------|-------------------------------|
| Proper Shipping Name | Nitrous oxide |
| Hazard Class | 2.2 |
| Subsidiary Class | (5.1) |
| UN-No | UN1070 |
| Description | UN1070,NITROUS OXIDE,2.2(5.1) |

MEX

| | |
|----------------------|--------------------------|
| Proper Shipping Name | Nitrous oxide |
| Hazard Class | 2.2 |
| Subsidiary Class | 5.1 |
| UN-No | UN1070 |
| Description | UN1070 Nitrous oxide,2.2 |

IATA

| | |
|---------------------------------|-------------------------------|
| UN-No | UN1070 |
| Proper Shipping Name | Nitrous oxide |
| Hazard Class | 2.2 |
| Subsidiary Class | 5.1 |
| ERG Code | 2AX |
| Description | UN1070,Nitrous oxide,2.2(5.1) |
| Maximum Quantity for Passenger | 75 kg |
| Maximum Quantity for Cargo Only | 150 kg |
| Limited Quantity | No information available. |

IMDG/IMO

| | |
|----------------------|--------------------------------|
| Proper Shipping Name | Nitrous oxide |
| Hazard Class | 2.2 |
| Subsidiary Class | 5.1 |
| UN-No | UN1070 |
| EmS No. | F-C, S-W |
| Description | UN1070, Nitrous oxide,2.2(5.1) |

ADR

| | |
|----------------------|---------------------------|
| Proper Shipping Name | Nitrous oxide |
| Hazard Class | 2.2 |
| UN-No | UN1070 |
| Classification Code | 20 |
| Description | UN1070, Nitrous oxide,2.2 |
| ADR/RID-Labels | 5.1 |

15. REGULATORY INFORMATION

International Inventories

| | |
|---------------|----------|
| TSCA | Complies |
| DSL | Complies |
| EINECS/ELINCS | Complies |

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:

| | | |
|---------------|------------|---------------------|
| Chemical Name | CAS-No | California Prop. 65 |
| Nitrous oxide | 10024-97-2 | Developmental |

U.S. State Right-to-Know Regulations

| | | | | | |
|---------------|---------------|------------|--------------|----------|--------------|
| Chemical Name | Massachusetts | New Jersey | Pennsylvania | Illinois | Rhode Island |
| Nitrous oxide | X | X | X | - | - |

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 05-Mar-2010

Revision Date 02-Sep-2010

Revision Number 1

Revision Note (M)SDS sections updated. 1.

| | | | | |
|-------------|-----------------|----------------|-------------------|----------------------------------|
| <u>NFPA</u> | Health Hazard 2 | Flammability 0 | Stability 0 | Physical and Chemical Hazards OX |
| <u>HMIS</u> | Health Hazard 1 | Flammability 0 | Physical Hazard 3 | Personal Protection - |

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.

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End of Safety Data Sheet