NITROUS OXIDE, REFRIGERATED LIQUID

Safety Data Sheet P-6226

This SDS conforms to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication.

Issue date: 01/01/1979 Revision date: 02/25/2022 Supersedes: 02/05/2021 Version: 1.1

SECTION: 1. Product and company identification

1.1. Product identifier

Product form	:	Substance
Trade name	:	MediPure Nitrous Oxide
Chemical name	:	Nitrous oxide
CAS-No.	:	10024-97-2
Formula	:	N2O
Other means of identification	:	Nitrous oxide, refrigerated liquid

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture	:	Industrial use; Use as directed.

1.3. Details of the supplier of the safety data sheet

Linde Inc.
10 Riverview Drive
Danbury, CT 06810-6268, USA
www.lindeus.com

Linde Inc. 1-844-44LINDE (1-844-445-4633)

1.4. Emergency telephone number

Emergency number : Onsite Emergency: 1-800-645-4633

CHEMTREC, 24 hr/day 7 days/week
— Within USA: 1-800-424-9300, Outside USA: 001-703-527-3887
(collect calls accepted, Contract 17729)

SECTION 2: Hazard identification

2.1. Classification of the substance or mixture

GHS-US classification

Simple asphyxiant	SIAS
Ox. Gas 1	H270
Press. Gas (Ref. Liq.)	H281
STOT SE 3	H336

2.2. Label elements

GHS US labelling

Hazard pictograms (GHS US) :

GHS03 GHS04 GHS07

Signal word (GHS US) : Danger

Hazard statements (GHS US) :
H270 - MAY CAUSE OR INTENSIFY FIRE; OXIDIZER
H281 - CONTAINS REFRIGERATED GAS; MAY CAUSE CRYOGENIC BURNS OR INJURY
H336 - MAY CAUSE DROWSINESS OR DIZZINESS
OSHA-H01 - MAY DISPLACE OXYGEN AND CAUSE RAPID SUFFOCATION.
CGA-HG13 - COMBUSTIBLES IN CONTACT WITH OXIDIZING REFRIGERATED LIQUIDS MAY EXPLODE ON IGNITION OR IMPACT.

Precautionary statements (GHS US) :
P202 - Do not handle until all safety precautions have been read and understood.
P220 - Keep/Store away from clothing, combustible materials.
P244 - Keep reduction valves/valves and fittings free from oil and grease.
P261 - Avoid breathing gas
P271+P403 - Use and store only outdoors or in a well-ventilated place.
P282 - Wear cold insulating gloves/face shield/eye protection.
P304+P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing.

P312 - Call a poison center/doctor if you feel unwell
P302, P336, P315 - IF ON SKIN: Thaw frosted parts with lukewarm water. Do not rub affected area. Get immediate medical advice/attention.
P370+P376 - IN CASE OF FIRE: Stop leak if safe to do so
P405 - Store locked up.
P501 - Dispose of contents/container in accordance with container Supplier/owner instructions
CGA-PG05 - Use a back flow preventive device in the piping.
CGA-PG20+CGA-PG10 - Use only with equipment of compatible materials of construction and rated for cylinder pressure.
CGA-PG22 - Use only with equipment cleaned for oxygen service.
CGA-PG24 - DO NOT change or force fit connections.
CGA-PG12 - Do not open valve until connected to equipment prepared for use.
CGA-PG21 - Open valve slowly.
CGA-PG06 - Close valve after each use and when empty.
CGA-PG23 - Always keep container in upright position.
CGA-PG28 - Avoid spills. Do not walk on or roll equipment over spills.

2.3. Other hazards

Other hazards which do not result in classification : Asphyxiant in high concentrations.

Contact with liquid may cause cold burns/frostbite.

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/information on ingredients

3.1. Substances

Name	Product identifier	%
NITROUS OXIDE, REFRIGERATED LIQUID (Main constituent)	(CAS-No.) 10024-97-2	100

3.2. Mixtures

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures after inhalation : Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Perform cardiopulmonary resuscitation if breathing stopped.

First-aid measures after skin contact : The liquid may cause frostbite. For exposure to liquid, immediately warm frostbite area with warm water not to exceed 105°F (41°C). Water temperature should be tolerable to normal skin. Maintain skin warming for at least 15 minutes or until normal coloring and sensation have returned to the affected area. In case of massive exposure, remove clothing while showering with warm water. Seek medical evaluation and treatment as soon as possible.

First-aid measures after eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. Contact an ophthalmologist immediately. Consult an eye specialist immediately.

First-aid measures after ingestion : Ingestion is not considered a potential route of exposure.

4.2. Most important symptoms and effects, both acute and delayed

No additional information available

4.3. Indication of any immediate medical attention and special treatment needed

None.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Use extinguishing media appropriate for surrounding fire.

5.2. Special hazards arising from the substance or mixture

Fire hazard : Oxidizing agent; vigorously accelerates combustion. Contact with flammable materials may cause fire or explosion.

Explosion hazard	:	If venting or leaking gas catches fire, do not extinguish flames. Vapors may spread from leak, creating an explosive reignition hazard. Vapors can be ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharge, or other ignition sources at locations distant from product handling point. Contact with combustible materials such as oil, grease, and other hydrocarbon products, especially in the presence of ignition sources such as pilot lights, other flames, smoking, sparks, heaters, electrical equipment, and static discharges may cause fire or explosion. Explosive atmospheres may linger. Before entering an area, especially a confined area, check the atmosphere with an appropriate device.
Reactivity	:	No reactivity hazard other than the effects described in sub-sections below.

5.3. Advice for firefighters

Firefighting instructions	:	DANGER! Extremely cold liquid and gas under pressure. Take care not to direct spray onto vents on top of container. Do not discharge sprays directly into liquid; cryogenic liquid can freeze water rapidly. **Danger: High-pressure, oxidizing gas.** Evacuate personnel to a safe area. Appropriate self-contained breathing apparatus may be required. Remove all sources of ignition. Vapor can spread from spill. Contact with flammable materials may cause fire or explosion. When containers have cooled, move them away from fire area if safe to do so. Before entering the area, especially a confined area, check the atmosphere with an appropriate device. On-site fire brigades must comply with their provincial and local fire code regulations.
Special protective equipment for fire fighters	:	Wear gas tight chemically protective clothing in combination with self contained breathing apparatus. Standard protective clothing and equipment (Self Contained Breathing Apparatus) for fire fighters.
Specific methods	:	Use fire control measures appropriate for the surrounding fire. Exposure to fire and heat radiation may cause gas containers to rupture. Cool endangered containers with water spray jet from a protected position. Prevent water used in emergency cases from entering sewers and drainage systems. Stop flow of product if safe to do so. Use water spray or fog to knock down fire fumes if possible.
Other information	:	Containers are equipped with a pressure relief device. (Exceptions may exist where authorized by TC.) Oxidizing agent; vigorously accelerates combustion. Contact with flammable materials may cause fire or explosion. Smoking, flames, and electric sparks are potential explosion hazards.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures	:	**Danger: High-pressure, oxidizing gas.** Evacuate personnel to a safe area. Appropriate self-contained breathing apparatus may be required. Approach suspected leak area with caution. Remove all sources of ignition. Vapor can spread from spill. Contact with flammable materials may cause fire or explosion. Ventilate area or move container to a well-ventilated area. Before entering the area, especially a confined area, check the atmosphere with an appropriate device.

6.1.1. For non-emergency personnel

No additional information available

6.1.2. For emergency responders

No additional information available

6.2. Environmental precautions

Prevent waste from contaminating the surrounding environment. Prevent soil and water pollution. Dispose of contents/container in accordance with container supplier/owner instructions.

6.3. Methods and material for containment and cleaning up

No additional information available

6.4. Reference to other sections

See also sections 8 and 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : Wear leather safety gloves and safety shoes when handling cylinders. Protect containers from physical damage; do not drag, roll, slide or drop. While moving cylinder, always keep in place removable valve cover. Never attempt to lift a cylinder by its cap; the cap is intended solely to protect the valve. When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders. 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. Slowly open the valve. If the valve is hard to open, discontinue use and contact your supplier. Close the container valve after each use; keep closed even when empty. Never apply flame or localized heat directly to any part of the container. High temperatures may damage the container and could cause the pressure relief device to fail prematurely, venting the container contents. For other precautions in using this product, see section 16.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions : Store only where temperature will not exceed 125°F (52°C). Post “No Smoking/No Open Flames” signs in storage and use areas. There must be no sources of ignition. Separate packages and protect against potential fire and/or explosion damage following appropriate codes and requirements (e.g, NFPA 30, NFPA 55, NFPA 70, and/or NFPA 221 in the U.S.) or according to requirements determined by the Authority Having Jurisdiction (AHJ). Always secure containers upright to keep them from falling or being knocked over. Install valve protection cap, if provided, firmly in place by hand when the container is not in use. Store full and empty containers separately. Use a first-in, first-out inventory system to prevent storing full containers for long periods. For other precautions in using this product, see section 16.

OTHER PRECAUTIONS FOR HANDLING, STORAGE, AND USE: When handling product under pressure, use piping and equipment adequately designed to withstand the pressures to be encountered. Never work on a pressurized system. Use a back flow preventive device in the piping. Gases can cause rapid suffocation because of oxygen deficiency; store and use with adequate ventilation. If a leak occurs, close the container valve and blow down the system in a safe and environmentally correct manner in compliance with all international, federal/national, state/provincial, and local laws; then repair the leak. Never place a container where it may become part of an electrical circuit.

Conditions to avoid : Do not store in a confined space. Cryogenic containers are each equipped with a pressure relief device and a pressure-controlling device. Under normal conditions, these containers will periodically vent product. Use adequate pressure relief devices in systems and piping to prevent pressure buildup; entrapped liquid can generate extremely high pressures when vaporized by warming.

7.3. Specific end use(s)

None.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

NITROUS OXIDE, REFRIGERATED LIQUID (10024-97-2)		
ACGIH	ACGIH OEL TWA [ppm]	50 ppm
USA OSHA	Not established	

8.2. Exposure controls

Appropriate engineering controls : USE ONLY IN A CLOSED SYSTEM. An explosion-proof, corrosion-resistant, forced-draft fume hood is preferred.

Hand protection : Wear working gloves when handling gas containers.

Eye protection : Wear safety glasses with side shields. Wear goggles when transfilling or breaking transfer connections. Wear goggles and a face shield when transfilling or breaking transfer connections.

Respiratory protection : When workplace conditions warrant respirator use, follow a respiratory protection program that meets or exceeds the requirements of the appropriate Health and Safety Regulations. Use an air-supplied or air-purifying cartridge if the action level is exceeded. Ensure that the respirator has the appropriate protection factor for the exposure level. If cartridge type respirators are used, the cartridge must be appropriate for the chemical exposure. For emergencies or instances with unknown exposure levels, use a self-contained breathing apparatus (SCBA).

Thermal hazard protection : Wear cold insulating gloves when transfilling or breaking transfer connections.

Environmental exposure controls	:	Refer to local regulations for restriction of emissions to the atmosphere. See section 13 for specific methods for waste gas treatment.
Other information	:	Consider the use of flame resistant safety clothing. Wear safety shoes while handling containers.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	:	Gas
Appearance	:	Colorless, non-flammable gas.
Molecular mass	:	44 g/mol
Colour	:	Colourless.
Odour	:	Sweetish.
Odour threshold	:	Odour threshold is subjective and inadequate to warn of overexposure.
pH	:	Not applicable.
Relative evaporation rate (butylacetate=1)	:	No data available
Relative evaporation rate (ether=1)	:	Not applicable.
Melting point	:	-90.81 °C
Freezing point	:	No data available
Boiling point	:	-88.5 °C
Flash point	:	Not applicable.
Critical temperature	:	36.4 °C
Auto-ignition temperature	:	Not applicable.
Decomposition temperature	:	650 °C
Flammability (solid, gas)	:	No data available
Vapour pressure	:	5080 kPa
Critical pressure	:	7255 kPa
Relative vapour density at 20 °C	:	No data available
Relative density	:	1.2
Density	:	0.785 g/cm³ (at 20 °C)
Relative gas density	:	1.5
Solubility	:	Water: 2.2 mg/l
Partition coefficient n-octanol/water (Log Pow)	:	Not applicable.
Partition coefficient n-octanol/water (Log Kow)	:	Not applicable.
Viscosity, kinematic	:	Not applicable.
Viscosity, dynamic	:	Not applicable.
Explosive properties	:	Not applicable.
Oxidizing properties	:	Oxidizer.
Explosive limits	:	Non flammable.

9.2. Other information

Gas group	:	Press. Gas (Liq.)
Additional information	:	Gas/vapour heavier than air. May accumulate in confined spaces, particularly at or below ground level.

SECTION 10: Stability and reactivity

10.1. Reactivity

No reactivity hazard other than the effects described in sub-sections below.

10.2. Chemical stability

Stable under normal conditions. In the presence of catalysts (e.g. halogen products, mercury, nickel, platinum) the rate of decomposition increases and decomposition can occur at even lower temperatures. At temperatures over 575°C and at atmospheric pressure, nitrous oxide decomposes into nitrogen and oxygen. Pressurized nitrous oxide can also decompose at temperatures equal or

greater than 300°C. Nitrous oxide dissociation is irreversible and exothermic, leading to a considerable rise in pressure.

10.3. Possibility of hazardous reactions

Violently oxidizes organic material.

10.4. Conditions to avoid

Heat.

10.5. Incompatible materials

Flammable materials, Hydrocarbons, Avoid oil, grease and all other combustible materials, Asphalt, Ethers, Alcohols, Acids, and Aldehydes. Alkali metals, Boron (B), tungsten carbide, and powdered aluminium.

10.6. Hazardous decomposition products

Nitrous oxide decomposes explosively at 1202°F (650°C) into two parts Nitrogen and one part oxygen. In the presence of catalytic surfaces such as Silver, Platinum (Pt), Cobalt (Co), and Copper or nickel oxide, this reaction occurs at lower temperatures.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity (oral) : Not classified
Acute toxicity (dermal) : Not classified
Acute toxicity (inhalation) : Not classified

NITROUS OXIDE, REFRIGERATED LIQUID (\f)10024-97-2	
LC50 Inhalation - Rat [ppm]	> 250 ppm/4h

Skin corrosion/irritation : Not classified
pH: Not applicable.
Serious eye damage/irritation : Not classified
pH: Not applicable.
Respiratory or skin sensitisation : Not classified
Germ cell mutagenicity : Not classified
Carcinogenicity : Not classified
Reproductive toxicity : Not classified
STOT-single exposure : MAY CAUSE DROWSINESS OR DIZZINESS.
STOT-repeated exposure : Not classified
Aspiration hazard : Not classified

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : No data available. No ecological damage caused by this product.

12.2. Persistence and degradability

NITROUS OXIDE, REFRIGERATED LIQUID (10024-97-2)	
Persistence and degradability	Not applicable for inorganic products.

12.3. Bioaccumulative potential

NITROUS OXIDE, REFRIGERATED LIQUID (10024-97-2)	
Partition coefficient n-octanol/water (Log Pow)	Not applicable.
Partition coefficient n-octanol/water (Log Kow)	Not applicable.

NITROUS OXIDE, REFRIGERATED LIQUID (10024-97-2)	
Bioaccumulative potential	No data available.

12.4. Mobility in soil

NITROUS OXIDE, REFRIGERATED LIQUID (10024-97-2)	
Mobility in soil	No data available.
Ecology - soil	Because of its high volatility, the product is unlikely to cause ground or water pollution.

12.5. Other adverse effects

Effect on the ozone layer : None.

Global warming potential [CO2=1] : 298

Effect on global warming : When discharged in large quantities may contribute to the greenhouse effect.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste treatment methods : Do not discharge into any place where its accumulation could be dangerous. Contact supplier if guidance is required.

Product/Packaging disposal recommendations : Do not attempt to dispose of residual or unused quantities. Return container to supplier.

SECTION 14: Transport information

In accordance with DOT

Transport document description (DOT) : UN2201 Nitrous oxide, refrigerated liquid, 2.2

UN-No.(DOT) : UN2201

Proper Shipping Name (DOT) : Nitrous oxide, refrigerated liquid

Class (DOT) : 2.2 - Class 2.2 - Non-flammable compressed gas 49 CFR 173.115

Hazard labels (DOT) : 2.2 - Non-flammable gas
5.1 - Oxidizer

DOT Special Provisions (49 CFR 172.102) : B6 - Packagings shall be made of steel.
T75 - When portable tank instruction T75 is referenced in Column (7) of the 172.101 Table, the applicable refrigerated liquefied gases are authorized to be transported in portable tanks in accordance with the requirements of 178.277 of this subchapter.
TP5 - For a portable tank used for the transport of flammable refrigerated liquefied gases or refrigerated liquefied oxygen, the maximum rate at which the portable tank may be filled must not exceed the liquid flow capacity of the primary pressure relief system rated at a pressure not exceeding 120 percent of the portable tank's design pressure. For portable tanks used for the transport of refrigerated liquefied helium and refrigerated liquefied atmospheric gas (except oxygen), the maximum rate at which the tank is filled must not exceed the liquid flow capacity of the pressure relief device rated at 130 percent of the portable tank's design pressure. Except for a portable tank containing refrigerated liquefied helium, a portable tank shall have an outage of at least two percent below the inlet of the pressure relief device or pressure control valve, under conditions of incipient opening, with the portable tank in a level attitude. No outage is required for helium.
TP22 - Lubricants for portable tank fittings (for example, gaskets, shut-off valves, flanges) must be oxygen compatible.

Additional information

Emergency Response Guide (ERG) Number : 122 (UN1070)

Other information : No supplementary information available.

Special transport precautions	:	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. Before transporting product containers: - Ensure there is adequate ventilation. - Ensure that containers are firmly secured. - Ensure valve is closed and not leaking. - Ensure valve outlet cap nut or plug (where provided) is correctly fitted. - Ensure valve protection device (where provided) is correctly fitted.

Transport by sea

UN-No. (IMDG)	:	2201
Class (IMDG)	:	2 - Gases
MFAG-No	:	122

Air transport

UN-No. (IATA)	:	2201
Class (IATA)	:	2 - Gases
Civil Aeronautics Law	:	Gases under pressure/Gases nonflammable nontoxic under pressure(Hazardous materials notice Appended Table 1 Article 194 of the Enforcement Regulations)

SECTION 15: Regulatory information

15.1. US Federal regulations

NITROUS OXIDE, REFRIGERATED LIQUID (10024-97-2)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory.

15.2. International regulations

CANADA

NITROUS OXIDE, REFRIGERATED LIQUID (10024-97-2)
Listed on the Canadian DSL (Domestic Substances List)

EU-Regulations

NITROUS OXIDE, REFRIGERATED LIQUID (10024-97-2)
Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)

15.2.2. National regulations

NITROUS OXIDE, REFRIGERATED LIQUID (10024-97-2)
Listed introduction on Australian Industrial Chemicals Introduction Scheme (AICIS Inventory) Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China) Listed on the Japanese ENCS (Existing New Chemical Substances) inventory Listed on the Japanese ISHL (Industrial Safety and Health Law) Listed on KECL/KECI (Korean Existing Chemicals Inventory) Listed on NZIoC (New Zealand Inventory of Chemicals) Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances) Listed on the Canadian IDL (Ingredient Disclosure List) Listed on INSQ (Mexican National Inventory of Chemical Substances) Listed on the TCSI (Taiwan Chemical Substance Inventory)

15.3. US State regulations

NITROUS OXIDE, REFRIGERATED LIQUID(10024-97-2)	
U.S. - California - Proposition 65 - Carcinogens List	No

NITROUS OXIDE, REFRIGERATED LIQUID(10024-97-2)	
U.S. - California - Proposition 65 - Developmental Toxicity	Yes
U.S. - California - Proposition 65 - Reproductive Toxicity - Female	Yes
U.S. - California - Proposition 65 - Reproductive Toxicity - Male	No
State or local regulations	U.S. - Massachusetts - Right To Know List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List

This product can expose you to NITROUS OXIDE, REFRIGERATED LIQUID, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

SECTION 16: Other information

Other information : When you mix two or more chemicals, you can 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 evaluate the end product. Before using any plastics, confirm their compatibility with this product.

Linde asks users of this product to study this SDS and become aware of the product hazards and safety information. To promote safe use of this product, a user should (1) notify employees, agents, and contractors of the information in this SDS and of any other known product hazards and safety information, (2) furnish this information to each purchaser of the product, and (3) ask each purchaser to notify its employees and customers of the product hazards and safety information.

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

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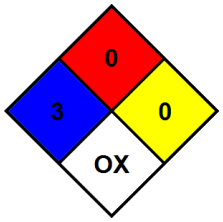
Revision date : 02/25/2022

NFPA health hazard : 3 - Materials that, under emergency conditions, can cause serious or permanent injury.

NFPA fire hazard : 0 - Materials that will not burn under typical fire conditions, including intrinsically noncombustible materials such as concrete, stone, and sand.

NFPA instability : 0 - Material that in themselves are normally stable, even under fire conditions.

NFPA specific hazard : OX - Materials that posses oxidizing properties.



SDS US (GHS HazCom 2012) - Linde 2022

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.