



MATERIAL SAFETY DATA SHEET

PRODUCT NAME: NITROUS OXIDE

1. Product and Company Identification

BOC Gases,
Division of,
The BOC Group, Inc.
575 Mountain Avenue
Murray Hill, NJ 07974

BOC Gases
Division of
BOC Canada Limited
5975 Falbourne Street, Unit 2
Mississauga, Ontario L5R 3W6
TELEPHONE NUMBER: (905) 501-1700

TELEPHONE NUMBER: (908) 464-8100

24-HOUR EMERGENCY TELEPHONE NUMBER:
CHEMTREC (800) 424-9300

24-HOUR EMERGENCY TELEPHONE NUMBER:
(905) 501-0802

EMERGENCY RESPONSE PLAN NO: 2-0101

PRODUCT NAME: NITROUS OXIDE

CHEMICAL NAME: Nitrous Oxide

COMMON NAMES/SYNONYMS: Dinitrogen Monoxide, Laughing Gas, Factitious Air, Hyponitrous Acid Anhydride

TDG (Canada) CLASSIFICATION: 2.2 (5.1)

WHMIS CLASSIFICATION: A, C, D2A

PREPARED BY: Loss Control (908)464-8100/(905)501-1700

PREPARATION DATE: 6/1/95

REVIEW DATES: 06/18/04

2. Composition, Information on Ingredients

EXPOSURE LIMITS¹:

INGREDIENT	% VOLUME	PEL-OSHA ²	TLV-ACGIH ³	LD ₅₀ or LC ₅₀ Route/Species
Nitrous Oxide FORMULA: N ₂ O CAS: 10024-97-2 RTECS #: QX1350000	98.0 to 99.995	Not Available	50 ppm TWA	Not Available

¹ Refer to individual state or provincial regulations, as applicable, for limits which may be more stringent than those listed here.

² As stated in 29 CFR 1910, Subpart Z (revised July 1, 1993)

³ As stated in the ACGIH 2004 Threshold Limit Values for Chemical Substances and Physical Agents.

OSHA Regulatory Status: This material is classified as hazardous under OSHA regulations.

3. Hazards Identification

EMERGENCY OVERVIEW

Colorless nonflammable gas with slightly sweet odor. Oxidizer. Will accelerate combustion and increase the risk of fire and explosion in combustible or flammable material. Inhalation of high concentrations will cause anesthesia. Repeated exposure over time may have adverse reproductive effects, decrease neurobehavioral functions and injure other organs. Intentional misuse of this product can be harmful or fatal. Repeated abuse of nitrous oxide can have long-term health effects. May cause asphyxiation by exclusion of oxygen. Reproductive Hazard. Contents under pressure. Use and store below 125 °F.

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ROUTE OF ENTRY:

Skin Contact No	Skin Absorption No	Eye Contact No	Inhalation Yes	Ingestion No
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HEALTH EFFECTS:

Exposure Limits Yes	Irritant No	Sensitization No
Teratogen Yes	Reproductive Hazard Yes	Mutagen Yes
Synergistic Effects Other agents that depress the central nervous system		

Carcinogenicity: -- NTP: No IARC: No OSHA: No

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

SKIN EFFECTS: Contact with rapidly expanding gas near the point of release may cause frostbite with redness, skin color change to gray or white, and blistering.

INGESTION EFFECTS: None known. Ingestion is unlikely.

INHALATION EFFECTS: High concentrations may cause deep breathing, dizziness, nausea and eventual unconsciousness due to inadequate oxygen supply. 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 as in air. Nitrous oxide is a slight narcotic, but lacks substantial toxicity. Asphyxia will occur due to oxygen exclusion. Maintain oxygen levels above 19.5% at sea level.

Intentional misuse or abuse of this product may be harmful or fatal. Repeated abuse can have long-term health effects.

Repeated exposure over time may adversely affect the liver, kidneys, nervous system, blood, reproductive system and fetus (See Section 11).

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. Many anesthesiologists feel that N₂O use should be restricted during the first two trimesters of pregnancy.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: None known.

POTENTIAL ENVIRONMENTAL EFFECTS: Ecotoxicity values were unavailable. Expected to have effects similar to those seen in experimental animals and humans.

4. First Aid Measures

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

SKIN: None required for gas. For frostbite, immerse skin in lukewarm water. DO NOT USE HOT WATER. Obtain medical attention.

INGESTION: None required.

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INHALATION: PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO NITROUS OXIDE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS. Conscious persons should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. Unconscious persons should be moved to an uncontaminated area, given artificial resuscitation and supplemental oxygen. Further treatment should be symptomatic and supportive.

5. Fire Fighting Measures

Conditions of Flammability: Not Flammable		
Flash point: None	Method: Not Applicable	Autoignition Temperature: None
LEL(%): None	UEL(%): None	
Hazardous combustion products: None		
Sensitivity to mechanical shock: None		
Sensitivity to static discharge: None		

FIRE AND EXPLOSION HAZARDS:

Nonflammable. Oxidizer. Can readily support or initiate combustion/explosion of organic matter and other oxidizable material. May decompose violently at temperatures above 1112°F (600°C). Cylinder may vent rapidly or rupture violently from pressure when involved in a fire situation.

EXTINGUISHING MEDIA:

Use extinguishing media suitable for the combustible materials involved in the fire.

FIRE FIGHTING INSTRUCTIONS:

Firefighters should wear respiratory protection (SCBA) and full turnout or Bunker gear. If possible, stop the flow of gas that is accelerating the fire. Continue to cool fire-exposed cylinders until well after flames are extinguished.

6. Accidental Release Measures

Extinguish all ignition sources. Evacuate all personnel from affected area. A leak near combustible or flammable materials may represent a severe fire or explosion hazard. Use appropriate protective equipment (See Section 8). Stop the flow of gas or remove cylinder to outdoor location if this can be done without risk. Ventilate enclosed areas. If leak is in user's equipment, be certain to purge piping with inert gas prior to attempting repairs. If leak is in container or container valve, contact the appropriate emergency telephone number listed in Section 1 or call your closest BOC location.

7. Handling and Storage

Electrical classification: Nonhazardous

Use only in well-ventilated areas. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Use a pressure reducing regulator when connecting cylinder to lower pressure piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the container. Use a check valve or trap in the discharge line to prevent hazardous back flow into the container. Do not insert any object (i.e.: screwdriver) into valve cap openings as this can damage the valve causing leakage.

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Protect containers from physical damage. Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Do not allow the temperatures where containers are stored to exceed 125°F (52°C). Containers should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use "first in-first out" inventory system to prevent full containers being stored for excessive periods of time. "Post NO SMOKING OR OPEN FLAMES" signs in the storage or use area. There should be no sources of ignition in the storage or use area.

Due to increased misuse and abuse of nitrous oxide, handling 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 carry a compressed gas cylinder or a container of gas in a cryogenic liquid form in an enclosed space such as a car trunk, van or station wagon. A leak can result in a fire, explosion, asphyxiation or a toxic exposure.

For additional recommendations, consult Compressed Gas Association's Pamphlet P-1, G-8.1, G-8.2, and SB-6.

8. Exposure Controls, Personal Protection

ENGINEERING CONTROLS:

Local exhaust ventilation and enclosed processes as necessary to control air contaminants to at or below acceptable exposure guidelines.

EYE/FACE PROTECTION:

Chemical safety goggles or safety glasses.

SKIN PROTECTION:

Protective gloves suitable for the job. Gloves must be clean and free from grease or oil.

RESPIRATORY PROTECTION:

For emergency release use NIOSH approved air-supplying respirator systems (SCBA or airline/escape bottle) using at a minimum Grade D air.

OTHER/GENERAL PROTECTION:

Safety shoes, eyewash station

9. Physical and Chemical Properties

PARAMETER	VALUE	UNITS
Physical state (gas, liquid, solid)	: Gas	
Vapor pressure at 20°C	: 736.	psig
Vapor density (Air = 1)	: 1.529	
Evaporation point	: Gas	
Boiling point	: -127.2	°F
	: -88.47	°C
Freezing point	: -131.5	°F
	: -90.81	°C
PH	: Not Applicable	
Specific gravity at boiling	: 1.227	
Oil/water partition coefficient	: Not Available	
Solubility (H ₂ O)	: 2.3, (slight)	@ 70 °F/21.1 °C; 1 atm
Odor threshold	: Not Available	
Odor and appearance	: Colorless gas, slightly sweet taste and odor. Liquid appears similar to water.	

10. Stability and Reactivity

STABILITY: Stable.

INCOMPATIBLE MATERIALS/CONDITIONS: All flammable, inorganic and combustible materials. 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. Powerful reducing agents will react violently. Avoid heat, sparks, flames, and other ignition sources.

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: Will not occur.

11. Toxicological Information

INHALATION: Nitrous oxide has a narcotic effect at high concentrations.

SKIN AND EYE: Not expected to cause irritation

OTHER: Although nitrous oxide has adversely affected a variety of organs in both human and animal studies dose-response and causal relationships are poorly defined. Various studies indicate that nitrous oxide may adversely affect the blood and blood forming organs, liver, kidneys, nervous system, reproductive system, and fetus. The ACGIH TLV for nitrous oxide was established to protect against adverse hematologic, nervous system, and reproductive effects.

Dentists and dental assistants (> 8 H/week) heavily exposed to nitrous oxide exhibited higher hepatic and renal disease rates than nonexposed dentists and their assistants. 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.

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Dentists exposed to nitrous oxide longer than 3000 hours within the prior 10 years exhibited neurologic symptoms (i.e.: weakness, tingling, and numbness).

Reproductive toxicity has been observed in humans and animals following exposure to nitrous oxide in concentrations in excess of the TLV. 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 anomalies) were seen at 1,000 ppm.

Female workers directly exposed to waste anesthetic gases have exhibited a higher than expected incidence of spontaneous abortion. Exposure to nitrous oxide alone resulted in a 50% increase in congenital abnormalities and a 100% increase in spontaneous abortions in female dental assistants compared to nonusers of nitrous oxide.

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.

12. Ecological Information

Product does not contain Class I or Class II ozone depleting substances.

13. Disposal Considerations

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 BOC Gases or authorized distributor for proper disposal.

14. Transport Information

PARAMETER	United States DOT	Canada TDG
PROPER SHIPPING NAME:	Nitrous Oxide	Nitrous Oxide
HAZARD CLASS:	2.2 (5.1)	2.2 (5.1)
IDENTIFICATION NUMBER:	UN 1070	UN 1070
SHIPPING LABEL:	NONFLAMMABLE GAS, OXIDIZER	NONFLAMMABLE GAS, OXIDIZER

15. Regulatory Information

SARA TITLE III NOTIFICATIONS AND INFORMATION

SARA TITLE III - HAZARD CLASSES:

Acute Health Hazard
Fire Hazard
Sudden Release of Pressure Hazard
Chronic Health Hazard

SARA 313: This product does not contain ingredients subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 49 CFR Part 372.

U.S. TSCA/Canadian DSL: All ingredients are listed on the U.S. Toxic Substances Control Act (TSCA) inventory or exempt from listing and on the Canadian Domestic Substance List (DSL).

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California Proposition 65: This product does not contain ingredient(s) known to the State of California to cause cancer or reproductive toxicity.

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

16. Other Information

NFPA HAZARD CODES	HMIS HAZARD CODES	RATINGS SYSTEM
Health: 2	Health: 1	0 = No Hazard
Flammability: 0	Flammability: 0	1 = Slight Hazard
Instability: 0	Physical Hazard: 3	2 = Moderate Hazard
OXIDIZER		3 = Serious Hazard
		4 = Severe Hazard

Note: Ratings were assigned in accordance with Compressed Gas Association (CGA) guidelines as published in CGA Pamphlet P-19-2004, *CGA Recommended Hazard Ratings for Compressed Gases, 2nd Edition*.

ACGIH	American Conference of Governmental Industrial Hygienists
DOT	Department of Transportation
IARC	International Agency for Research on Cancer
NTP	National Toxicology Program
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
SARA	Superfund Amendments and Reauthorization Act
STEL	Short Term Exposure Limit
TDG	Transportation of Dangerous Goods
TLV	Threshold Limit Value
WHMIS	Workplace Hazardous Materials Information System

Compressed gas cylinders shall not be refilled without the express written permission of the owner. Shipment of a compressed gas cylinder which has not been filled by the owner or with his/her (written) consent is a violation of transportation regulations.

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