

Praxair Material Safety Data Sheet

1. Chemical Product and Company Identification

Product Name: Nitric Oxide	Trade Name: Nitric Oxide
Product Use: Many.	
Chemical Name: Nitric oxide	Synonym: Nitrogen (II) oxide, nitrogen monoxide, mononitrogen monoxide.
Chemical Formula: NO	Chemical Family: Nitrogen oxides
Telephone: Emergencies: * 1-800-363-0042	Supplier /Manufacture: Praxair Canada Inc. 1 City Centre Drive Suite 1200 Mississauga, ON L5B 1M2
	Phone: 905-803-1600
	Fax: 905-803-1682

**Call emergency numbers 24 hours a day only for spills, leaks, fire, exposure, or accidents involving this product. For routine information, contact your supplier or Praxair sales representative.*

2. Composition and Information on Ingredients

INGREDIENTS	% (VOL)	CAS NUMBER	LD ₅₀ (Species & Routes)	LC ₅₀ (Rat, 4 hrs.)	TLV-TWA (ACGIH)
Nitric oxide	100	10102-43-9	Not applicable.	57 ppm	25 ppm

3. Hazards Identification



Emergency Overview



DANGER! Toxic, oxidizing, corrosive high pressure gas. May be fatal if inhaled. May cause lung damage. Can cause eye and skin burns. Symptoms may be delayed. Vigorously accelerates combustion. Self-contained breathing apparatus and protective clothing must be worn by rescue workers.

ROUTES OF EXPOSURE: Inhalation. Skin absorption. Skin contact. Eye contact.

EFFECTS OF A SINGLE (ACUTE) OVEREXPOSURE:

INHALATION: This material readily converts to nitrogen dioxide in air. Overexposure may cause irritation of mucous membranes, sinuses, pharynx, and bronchia, with pain, headache, cyanosis, irregular respiration, choking, dizziness, and possibly pulmonary edema. Often no pulmonary symptoms at time of exposure; may have latency of 5-72 hours. High vapour concentrations may cause pain, choking, bronchoconstriction, reflex slowing of the heart, and possibly asphyxiation. Lack of oxygen can cause death.

SKIN CONTACT: Severe irritant; may cause burns.

SKIN ABSORPTION:	Prolonged or widespread skin contact with the liquid may result in the absorption of harmful amounts of material.
SWALLOWING:	A highly unlikely route of exposure. This product is a gas at room temperature and pressure.
EYE CONTACT:	May cause severe conjunctivitis seen as marked redness and swelling of the conjunctiva, and corneal injury with opacification.

EFFECTS OF REPEATED (CHRONIC) OVEREXPOSURE:

Repeated inhalation may result in bronchitis or emphysema. Repeated skin contact may result in cumulative dermatitis.

OTHER EFFECTS OF OVEREXPOSURE:

None known.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE:

Inhalation may aggravate asthma and inflammatory or fibrotic pulmonary disease. Because of its irritating properties, this material may aggravate an existing dermatitis.

SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAZARD EVALUATION:

Nitric oxide has been shown to cause mutations in bacteria, and to cause mutations, sister-chromatid exchanges, and chromosomal aberrations in mammalian cells. Although not demonstrated with nitric oxide, repeated or prolonged maternal hypoxia induced by overexposure to other chemical asphyxiants has produced embryofetal toxicity in laboratory animals.

CARCINOGENICITY:

Not listed as carcinogen by OSHA, NTP or IARC.

4. First Aid Measures

INHALATION:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately. Keep patient warm.

SKIN CONTACT:

Immediately flush affected areas with water for at least 15 minutes while removing contaminated clothing and shoes. Discard clothing and shoes. Call a physician.

SWALLOWING:

This product is a gas at normal temperature and pressure.

EYE CONTACT:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention.

NOTES TO PHYSICIAN:

In case of overexposure, keep patient under medical observation for at least 72 hours to observe for pulmonary edema. Patient may have second acute pulmonary reaction 2-6 weeks after the first one. The hazards of this material are mainly due to its severe irritant and corrosive properties on the skin and mucosal surfaces. There is no specific antidote. Treatment of over-exposure should be directed at the control of symptoms and the clinical condition.

5. Fire Fighting Measures

FLAMMABLE :	No.	IF YES, UNDER WHAT CONDITIONS?	Vigorously accelerates combustion.
FLASH POINT (test method)	Not applicable.	AUTOIGNITION TEMPERATURE	Not applicable.
FLAMMABLE LIMITS IN AIR, % by volume:	LOWER: Not applicable.	UPPER:	Not applicable.

EXTINGUISHING MEDIA:

Oxidizing gas. Vigorously accelerates combustion. Use media appropriate for surrounding fire.

SPECIAL FIRE FIGHTING PROCEDURES:

DANGER! Highly toxic gas. Evacuate all personnel from danger area. Do not approach area without self-contained breathing apparatus and protective clothing. Immediately cool containers with water spray from maximum distance until cool, then move containers away from fire area if without risk. If containers are leaking, reduce vapours with water spray or fog. Shut off leak if without risk while continuing cooling water spray. Remove containers away from fire area of fire if without risk.

UNUSUAL FIRE AND EXPLOSION HAZARD:

Oxidizing agent, may accelerate combustion. Contact with flammable materials may cause fire or explosion. Container may rupture due to heat of fire. Vapours are extremely irritating. Contact may cause burns to skin and eyes. No part of a container should be subjected to a temperature higher than 52 C. See incompatibility in Section X. Most containers are provided with a pressure relief device designed to vent contents when they are exposed to elevated temperature.

HAZARDOUS COMBUSTION PRODUCTS:

Burning produces highly toxic oxides of nitrogen.

SENSITIVITY TO IMPACT:

Avoid impact against container.

SENSITIVITY TO STATIC DISCHARGE:

Not applicable.

6. Accidental Release Measures

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:

DANGER! Immediately evacuate all personnel from danger area. **DANGER:** Corrosive, toxic gas. Use self-contained breathing apparatus and protective clothing where needed. Contact with flammable materials may cause fire or explosion (See Section V). Reduce vapours with fog or fine water spray. Do not spray water directly on leak as this may cause leak to increase. Reverse flow into cylinder may cause rupture. Shut off leak if without risk. Ventilate area of leak or move leaking container to well ventilated area. Prevent runoff from contaminating surrounding environment. Corrosive, toxic vapours may spread from spill. Before entering area, especially confined areas, check atmosphere with appropriate device.

WASTE DISPOSAL METHOD:

Prevent waste from contaminating the surrounding environment. Keep personnel away. Discard any product, residue, disposable container, or liner in an environmentally acceptable manner, in full compliance with federal, provincial, and local regulations. If necessary, call your local supplier for assistance.

7. Handling and Storage

PRECAUTIONS TO BE TAKEN IN STORAGE:

Store and use with adequate ventilation. Separate flammable cylinders from oxygen, chlorine, and other oxidizers by at least 6 m or use a barricade of non-combustible material. This barricade should be at least 1.5 m high and have a fire resistance rating of at least ½ hour. Firmly secure cylinders upright to keep them from falling or being knocked over. Screw valve protection cap firmly in place by hand. Post "No Smoking or Open Flames" signs in storage and use areas. There must be no sources of ignition. All electrical equipment in storage areas must be explosion-proof. Storage areas must meet national electric codes for Class 1 hazardous areas. Store only where temperature will not exceed 52 C. Store full and empty cylinders separately. Use a first-in, first-out inventory system to prevent storing full cylinders for long periods.

PRECAUTIONS TO BE TAKEN IN HANDLING:

Protect cylinders from damage. Use a suitable hand truck to move cylinders; do not drag, roll, slide, or drop. Never attempt to lift a cylinder by its cap; the cap is intended solely to protect the valve. Never insert an object (e.g., wrench, screwdriver, pry bar) into cap openings; doing so may damage the valve and cause a leak. Use an adjustable strap wrench to remove over-tight or rusted caps. Open valve slowly. If valve is hard to open, discontinue use and contact your supplier. For other precautions, see Section 16.

For additional information on storage and handling, refer to Compressed Gas Association (CGA) pamphlet P-1, *Safe Handling of Compressed Gases in Containers*, available from the CGA. Refer to Section 16 for the address and phone number along with a list of other available publications.

OTHER HAZARDOUS CONDITIONS OF HANDLING, STORAGE, AND USE:

Toxic, oxidizing, corrosive high-pressure gas. May be fatal if inhaled. Do not breathe gas. Do not get vapour in eyes, on skin, or on clothing. Have safety showers and eyewash fountains immediately available. **Use piping and equipment adequately designed to withstand pressures to be encountered.** Use only in a closed system constructed of corrosion-resistant materials. **May accelerate combustion.** Keep oil, grease, and combustibles away. **Store and use with adequate ventilation at all times.** Close valve after each use; keep closed even when empty. **Prevent reverse flow.** Reverse flow into cylinder may cause rupture. Use a check valve or other protective device in any line or piping from the cylinder **When returning cylinder to supplier**, be sure valve is closed, then install valve outlet plug tightly. **Never work on a pressurized system.** *If there is a leak, close the cylinder valve. Vent the system down in a safe and environmentally sound manner in compliance with all federal, provincial, and local laws; then repair the leak.* **Never place a compressed gas cylinder where it may become part of an electrical circuit.**

8. Exposure Controls/Personal Protection

VENTILATION/ENGINEERING CONTROLS:

LOCAL EXHAUST: A corrosion-resistant system is acceptable.
See SPECIAL.

MECHANICAL (general): Inadequate.
See SPECIAL.

SPECIAL: Use only in a closed system.
A corrosion-resistant, forced-draft fume hood is preferred.

OTHER: See SPECIAL.

PERSONAL PROTECTION:

RESPIRATORY PROTECTION: Use respirable fume respirator or air supplied respirator when working in confined space or where local exhaust or ventilation does not keep exposure below TLV. Select in accordance with the provincial regulations or guidelines. Selection should also be based on the current CSA standards Z94.4, "Selection, care and use of respirators". Respirators should be approved by NIOSH and MSHA.

For concentrations up to 10 times the applicable exposure limit any NIOSH/MSHA approved supplied air respirator is recommended. Up to 50 times the TLV, a NIOSH/MSHA approved respirator with a full-face piece or self-contained breathing apparatus is recommended. For higher concentration us only self-contained breathing apparatus operated in the pressure demand mode.

SKIN PROTECTION: Butyl gloves. Gloves, PVC.

EYE PROTECTION: Wear safety glasses when handling cylinders.

Select in accordance with the current CSA standard Z94.3, "Industrial Eye and Face Protection", and any provincial regulations, local bylaws or guidelines.

OTHER PROTECTIVE EQUIPMENT: Metatarsal shoes for cylinder handling. Protective clothing where needed. Cuffless trousers should be worn outside the shoes. Select in accordance with the current CSA standard Z195, "Protective Foot Wear", and any provincial regulations, local bylaws or guidelines.

9. Physical and Chemical Properties

PHYSICAL STATE: Gas. (Compressed Gas.)	FREEZING POINT: -163.6°C (-262.5°F)	pH: Not applicable.
BOILING POINT: -151.8°C (-241.2°F)	VAPOUR PRESSURE: Not applicable.	MOLECULAR WEIGHT: 30.006 g/mole
SPECIFIC GRAVITY: LIQUID (Water = 1) 1.269 @ -150.0 C	SOLUBILITY IN WATER: Slight. Reacts to form nitric acid.	
SPECIFIC GRAVITY: VAPOUR (air = 1) 1.04 @21 C	EVAPORATION RATE (Butyl Acetate=1): Not applicable.	COEFFICIENT OF WATER/OIL DISTRIBUTION: Not applicable.
VAPOUR DENSITY: 0.00125 g/ml @ 21.1 C	% VOLATILES BY VOLUME: 100% (v/v).	ODOUR THRESHOLD: Not available.
APPEARANCE & ODOUR: Colourless. Odour: Pungent. Irritating. (Strong.)		

10. Stability and Reactivity

STABILITY:	Unstable.
CONDITIONS OF CHEMICAL INSTABILITY:	Nitric oxide is thermodynamically unstable at room temperature slowly undergoing disproportionably: $4NO \rightarrow N_2O_3 + N_2O$.
INCOMPATIBILITY (materials to avoid):	Air, oxygen, flammable materials, combustible materials, powdered aluminum, boron, chlorine monoxide, chromium, fluorine, nitrogen trichloride, ozone, oxygen and phosphorus, oxidizing agents, halogens, iron, sodium monoxide, magnesium, manganese, uranium, tungsten carbide.
HAZARDOUS DECOMPOSITION PRODUCTS:	Thermal decomposition or burning will produce highly toxic fumes of nitrogen oxides.
HAZARDOUS POLYMERIZATION:	Will not occur.
CONDITIONS OF REACTIVITY:	None.

11. Toxicological Information

See section 3.

12. Ecological Information

No adverse ecological effects expected. This product does not contain any Class I or Class II ozone-depleting chemicals. The components of this mixture are not listed as marine pollutants by TDG Regulations.

13. Disposal Considerations

WASTE DISPOSAL METHOD:

Do not attempt to dispose of residual or unused quantities. Return cylinder to supplier.

14. Transport Information

TDG/IMO SHIPPING NAME:

Nitric oxide, Compressed

HAZARD CLASS:

CLASS 2.3 (5.1)(8)
Toxic, Oxidizing and
Corrosive gas.

IDENTIFICATION #:

UN1660

PRODUCT REPORTABLE QUANTITY (PROQ):

Any accidental release in a quantity that could pose a danger to public safety or any sustained release of 10 minutes or more

SHIPPING LABEL(s):

Toxic gas, Oxidizing material, Corrosive material

PLACARD (when required):

Toxic gas

SPECIAL SHIPPING INFORMATION:

Cylinders should be transported in a secure position, in a well-ventilated vehicle. Cylinders transported in an enclosed, non-ventilated compartment of a vehicle can present serious safety hazards.

15. Regulatory Information

The following selected regulatory requirements may apply to this product. Not all such requirements are identified. Users of this product are solely responsible for compliance with all applicable federal, provincial, and local regulations.

DSL (Canada)

This product is on the DSL list

WHMIS (Canada)

CLASS A: Compressed gas.
CLASS C: Oxidizing material.
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC).
CLASS E: Corrosive gas.

International Regulations

EINECS

Not available.

DSCL (EEC)

R8- Contact with combustible material may cause fire.
R26- Very toxic by inhalation.

International Lists

No products were found.

16. Other Information

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.

HAZARD RATING SYSTEM:

HMIS RATINGS:

HEALTH 3

FLAMMABILITY 0

PHYSICAL HAZARD 2

STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA:

THREADED: CGA-660

PIN-INDEXED YOKE: Not available.

ULTRA-HIGH-INTEGRITY
CONNECTION: None.

Use the proper CGA connections. **DO NOT USE ADAPTERS.** Additional limited-standard connections may apply. See CGA pamphlets V-1 and V-7 listed below.

Ask your supplier about free Praxair safety literature as referred to in this MSDS and on the label for this product. Further information about this product can be found in the following pamphlets published by the Compressed Gas Association, Inc. (CGA), 4221 Walney Road, 5th Floor, Chantilly, VA 20151-2923, Telephone (703) 788-2700, Fax (703) 961-1831, website: www.cganet.com.

- AV-1 Safe Handling and Storage of Compressed Gas
- P-1 Safe Handling of Compressed Gases in Containers
- V-1 Compressed Gas Cylinder Valve Inlet and Outlet Connections
- V-7 Standard Method of Determining Cylinder Valve Outlet Connections for Industrial Gas Mixtures
- Handbook of Compressed Gases, Fifth Edition

PREPARATION INFORMATION:

DATE: October 15, 2016

DEPARTMENT: Safety and Environmental Services

TELEPHONE: 905-803-1600

The opinions expressed herein are those of qualified experts within Praxair Canada Inc. We believe that the information contained herein is current as of the date of this Material Safety Data Sheet. Since the use of this information and the conditions of use of the product are not within the control of Praxair Canada Inc., it is the user's obligation to determine the conditions of safe use of the product.

Praxair Canada Inc. requests the users of this product to study this Material Data Sheet (MSDS) and become aware of product hazards and safety information. To promote safe use of this product, a user should (1) notify its employees, agents and contractors of the information on this MSDS and any product hazards and safety information, (2) furnish this same information to each of its customers for the product, and (3) request such customers to notify their employees and customers for the product of the same product hazards and safety information.

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Product Name: Nitric Oxide

MSDS# E-4632-K

Date: Oct. 15, 2016



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