Safety Data Sheet

Version 2.0 SDS Number 300000000098
Revision Date 11/10/2016 Print Date 12/16/2017

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Nitric oxide
Chemical formula	:	NO
Synonyms	:	Nitric oxide, Mononitrogen Monoxide, Nitrogen Monoxide
Product Use Description	:	General Industrial
Manufacturer/Importer/Distributor	:	Air Products Canada Ltd. 2233 Argentia Rd, Suite 203 Mississauga, Ontario L5N 2X7 GST No.877787945 RT0001
Telephone	:	905-816-6670
Emergency telephone number (24h)	:	877-288-5002 (Canada, Multilingual) 800-523-9374 (US)

2. HAZARDS IDENTIFICATION

GHS classification

Oxidizing gases - Category 1
Gases under pressure - Compressed gas.
Acute toxicity - Category 2
Skin corrosion - Category 1B

GHS label elements

Hazard pictograms/symbols

Signal Word: Danger

Hazard Statements:

H270:May cause or intensify fire; oxidiser.
H280:Contains gas under pressure; may explode if heated.
H314:Causes severe skin burns and eye damage.

H330:Fatal if inhaled.

Precautionary Statements:

Prevention : P220:Keep away from clothing and other combustible materials.
P244:Keep valves and fittings free from oil and grease.
P260:Do not breathe dust/fume/gas/mist/vapours/spray.
P264:Wash hands thoroughly after handling.
P271:Use only outdoors or in a well-ventilated area
P280:Wear protective gloves/protective clothing/eye protection/face protection.
P284:Wear respiratory protection.

Response : P301+P330+P331 :IF SWALLOWED: rinse mouth. Do NOT induce vomiting.
P303+P361+P353 :IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water.
P304+P340+P310 :IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/doctor.
P305+P351+P338 :IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P363 :Wash contaminated clothing before reuse.
P370+P376 :In case of fire: Stop leak if safe to do so.

Storage : P403:Store in a well-ventilated place.
P403+P233:Store in a well-ventilated place. Keep container tightly closed.
P405:Store locked up.

Disposal : P501:Disposal of contents/container to be specified in accordance with regulations.

Hazards not otherwise classified

Very toxic by inhalation.
High pressure, oxidizing gas.
Vigorously accelerates combustion.
Keep oil, grease, and combustibles away.
May react violently with combustible materials.
Extremely reactive.
May react violently with water.
Do not breathe gas.
Corrosive to eyes, respiratory system and skin.
Wear self-contained breathing apparatus and protective suit.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Components	CAS Number	Concentration (Volume)
Nitric oxide	10102-43-9	100 %

Concentration is nominal. For the exact product composition, please refer to technical specifications.

4. FIRST AID MEASURES

General advice : Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.

Eye contact : In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
Keep eye wide open while rinsing.

Skin contact : Immediate medical treatment is necessary as untreated wounds from corrosion of the skin heal slowly and badly. Flush with copious amounts of water until treatment is available.

Ingestion : Ingestion is not considered a potential route of exposure.

Inhalation : Move to fresh air. In case of shortness of breath, give oxygen. If breathing has stopped or is labored, give assisted respirations. Supplemental oxygen may be indicated. If the heart has stopped, trained personnel should begin cardiopulmonary resuscitation immediately. Mouth to mouth resuscitation is not recommended. If unconscious place in recovery position and seek medical advice. Consult a doctor.

Notes to physician

Treatment : Absorption of nitric oxide may lead to the formation of methemoglobin, and a conversion fraction of 10% may be noted as a "lilac" cyanosis. High levels of conversion (>35-40%) may be indications for treatment with intravenous methylene blue or exchange transfusion. Nitric oxide and its reaction product nitrogen dioxide are deep lung irritants and produce chemical pneumonitis and pulmonary edema, often delayed in onset. Lung injury caused by inhalation of oxides of nitrogen may be accompanied by bacterial infection of the airway and delayed bronchiolitis obliterans. If nitric oxide and nitrogen dioxide have been inhaled under conditions which produce lung effects, the participation of a physician skilled in the treatment of pulmonary disease is essential. If exposed or concerned: Get medical attention/advice.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media : All known extinguishing media can be used.

Specific hazards : Upon exposure to intense heat or flame, cylinder will vent rapidly and or rupture violently. Oxidant. Strongly supports combustion. May react violently with combustible materials. Some materials which are noncombustible in air may burn in the presence of an oxidizer. Use of water may result in the formation of very toxic aqueous solutions. Move away from container and cool with water from a protected position. Keep adjacent cylinders cool by spraying with large amounts of water until the fire burns itself out.

Special protective equipment : Use self-contained breathing apparatus.

for fire-fighters

6. ACCIDENTAL RELEASE MEASURES

Personal precautions	:	Evacuate personnel to safe areas. Use self-contained breathing apparatus or positive pressure air line with mask and escape pack in areas where concentration is unknown or above the exposure limits. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe. Ventilate the area.
Environmental precautions	:	Should not be released into the environment. Prevent further leakage or spillage if safe to do so.
Methods for cleaning up	:	Ventilate the area. Approach suspected leak areas with caution.
Additional advice	:	If possible, stop flow of product. If leak is from cylinder or cylinder valve, call the emergency telephone number. If the leak is in the user's system, close the cylinder valve, safely vent the pressure, and purge with an inert gas before attempting repairs. Increase ventilation to the release area and monitor concentrations.

7. HANDLING AND STORAGE

Handling

Only experienced and properly instructed persons should handle compressed gases/cryogenic liquids. Protect cylinders from physical damage; do not drag, roll, slide or drop. Do not allow storage area temperature to exceed 50°C (122°F). Before using the product, determine its identity by reading the label. Know and understand the properties and hazards of the product before use. When doubt exists as to the correct handling procedure for a particular gas, contact the supplier. Do not remove or deface labels provided by the supplier for the identification of the cylinder contents. When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders. Leave valve protection caps in place until the container has been secured against either a wall or bench or placed in a container stand and is ready for use. Use an adjustable strap wrench to remove over-tight or rusted caps. Before connecting the container, check the complete gas system for suitability, particularly for pressure rating and materials. Before connecting the container for use, ensure that back feed from the system into the container is prevented. Ensure the complete gas system is compatible for pressure rating and materials of construction. Ensure the complete gas system has been checked for leaks before use. Employ suitable pressure regulating devices on all containers when the gas is being emitted to systems with lower pressure rating than that of the container. Never insert an object (e.g. wrench, screwdriver, pry bar, etc.) into valve cap openings. Doing so may damage valve, causing a leak to occur. Open valve slowly. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier. Close container valve after each use and when empty, even if still connected to equipment. Never attempt to repair or modify container valves or safety relief devices. Damaged valves should be reported immediately to the supplier. Close valve after each use and when empty. Replace outlet caps or plugs and container caps as soon as container is disconnected from equipment. Do not subject containers to abnormal mechanical shock. Never attempt to lift a cylinder by its valve protection cap or guard. Do not use containers as rollers or supports or for any other purpose than to contain the gas as supplied. Never strike an arc on a compressed gas cylinder or make a cylinder a part of an electrical circuit. Keep container valve outlets clean and free from contaminates particularly oil and water. Do not smoke while handling product or cylinders. Never re-compress a gas or a gas mixture without first consulting the supplier. Never attempt to transfer gases from one cylinder/container to another. Always use backflow protective device in

piping. Purge system with dry inert gas (e.g. helium or nitrogen) before gas is introduced and when system is placed out of service. Avoid suckback of water, acid and alkalis. Installation of a cross purge assembly between the cylinder and the regulator is recommended. When returning cylinder install valve outlet cap or plug leak tight. Never permit oil, grease, or other readily combustible substances to come into contact with valves or containers containing oxygen or other oxidants. Do not use rapidly opening valves (e.g. ball valves). Open valve slowly to avoid pressure shock. Never pressurize the entire system at once. Use only with equipment cleaned for oxygen service and rated for cylinder pressure. Never use direct flame or electrical heating devices to raise the pressure of a container. Containers should not be subjected to temperatures above 50°C (122°F).

Storage

Open/close valve slowly. Close when not in use. Wear Safety Eye Protection. Check Safety Data Sheet before use. Containers should be stored in the vertical position and properly secured to prevent toppling. The container valves should be tightly closed and where appropriate valve outlets should be capped or plugged. Container valve guards or caps should be in place. Full containers should be stored so that oldest stock is used first. Keep containers tightly closed in a cool, well-ventilated place. Stored containers should be periodically checked for general condition and leakage. Observe all regulations and local requirements regarding storage of containers. Local codes may have special requirements for toxic gas storage. Protect containers stored in the open against rusting and extremes of weather. Containers should not be stored in conditions likely to encourage corrosion. Containers should be stored in a purpose build compound which should be well ventilated, preferably in the open air. Keep container tightly closed in a dry and well-ventilated place. Full and empty cylinders should be segregated. Do not allow storage temperature to exceed 50°C (122°F). Display "No Smoking or Open Flames" signs in the storage areas. Return empty containers in a timely manner. Flammable storage areas should be separated from oxygen and other oxidizers by a minimum distance of 20 ft. (6.1 m.) or by a barrier of non-combustible material at least 5 ft. (1.5 m.) high, having a fire resistance rating of at least 1/2 hour.

Technical measures/Precautions

Containers should be segregated in the storage area according to the various categories (e.g. flammable, toxic, etc.) and in accordance whit local regulations. Keep away from combustible material. Where necessary containers containing oxygen and oxidants should be separated from flammable gases by a fire resistant partition. Segregate from flammable gases and other flammable materials in store.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering measures

Provide natural or explosion-proof ventilation adequate to ensure concentrations are kept below exposure limits.

Personal protective equipment

Respiratory protection	:	Use self-contained breathing apparatus or positive pressure air line with mask and escape pack in areas where concentration is unknown or above the exposure limits. Users of breathing apparatus must be trained.
Hand protection	:	Sturdy work gloves are recommended for handling cylinders. Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
Eye protection	:	Safety glasses recommended when handling cylinders. A full faceshield should be worn in addition to safety glasses when connecting,

disconnecting or opening cylinders.

Skin and body protection : Safety shoes are recommended when handling cylinders.
Encapsulated chemical protective suit in emergency situations.

Special instructions for protection and hygiene : Ensure adequate ventilation, especially in confined areas. Provide good ventilation and/or local exhaust to prevent accumulation of concentrations above exposure limits. Gloves must be clean and free of oil and grease.

Exposure limit(s)

Nitric oxide	Time Weighted Average (TWA): CAD AB OEL	25 ppm	31 mg/m3
Nitric oxide	Time Weighted Average (TWA): CAD BC OEL	25 ppm	-
Nitric oxide	Time Weighted Average (TWA): CAD ON OEL	25 ppm	-
Nitric oxide	Time Weighted Average (TWA): OEL (QUE)	25 ppm	31 mg/m3
Nitric oxide	Time Weighted Average (TWA): OEL (QUE)	25 ppm	31 mg/m3
Nitric oxide	8 hour average contamination limit: CAD SK OEL	25 ppm	-
Nitric oxide	15 minute average contamination limit: CAD SK OEL	38 ppm	-
Nitric oxide	Time Weighted Average (TWA): CAD MB OEL	25 ppm	-

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance : Compressed gas. Colorless gas

Odor : Irritating. Poor warning properties at low concentrations.

Odor threshold : No data available.

pH : Not applicable.

Melting point/range : -263 °F (-164 °C)

Boiling point/range : -242 °F (-152 °C)

Flash point : Not applicable.

Evaporation rate : Not applicable.

Flammability (solid, gas) : Refer to product classification in Section 2

Upper/lower explosion/flammability limit : No data available.

Vapor pressure : Not applicable.

Water solubility : 0.067 g/l

Relative vapor density	:	1 (air = 1)
Relative density	:	1.3 (water = 1)
Partition coefficient (n-octanol/water)	:	Not applicable.
Auto-ignition temperature	:	No data available.
Decomposition temperature	:	No data available.
Viscosity	:	Not applicable.
Molecular Weight	:	30 g/mol
Density	:	0.075 lb/ft3 (0.0012 g/cm3)

10. STABILITY AND REACTIVITY

Chemical Stability	:	Stable under normal conditions.
Materials to avoid	:	Oxygen. Flammable materials. Organic materials. Avoid oil, grease and all other combustible materials.
Hazardous decomposition products	:	Decomposes at room temperature to other nitrogen oxides and nitrogen. Oxidises in air to form nitrogen dioxide which is extremely reactive.

11. TOXICOLOGICAL INFORMATION

11.1. Information on toxicological effects

Likely routes of exposure

Effects on Eye	:	Irritating to eyes. Causes severe eye burns.
Effects on Skin	:	Causes skin irritation. Causes skin burns.
Inhalation Effects	:	Irritating to respiratory system. Can cause severe lung damage. Delayed adverse effects possible. Prolonged exposure to small concentrations may result in pulmonary edema. Delayed fatal pulmonary edema possible.
Ingestion Effects	:	No data available.
Symptoms	:	No data available.

Acute toxicity

Acute Oral Toxicity	:	No data is available on the product itself.
Inhalation	:	LC50 (1 h) : 115 ppm Species : Rat.
Acute Dermal Toxicity	:	No data is available on the product itself.
Skin corrosion/irritation	:	Causes skin burns.
Serious eye damage/eye irritation	:	Risk of serious damage to eyes.
Sensitization.	:	No data available.

Chronic toxicity or effects from long term exposures

Carcinogenicity	:	No data available.
Reproductive toxicity	:	No data is available on the product itself.
Germ cell mutagenicity	:	This product or a component was mutagenic in a bacterial assay and in a cultured mammalian cell assay.
Specific target organ systemic toxicity (single exposure)	:	No data available.
Specific target organ systemic toxicity (repeated exposure)	:	No data available.
Aspiration hazard	:	No data available.

Asthma.

12. ECOLOGICAL INFORMATION

Ecotoxicity effects

Aquatic toxicity	:	No data is available on the product itself.
Toxicity to other organisms	:	No data available.

Persistence and degradability

Biodegradability	:	No data is available on the product itself.
Mobility	:	Because of its high volatility, the product is unlikely to cause ground pollution.

Bioaccumulation : Refer to Section 9 "Partition Coefficient (n-octanol/water)".

13. DISPOSAL CONSIDERATIONS

Waste from residues / unused products : In accordance with local and national regulations. Contact supplier if guidance is required. Return unused product in original cylinder to supplier. Must not be discharged to atmosphere.

Contaminated packaging : Return cylinder to supplier.

14. TRANSPORT INFORMATION

DOT

UN/ID No. : UN1660
Proper shipping name : Nitric oxide, compressed
Class or Division : 2.3
Label(s) : 2.3 (5.1, 8)
PIH Zone : A
RQ Substance : Yes

Marine Pollutant : No

* NOTE: This product contains a USDOT Hazardous Substance and will meet the Reportable Quantity definition when shipped to, from, or within the United States, in the amount specified in 49CFR 172.101 Appendix A.

IATA

Transport Forbidden

IMDG

UN/ID No. : UN1660
Proper shipping name : NITRIC OXIDE, COMPRESSED
Class or Division : 2.3
Label(s) : 2.3 (5.1, 8)
RQ Substance : Yes
Marine Pollutant : No
Segregation Group: : None

* NOTE: This product contains a USDOT Hazardous Substance and will meet the Reportable Quantity definition when shipped to, from, or within the United States, in the amount specified in 49CFR 172.101 Appendix A.

TDG

UN/ID No. : UN1660
Proper shipping name : NITRIC OXIDE, COMPRESSED

Class or Division : 2.3
Label(s) : 2.3 (5.1, 8)
RQ Substance : Yes
Marine Pollutant : No

* NOTE: This product contains a USDOT Hazardous Substance and will meet the Reportable Quantity definition when shipped to, from, or within the United States, in the amount specified in 49CFR 172.101 Appendix A.

Further Information
Avoid transport on vehicles where the load space is not separated from the driver's compartment. Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency. The transportation information is not intended to convey all specific regulatory data relating to this material. For complete transportation information, contact customer service.

15. REGULATORY INFORMATION

Country	Regulatory list	Notification
USA	TSCA	Included on Inventory.
EU	EINECS	Included on Inventory.
Canada	DSL	Included on Inventory.
Australia	AICS	Included on Inventory.
Japan	ENCS	Included on Inventory.
South Korea	ECL	Included on Inventory.
China	SEPA	Included on Inventory.
Philippines	PICCS	Included on Inventory.

EPA SARA Title III Section 312 (40 CFR 370) Hazard Classification
Sudden Release of Pressure Hazard.

EPA SARA Title III Section 313 (40 CFR 372) Component(s) above 'de minimus' level
None.

16. OTHER INFORMATION

NFPA Rating

Health : 3
Fire : 0
Instability : 0
Special : OX

HMIS Rating

Health : 3
Flammability : 0
Physical hazard : 3

Prepared by : Air Products and Chemicals, Inc. Global EH&S Department

Telephone : 905-816-6670

Preparation Date : 12/16/2017

For additional information, please visit our Product Stewardship web site at http://www.airproducts.com/productstewardship/