**SECTION 1: Identification of the substance/mixture and of the company/undertaking**

*1.1. Product identifier*

- **Product form**: Substance
- **Substance name**: Nitrous Oxide (Refrigerated Liquid)
- **Chemical name**: Nitrous Oxide
- **CAS No**: 10024-97-2
- **Product code**: SG-1001-01274
- **Formula**: N₂O

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

- **Use of the substance/mixture**: Medical or Laboratory Purposes, Test gas/Calibration gas.

*1.3. Details of the supplier of the safety data sheet*

Air Liquide
2700 Post Oak Boulevard
Houston, TX 77056 - USA
T 1-800-819-1704
www.us.airliquide.com

*1.4. Emergency telephone number*

- **Emergency number**: CHEMTREC: 1-800-424-9300

**SECTION 2: Hazards identification**

*2.1. Classification of the substance or mixture*

**GHS-US classification**

- Ox. Gas 1: H270
- Refrigerated liquefied gas: H281
- STOT SE 3: H336

Full text of H-phrases: see section 16

*2.2. Label elements*

**GHS-US labeling**

- **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-HG01 - May cause frostbite

- **Precautionary statements (GHS-US)**: P202 - Do not handle until all safety precautions have been read and understood
  - P220 - Keep/Store away from combustible materials, clothing
  - P244 - Keep reduction valves/valves and fittings free from oil and grease
  - P261 - Avoid breathing gas
  - P271 - Use only outdoors or in a well-ventilated area
  - P280 - Wear eye protection, face protection, protective clothing, protective gloves
  - P302 - IF ON SKIN: Get immediate medical advice/attention, Thaw frosted parts with lukewarm water. Do not rub affected area
  - P304+P340 - If inhaled: Remove person to fresh air and keep comfortable for breathing
  - P338 - Thaw with heat, if necessary
  - P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
  - P308+P313 - If exposed or concerned: Get medical advice/attention
  - P403 - Store in a well-ventilated place
  - P501 - Dispose of contents/container in accordance with local/regional/national/international regulations
Nitrous Oxide (Refrigerated Liquid)
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CGA-PG02 - Protect from sunlight when ambient temperature exceeds 52°C (125°F)
CGA-PG05 - Use a back flow preventive device in the piping
CGA-PG06 - Close valve after each use and when empty
CGA-PG10 - Use only with equipment rated for cylinder pressure
CGA-PG14 - Approach suspected leak area with caution
CGA-PG20 - Use only with equipment of compatible materials of construction
CGA-PG21 - Open valve slowly
CGA-PG22 - Use only with equipment cleaned for oxygen service

2.3. Other hazards
No additional information available

2.4. Unknown acute toxicity (GHS US)
Not applicable

SECTION 3: Composition/information on ingredients

3.1. Substance
Substance type: Mono-constituent
Name: Nitrous Oxide (Refrigerated Liquid)
CAS No: 10024-97-2

<table>
<thead>
<tr>
<th>Name</th>
<th>Product identifier</th>
<th>%</th>
<th>GHS-US classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrous oxide</td>
<td>(CAS No) 10024-97-2</td>
<td>&gt; 99</td>
<td>Ox, Gas 1, H270</td>
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<tr>
<td></td>
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<td></td>
<td>Liquefied gas, H280</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>STOT SE 3, H336</td>
</tr>
</tbody>
</table>

Full text of H-phrases: see section 16

3.2. Mixture
Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures
First-aid measures after inhalation: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, give artificial respiration. Apply artificial respiration with bag or mask if breathing stopped. Get medical advice/attention.
First-aid measures after skin contact: Thaw frosted parts with lukewarm water. Do not rub affected area. Do not remove clothing if it sticks to the skin. Get immediate medical advice/attention.
First-aid measures after eye contact: If eye tissue is frozen, seek medical attention immediately. If tissue is not frozen. Immediately flush eyes thoroughly with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get immediate medical advice/attention.
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
Symptoms/injuries after inhalation: May displace oxygen and cause rapid suffocation. May cause drowsiness or dizziness.
Symptoms/injuries after skin contact: May cause frostbite.
Symptoms/injuries after eye contact: Contact with the product may cause cold burns or frostbite.
Symptoms/injuries after ingestion: Ingestion is not considered a potential route of exposure.
Symptoms/injuries upon intravenous administration: Not known.
Chronic symptoms: Adverse effects not expected from this product.

4.3. Indication of any immediate medical attention and special treatment needed
If you feel unwell, seek medical advice. If breathing is difficult, give oxygen.

SECTION 5: Firefighting measures

5.1. Extinguishing media
Suitable extinguishing media: Use extinguishing media appropriate for surrounding fire.
Unsuitable extinguishing media: Do not use water jet to extinguish.

5.2. Special hazards arising from the substance or mixture
Fire hazard: The product is not flammable.
Explosion hazard: Product is not explosive. Heat may build pressure, rupturing closed containers, spreading fire and increasing risk of burns and injuries.
Reactivity: None known.
5.3. Advice for firefighters

Firefighting instructions: In case of fire: Evacuate area. Fight fire remotely due to the risk of explosion. Use water spray or fog for cooling exposed containers. Exercise caution when fighting any chemical fire.

Protection during firefighting: Standard protective clothing and equipment (e.g., Self Contained Breathing Apparatus) for fire fighters. Do not enter fire area without proper protective equipment, including respiratory protection.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures: Ensure adequate ventilation.

6.1.1. For non-emergency personnel

Protective equipment: Wear protective equipment consistent with the site emergency plan.


6.1.2. For emergency responders

Protective equipment: Standard protective clothing and equipment (e.g., Self Contained Breathing Apparatus) for fire fighters. Equip cleanup crew with proper protection.

Emergency procedures: Evacuate and limit access. Ventilate area.

6.2. Environmental precautions

Try to stop release if safe to do so.

6.3. Methods and material for containment and cleaning up

For containment: Try to stop release if safe to do so.

Methods for cleaning up: Dispose of this material and its container in accordance with local regulations.

6.4. Reference to other sections

See also Sections 8 and 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Additional hazards when processed: Use equipment rated for cylinder pressure. Close valve after each use and when empty. Do not pierce or burn, even after use.

Precautions for safe handling: Do not handle until all safety precautions have been read and understood. Use only outdoors or in a well-ventilated area.

Hygiene measures: Do not eat, drink or smoke when using this product.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures: Comply with applicable regulations.

Storage conditions: Do not expose to temperatures exceeding 52°C (125°F). Keep container closed when not in use. Protect cylinder from physical damage. Store in well ventilated area. Store locked up.

Incompatible products: None known.


7.3. Specific end use(s)

See Section 1.2.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

<table>
<thead>
<tr>
<th>Nitrous Oxide (Refrigerated Liquid) (10024-97-2)</th>
<th>ACGIH</th>
<th>Not applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>OSHA</td>
<td>Not applicable</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nitrous oxide (10024-97-2)</th>
<th>ACGIH</th>
<th>ACGIH TWA (ppm)</th>
<th>50 ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>OSHA</td>
<td>Not applicable</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
8.2. Exposure controls

**Appropriate engineering controls**: Ensure exposure is below occupational exposure limits. Provide adequate general and local exhaust ventilation. Systems under pressure should be regularly checked for leakages. Oxygen detectors should be used when asphyxiating gases may be released. Consider work permit system e.g. for maintenance activities.


**Eye protection**: Wear safety glasses with side shields. 29 CFR 1910.133: Eye and Face Protection. Wear goggles and faceshield when transfilling or breaking transfer connections.

**Skin and body protection**: Wear suitable protective clothing, e.g. - lab coats, coveralls or flame resistant clothing.

**Respiratory protection**: None necessary during normal and routine operations. See Sections 5 & 6.

**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**: Wear safety shoes while handling containers. 29 CFR 1910.136: Foot Protection.

### SECTION 9: Physical and chemical properties

#### 9.1. Information on basic physical and chemical properties

**Physical state**: Gas

**Appearance**: Clear, colorless gas.

**Color**: Colorless

**Odor**: Slightly sweet

**Odor threshold**: No data available

**pH**: No data available

**Melting point**: -90.81 °C

**Freezing point**: -90.81 °C

**Boiling point**: -87.45 °C

**Critical temperature**: 37.45 °C

**Critical pressure**: 7255 kPa

**Flash point**: Not applicable - not flammable

**Relative evaporation rate (butyl acetate=1)**: No data available

**Flammability (solid, gas)**: See Section 2.1 and 2.2

**Explosion limits**: Not applicable - not flammable

**Explosive properties**: Not applicable - not flammable.

**Oxidizing properties**: Not combustible but enhances combustion of other substances. May cause or intensify fire; oxidizer.

**Vapor pressure**: 51.3 bar 23°C - NOAA/NIOSH

**Relative density**: 1.2

**Relative vapor density at 20 °C**: Heavier than air 1.53

**Specific gravity / density**: 1.977 g/l

**Molecular mass**: 44.02

**Relative gas density**: Heavier than air

**Solubility**: No data available

**Log Pow**: No data available

**Log Kow**: No data available

**Auto-ignition temperature**: No data available

**Decomposition temperature**: No data available

**Viscosity**: No data available

**Viscosity, kinematic**: No data available

**Viscosity, dynamic**: No data available

#### 9.2. Other information

**Additional information**: Gas/vapour heavier than air. May accumulate in confined spaces, particularly at or below ground level.
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SECTION 10: Stability and reactivity

10.1. Reactivity
None known.

10.2. Chemical stability
Stable under normal conditions.

10.3. Possibility of hazardous reactions
May react violently with reducing agents. Can form explosive mixtures with flammable materials.

10.4. Conditions to avoid
None under recommended storage and handling conditions (see section 7).

10.5. Incompatible materials

10.6. Hazardous decomposition products
Under normal conditions of storage and use hazardous decomposition products should not be produced.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Likely routes of exposure: Inhalation; Skin and eye contact
Acute toxicity: Not classified

<table>
<thead>
<tr>
<th>Nitrous Oxide (Refrigerated Liquid) (10024-97-2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LC50 inhalation rat (ppm)</td>
</tr>
<tr>
<td>ATE US (gases)</td>
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</table>

<table>
<thead>
<tr>
<th>Nitrous oxide (10024-97-2)</th>
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</thead>
<tbody>
<tr>
<td>LC50 inhalation rat (ppm)</td>
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</tbody>
</table>

Skin corrosion/irritation: Not classified
Serious eye damage/irritation: Not classified
Respiratory or skin sensitization: Not classified
Germ cell mutagenicity: Not classified
Carcinogenicity: Not classified
Reproductive toxicity: Not classified
Specific target organ toxicity (single exposure): May cause drowsiness or dizziness.
Specific target organ toxicity (repeated exposure): Not classified
Aspiration hazard: Not classified
Symptoms/injuries after inhalation: May displace oxygen and cause rapid suffocation. May cause drowsiness or dizziness.
Symptoms/injuries after skin contact: May cause frostbite.
Symptoms/injuries after eye contact: Contact with the product may cause cold burns or frostbite.
Symptoms/injuries after ingestion: Ingestion is not considered a potential route of exposure.
Symptoms/injuries upon intravenous administration: Not known.
Chronic symptoms: Adverse effects not expected from this product.

SECTION 12: Ecological information

12.1. Toxicity
No additional information available

12.2. Persistence and degradability

<table>
<thead>
<tr>
<th>Nitrous oxide (10024-97-2)</th>
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</thead>
<tbody>
<tr>
<td>Persistence and degradability</td>
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</tbody>
</table>

12.3. Bioaccumulative potential
Nitrous Oxide (Refrigerated Liquid)
Safety Data Sheet
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<table>
<thead>
<tr>
<th>Nitrous oxide (10024-97-2)</th>
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<tbody>
<tr>
<td>Log Pow</td>
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<tr>
<td>Bioaccumulative potential</td>
</tr>
</tbody>
</table>

12.4. Mobility in soil

<table>
<thead>
<tr>
<th>Nitrous oxide (10024-97-2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecology - soil</td>
</tr>
</tbody>
</table>

12.5. Other adverse effects

- Effect on ozone layer: No known effects from this product.
- Effect on the global warming: Contains greenhouse gas(es) not covered by 842/2006/EC.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

- Waste treatment methods: Contact supplier if guidance is required. Do not discharge into any place where its accumulation could be dangerous. Ensure that the emission levels from local regulations or operating permits are not exceeded.
- Waste disposal recommendations: Refer to the CGA Pamphlet P-63 "Disposal of Gases" available at www.cganet.com for more guidance on suitable disposal methods.

SECTION 14: Transport information

Department of Transportation (DOT)
In accordance with DOT
Transport document description: UN2201 Nitrous oxide, refrigerated liquid (Nitrous oxide, refrigerated liquid), 2.2
UN-No.(DOT): UN2201
Proper Shipping Name (DOT): Nitrous oxide, refrigerated liquid
Transport hazard class(es) (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 Packaging Non Bulk (49 CFR 173.xxx): 304
DOT Packaging Bulk (49 CFR 173.xxx): 314;315
DOT Special Provisions (49 CFR 172.102): B6 - Packaging 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.

DOT Packaging Exceptions (49 CFR 173.xxx): None
DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27): Forbidden
DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75): Forbidden
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DOT Vessel Stowage Location: D - The material must be stowed “on deck only” on a cargo vessel and on a passenger vessel carrying a number of passengers limited to not more than the larger of 25 passengers or one passenger per each 3 m of overall vessel length, but the material is prohibited on passenger vessels in which the limiting number of passengers is exceeded.

DOT Vessel Stowage Other: 40 - Stow “clear of living quarters”

Additional information
Other information: No supplementary information available.

ADR
Transport document description: UN 2201 NITROUS OXIDE, REFRIGERATED LIQUID, 2.2 (5.1), (C/E)
Class (ADR): 2 - Gases
Hazard identification number (Kemler No.): 225
Classification code (ADR): 3O
Hazard labels (ADR): 2.2 - Non-flammable compressed gas
5.1 - Oxidizer

Orange plates: 225 2201

Tunnel restriction code (ADR): C/E
Limited quantities (ADR): 0
Excepted quantities (ADR): E0

Transport by sea
UN-No. (IMDG): UN2201
Proper Shipping Name (IMDG): Nitrous oxide, refrigerated liquid
Class (IMDG): 2 - Gases

Air transport
UN-No. (IATA): UN2201
Proper Shipping Name (IATA): Nitrous oxide, refrigerated liquid
Class (IATA): 2

SECTION 15: Regulatory information

15.1. US Federal regulations
Nitrous oxide (10024-97-2)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

15.2. International regulations

CANADA
Nitrous oxide (10024-97-2)
Listed on the Canadian DSL (Domestic Substances List)
WHMIS Classification
Class A - Compressed Gas
Class C - Oxidizing Material
Class D Division 2 Subdivision A - Very toxic material causing other toxic effects

EU-Regulations
Nitrous oxide (10024-97-2)
Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)

Classification according to Regulation (EC) No. 1272/2008 [CLP]
Not classified
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Classification according to Directive 67/548/EEC [DSD] or 1999/45/EC [DPD]
Not classified

National regulations

<table>
<thead>
<tr>
<th>Nitrous oxide (10024-97-2)</th>
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<tbody>
<tr>
<td>Listed on the AICS (Australian Inventory of Chemical Substances)</td>
</tr>
<tr>
<td>Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China)</td>
</tr>
<tr>
<td>Listed on the Japanese ENCS (Existing &amp; New Chemical Substances) inventory</td>
</tr>
<tr>
<td>Listed on the Korean ECL (Existing Chemicals List)</td>
</tr>
<tr>
<td>Listed on NZIoC (New Zealand Inventory of Chemicals)</td>
</tr>
<tr>
<td>Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances)</td>
</tr>
<tr>
<td>Listed on the Canadian IDL (Ingredient Disclosure List)</td>
</tr>
</tbody>
</table>

15.3. US State regulations

<table>
<thead>
<tr>
<th>Nitrous oxide (10024-97-2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. - California - Proposition 65 - Carcinogens List</td>
</tr>
<tr>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nitrous oxide (10024-97-2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. - Massachusetts - Right To Know List</td>
</tr>
<tr>
<td>U.S. - New Jersey - Right to Know Hazardous Substance List</td>
</tr>
<tr>
<td>U.S. - Pennsylvania - RTK (Right to Know) List</td>
</tr>
</tbody>
</table>

SECTION 16: Other information

Indication of changes:
Revised safety data sheet in accordance with OSHA final rule on GHS implementation promulgated March 26, 2012.

Other information:
This Safety Data Sheet is offered pursuant to OSHA’s Hazard Communication Standard, 29 CFR, 1910.1200. Other government regulations must be reviewed for applicability to this product.

Full text of H-phrases:

<table>
<thead>
<tr>
<th>Liquefied gas</th>
<th>Gases under pressure Liquefied gas</th>
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<tbody>
<tr>
<td>Ox. Gas 1</td>
<td>Oxidizing gases Category 1</td>
</tr>
<tr>
<td>Refrigerated liquefied gas</td>
<td>Gases under pressure Refrigerated liquefied gas</td>
</tr>
<tr>
<td>STOT SE 3</td>
<td>Specific target organ toxicity (single exposure) Category 3</td>
</tr>
<tr>
<td>H270</td>
<td>May cause or intensify fire; oxidizer</td>
</tr>
<tr>
<td>H280</td>
<td>Contains gas under pressure; may explode if heated</td>
</tr>
<tr>
<td>H281</td>
<td>Contains refrigerated gas; may cause cryogenic burns or injury</td>
</tr>
<tr>
<td>H336</td>
<td>May cause drowsiness or dizziness</td>
</tr>
</tbody>
</table>

SDS US (GHS HazCom 2012)

This Safety Data Sheet is offered pursuant to OSHA’s Hazard Communication Standard, 29 CFR, 1910.1200. Other government regulations must be reviewed for applicability to this product. To the best of Air Liquide America Corporation’s knowledge, the information contained herein is reliable and accurate as of this date; however, accuracy, suitability or completeness are not guaranteed and no warranties of any type, either express or implied, are provided. The information contained herein relates only to this specific product. If this product is combined with other materials, all component properties must be considered. Data may be changed from time to time. Be sure to consult the latest edition.