1. PRODUCT AND COMPANY IDENTIFICATION

Product Name: 750 PPM SULFUR DIOXIDE, 750 PPM NITRIC OXIDE In NITROGEN

UN-Number: UN1956

Recommended Use: Industrial use.

Supplier Address*: Linde Gas North America LLC - Linde Merchant Production Inc. - Linde LLC
575 Mountain Ave.
Murray Hill, NJ 07974
Phone: 908-464-8100
www.lindeus.com

Linde Gas Puerto Rico, Inc.
Las Palmas Village
Road No. 869, Street No. 7
Catano, Puerto Rico 00962
Phone: 787-641-7445
www.pr.lindegas.com

Linde Canada Limited
5860 Chedworth Way
Mississauga, Ontario L5R 0A2
Phone: 905-501-1700
www.lindecanada.com

* May include subsidiaries or affiliate companies/ divisions.

For additional product information contact your local customer service.

Chemical Emergency Phone Number: Chemtrec: 1-800-424-9300 for US/ 703-527-3887 outside US

2. HAZARDS IDENTIFICATION

**WARNING!**

Emergency Overview

Harmful by inhalation
May cause skin, eye, and respiratory tract irritation
Contents under pressure
Keep at temperatures below 52°C / 125°F

Appearance: Reddish-brown in air

Physical State: Compressed gas.

Odor: Acrid

OSHA Regulatory Status: This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Potential Health Effects:
Principle Routes of Exposure

Eye contact. Skin contact. Inhalation.

Acute Toxicity

Inhalation

Harmful by inhalation. May cause irritation. Symptoms may be delayed.

Simple asphyxiant. May cause suffocation by displacing the oxygen in the air. Exposure to oxygen-deficient atmosphere (<19.5%) may cause dizziness, drowsiness, nausea, vomiting, excess salivation, diminished mental alertness, loss of consciousness and death. Exposure to atmospheres containing 8-10% or less oxygen will bring about unconsciousness without warning and so quickly that the individuals cannot help or protect themselves. Lack of sufficient oxygen may cause serious injury or death.

Eyes

May cause irritation. Contact with rapidly expanding gas near the point of release may cause frostbite.

Skin

May cause irritation. Contact with rapidly expanding gas near the point of release may cause frostbite.

Skin Absorption Hazard

No known hazard in contact with skin.

Ingestion

Not an expected route of exposure.

Chronic Effects

Repeated overexposure to nitrogen dioxide may cause respiratory problems, fatigue, alteration to taste and smell, dental erosion and gum disease

Aggravated Medical Conditions

Skin disorders. Pre-existing eye disorders. Respiratory disorders.

Environmental Hazard

See Section 12 for additional Ecological Information.

3. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS-No</th>
<th>Volume %</th>
<th>Chemical Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen</td>
<td>7727-37-9</td>
<td>&lt;99</td>
<td>N₂</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>7446-09-5</td>
<td>0.075</td>
<td>SO₂</td>
</tr>
<tr>
<td>Nitric oxide</td>
<td>10102-43-9</td>
<td>0.075</td>
<td>NO</td>
</tr>
</tbody>
</table>

Additional information:
Composition listed covers broad ranges rather than exact percentages for specific products.

4. FIRST AID MEASURES

Eye Contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

Skin Contact
Wash off with warm water and soap. Get medical attention if irritation develops and persists.

Inhalation
PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF INHALATION OVEREXPOSURE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS. Conscious inhalation victims should be assisted to an uncontaminated area and inhale fresh air. If breathing is difficult, administer oxygen. Unconscious persons should be moved to an uncontaminated area and, as necessary, given artificial resuscitation and supplemental oxygen. Treatment should be symptomatic and supportive.

Ingestion
None under normal use. Get medical attention if symptoms occur.

Notes to Physician
Treat symptomatically.
5. FIRE-FIGHTING MEASURES

Flammable Properties
Not flammable.

Suitable Extinguishing Media
Use extinguishing agent suitable for type of surrounding fire.

Unsuitable Extinguishing Media
Do not use halogenated extinguishing agents or foam.

Hazardous Combustion Products
Nitrogen oxides (NOx). Sulfur oxides.

Explosion Data

Sensitivity to Mechanical Impact
None

Sensitivity to Static Discharge
None

Specific Hazards Arising from the Chemical
Continue to cool fire exposed cylinders until flames are extinguished. Cylinders may rupture under extreme heat. Damaged cylinders should be handled only by specialists.

Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/ NIOSH (approved or equivalent) and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions
Ensure adequate ventilation. Evacuate personnel to safe areas. Use personal protective equipment. Monitor oxygen level.

Environmental Precautions
Prevent spreading of vapors through sewers, ventilation systems and confined areas.

Methods for Containment
Stop the flow of gas or remove cylinder to outdoor location if this can be done without risk. If leak is in container or container valve, contact the appropriate emergency telephone number in Section 1 or call your closest Linde location.

Methods for Cleaning Up
Return cylinder to Linde or an authorized distributor.

Other Information
Ventilate the area.

7. HANDLING AND STORAGE

Handling
Use only in ventilated areas. Never attempt to lift a cylinder by its valve protection cap. Protect cylinders from physical damage; do not drag, roll, slide or drop. When moving cylinders, even for short distance, use a cart designed to transport cylinders. Use equipment rated for cylinder pressure. Use backflow preventive device in piping. Never insert an object (e.g. wrench, screwdriver, pry bar, etc.) into valve cap openings. Doing so may damage valve, causing leak to occur. “NO SMOKING” signs should be posted in storage and use areas.

Use an adjustable strap wrench to remove over-tight or rusted caps. Close valve after each use and when empty. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier.

Never put cylinders into trunks of cars or unventilated areas of passenger vehicles. Never attempt to refill a compressed gas cylinder without the owner’s written consent. Never strike an arc on a compressed gas cylinder or make a cylinder a part of an electrical circuit.

For additional recommendations consult Compressed Gas Association’s (CGA) Safety Bulletin SB-2, Oxygen-Deficient Atmospheres.
8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>ACGIH TLV</th>
<th>OSHA PEL</th>
<th>NIOSH IDLH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitric oxide 10102-43-9</td>
<td>TWA: 25 ppm</td>
<td>TWA: 25 ppm</td>
<td>IDLH: 100 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TWA: 30 mg/ m³</td>
<td>TWA: 25 ppm</td>
</tr>
<tr>
<td>Sulfur dioxide 7446-09-5</td>
<td>STEL: 0.25 ppm</td>
<td>TWA: 5 ppm</td>
<td>IDLH: 100 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TWA: 13 mg/ m³</td>
<td>TWA: 2 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(vacated) TWA: 2 ppm</td>
<td>TWA: 5 mg/ m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(vacated) STEL: 5 ppm</td>
<td>STEL: 5 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(vacated) STEL: 15 mg/ m³</td>
<td>STEL: 13 mg/ m³</td>
</tr>
</tbody>
</table>

Immediately Dangerous to Life or Health. ACGIH TLV: American Conference of Governmental Industrial Hygienists - Threshold Limit Value. OSHA PEL: Occupational Safety and Health Administration - Permissible Exposure Limits.

Other Exposure Guidelines
Vacated limits revoked by the Court of Appeals decision in AFL-CIO v. OSHA, 965 F.2d 962 (11th Cir., 1992).

Engineering Measures
Showers. Eyewash stations. Local exhaust ventilation to prevent accumulation of high concentrations and maintain air-oxygen levels at or above 19.5%.

Ventilation
Use ventilation adequate to keep exposures below recommended exposure limits.

Personal Protective Equipment

Eye/ Face Protection
Wear protective eyewear (safety glasses).

Skin and Body Protection
Work gloves and safety shoes are recommended when handling cylinders.

Respiratory Protection

General Use
If exposure limits are exceeded or irritation is experienced, NIOSH/ MSHA approved respiratory protection should be worn. Positive-pressure supplied air respirators may be required for high airborne contaminant concentrations. Respiratory protection must be provided in accordance with current local regulations.

Emergency Use
Use positive pressure airline respirator with escape cylinder or self contained breathing apparatus for oxygen-deficient atmospheres (<19.5%).

Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.
9. PHYSICAL AND CHEMICAL PROPERTIES

Product Information

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Boiling Point</th>
<th>Melting Point</th>
<th>Molecular Weight</th>
<th>Evaporation Rate</th>
<th>Water Solubility</th>
<th>Vapor Pressure</th>
<th>Vapor Density (Air=1)</th>
<th>Gas Density Kg/m³@20°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitric oxide</td>
<td>-151.8 °C</td>
<td>-164 °C</td>
<td>31.01</td>
<td>-</td>
<td>No information available</td>
<td>26000 mmHg @ 20 °C</td>
<td>1.04</td>
<td>1.248</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>-10 °C</td>
<td>-75.7 °C</td>
<td>64.06</td>
<td>-</td>
<td>No information available</td>
<td>3200 hPa @ 20 °C</td>
<td>2.26</td>
<td>2.697</td>
</tr>
</tbody>
</table>

The following information is for the NON-INERT components of this mixture:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Boiling Point</th>
<th>Melting Point</th>
<th>Molecular Weight</th>
<th>Evaporation Rate</th>
<th>Water Solubility</th>
<th>Vapor Pressure</th>
<th>Vapor Density (Air=1)</th>
<th>Gas Density Kg/m³@20°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen</td>
<td>-196 °C</td>
<td>-210 °C</td>
<td>28.01</td>
<td>-</td>
<td>0.023 (vol/ vol @ 20°C and 1 atm)</td>
<td>Above critical temperature</td>
<td>0.97</td>
<td>1.165</td>
</tr>
</tbody>
</table>

10. STABILITY AND REACTIVITY

Stability

Stable under recommended storage conditions.

Incompatible Products


Conditions to Avoid

Due to the presence of nitric oxide: Heat, flames and sparks. Reacts vigorously with fluorine, fluorine oxides, and chlorine in the presence of moisture. Sulfur dioxide reacts violently with peroxides, chromates, bichromates, permanganates, and oxygen difluoride. It also reacts with chlorates to form chlorine, which may become explosive at elevated temperatures. Forms sulfuric acid in contact with water.

Hazardous Decomposition Products

Nitrogen oxides (NOx). Sulfur oxides.

Hazardous Polymerization

Hazardous polymerization does not occur.

11. TOXICOLOGICAL INFORMATION

Acute Toxicity

Product Information

LD50 Oral: No information available.

LD50 Dermal: No information available.

LC50 Inhalation: Refer to CGA P-20 for classification procedures for toxic gas mixtures.
Inhalation
The irritant actions of sulfur dioxide is believed to be caused by the formation of sulfuric acid when the gas dissolves. Bronchospastiction caused by sulfur dioxide is concentration related. Fifteen humans which inhaled 1, 5, or 25 ppm for 6 hours (nose-breathing) exhibited reduced forced expiratory volume and forced expiratory flow at all concentrations. Significant reduction in nasal mucous flow rate was seen following exposure to 5 or 25 ppm.

Repeated Dose Toxicity
Repeated exposure to sulfur dioxide has caused thickening of the mucosal layer in the trachea and increases the goblet cells and mucous glands in test animals indicating the potential for chronic respiratory disease in humans. Dogs exposed continuously for 225 days to 5 ppm exhibited decreased lung compliance and increased pulmonary flow-resistance.

Component Information

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>LD50 Oral</th>
<th>LD50 Dermal</th>
<th>LC50 Inhalation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfur dioxide</td>
<td>-</td>
<td>-</td>
<td>Per CGA P-20: 2500 ppm/ 1 hr (Rat)</td>
</tr>
<tr>
<td>Nitric oxide</td>
<td>-</td>
<td>-</td>
<td>115 ppm/ 1 hr (Rat) NO₂</td>
</tr>
</tbody>
</table>

Chronic Toxicity
Repeated overexposure to nitrogen dioxide may cause respiratory problems, fatigue, alteration to taste and smell, dental erosion and gum disease.

Carcinogenicity
Sulfur dioxide may act as a promotor. Substantial increase in respiratory tract squamous cell carcinomas was reported in rats following exposure to benzo[a]pyrene and sulfur dioxide at 4 or 10 ppm (1-6 H/day, 5 days/week) compared to carcinomas resulting from exposure to sulfur dioxide or benzo[a]pyrene alone.

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>ACGIH</th>
<th>IARC</th>
<th>NTP</th>
<th>OSHA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfur dioxide</td>
<td></td>
<td>Group 3</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Irritation
Sulfur dioxide can cause irritation at relatively low levels (1-5 ppm); however workers may become acclimated even to initially unbearable concentrations (25 ppm). Pure sulfur dioxide may damage the skin, eyes, and mucous membranes.

Sensitization
No information available.

Reproductive Toxicity
Experimental inhalation exposures of rats and mice at 1.5 to 32 ppm of sulfur dioxide resulted in toxicity to both male and female reproductive systems. Effects included menstrual cycle changes and toxic effects to testes.

Developmental Toxicity
May be a developmental hazard based on animal data.

Synergistic Materials
None known.

Target Organ Effects
Respiratory system. Eyes. Skin.

12. ECOLOGICAL INFORMATION

Ecotoxicity
The environmental impact of this product has not been fully investigated.

Ozone depletion potential; ODP; (R-11 = 1): Does not contain ozone depleting chemical (40 CFR Part 82).
13. DISPOSAL CONSIDERATIONS

Waste Disposal Methods

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 Linde for proper disposal.

14. TRANSPORT INFORMATION

DOT

Proper shipping name  Compressed gas, n.o.s.
Hazard Class  2.2
Subsidiary Class
UN-Number  UN1956
Description  UN1956, Compressed gas, n.o.s. (Nitric Oxide, Nitrogen), 2.2
Emergency Response Guide Number  126

TDG

Proper Shipping Name  Compressed gas, n.o.s.
Hazard Class  2.2
UN-Number  UN1956
Description  UN1956, COMPRESSED GAS, N.O.S., 2.2

MEX

Proper Shipping Name  Compressed gas, n.o.s.
Hazard Class  2.2
UN-Number  UN1956
Description  UN1956 Compressed gas, n.o.s. (Nitric Oxide, Nitrogen), 2.2

IATA

UN-Number  UN1956
Proper Shipping Name  Compressed gas, n.o.s.
Hazard Class  2.2
ERG Code  2L
Description  UN1956, Compressed gas, n.o.s. (Nitric Oxide, Nitrogen), 2.2
Maximum Quantity for Passenger  75 kg
Maximum Quantity for Cargo Only  150 kg
Limited Quantity  Forbidden

IMDG/ IMO

Proper Shipping Name  Compressed gas, n.o.s.
Hazard Class  2.2
UN-Number  UN1956
EmS No.  F-C, S-V
Description  UN1956, Compressed gas, n.o.s. (Nitric Oxide, Nitrogen), 2.2

ADR

Proper Shipping Name  Compressed gas, n.o.s.
Hazard Class  2.2
UN-Number: UN1956
Classification Code: 1A
Description: UN1956 Compressed gas, n.o.s. (Nitric Oxide, Nitrogen), 2.2,

15. REGULATORY INFORMATION

International Inventories

<table>
<thead>
<tr>
<th>TSCA</th>
<th>Complies</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSL</td>
<td>Complies</td>
</tr>
<tr>
<td>EINECS/ELINCS</td>
<td>Complies</td>
</tr>
</tbody>
</table>

Legend

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
EINECS/ELINCS - European Inventory of Existing Commercial Chemical Substances/EU List of Notified Chemical Substances

U.S. Federal Regulations

SARA 313
Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372.

SARA 311/312 Hazard Categories

| Acute Health Hazard | No |
| Chronic Health Hazard | No |
| Fire Hazard | No |
| Sudden Release of Pressure Hazard | Yes |
| Reactive Hazard | No |

Clean Water Act
This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42).

Risk and Process Safety Management Programs
This material, as supplied, does not contain any regulated substances with specified thresholds under 40 CFR Part 68. This product does not contain any substances regulated as Highly Hazardous Chemicals pursuant to the 29 CFR Part 1910.110.

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>U.S. - CAA (Clean Air Act) - Accidental Release Prevention - Toxic Substances</th>
<th>U.S. - CAA (Clean Air Act) - Accidental Release Prevention - Flammable Substances</th>
<th>U.S. - OSHA - Process Safety Management - Highly Hazardous Chemicals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitric oxide</td>
<td>10000 lbs</td>
<td></td>
<td>250 lbs</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>5000 lbs</td>
<td></td>
<td>1000 lb</td>
</tr>
</tbody>
</table>

Clean Air Act, Section 112 Hazardous Air Pollutants (HAPs) (see 40 CFR 61)
This product does not contain any substances regulated as hazardous air pollutants (HAPs) under Section 112 of the Clean Air Act Amendments of 1990.

CERCLA/ SARA
This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material.
### Chemical Name

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Hazardous Substances RQs</th>
<th>Extremely Hazardous Substances RQs</th>
<th>TPQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitric oxide</td>
<td>10 lb</td>
<td>10 lb</td>
<td>100 lb TPQ</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>500 lb</td>
<td>500 lb</td>
<td>500 lb TPQ</td>
</tr>
</tbody>
</table>

#### U.S. State Regulations

**California Proposition 65**
This product does not contain any Proposition 65 chemicals.

#### U.S. State Right-to-Know Regulations

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Massachusetts</th>
<th>New Jersey</th>
<th>Pennsylvania</th>
<th>Illinois</th>
<th>Rhode Island</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>X</td>
</tr>
<tr>
<td>Nitric oxide</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

#### International Regulations

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Carcinogen Status</th>
<th>Exposure Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfur dioxide</td>
<td></td>
<td>Mexico: TWA 2 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mexico: TWA 5 mg/ m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mexico: STEL 5 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mexico: STEL 10 mg/ m³</td>
</tr>
<tr>
<td>Nitric oxide</td>
<td></td>
<td>Mexico: TWA 25 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mexico: TWA 30 mg/ m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mexico: STEL 35 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mexico: STEL 45 mg/ m³</td>
</tr>
</tbody>
</table>

#### Canada

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

**WHMIS Hazard Class**
Non-controlled
A  Compressed gases

#### Chemical Name

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>NPRI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfur dioxide</td>
<td>X</td>
</tr>
</tbody>
</table>

**Legend**
NPRI - National Pollutant Release Inventory

16. OTHER INFORMATION
750 PPM SULFUR DIOXIDE, 750 PPM NITRIC OXIDE in NITROGEN, Material Safety Data Sheet, Revision Date 25-Mar-2014, Page 10 / 10

Prepared By
Product Stewardship
23 British American Blvd.
Latham, NY 12110
1-800-572-6501

Issuing Date
10-Feb-2011

Revision Date
25-Mar-2014

Revision Number
1

Revision Note
Not applicable.

NFPA
Health Hazard 1
Flammability 0
Stability 0

HMIS
Health Hazard 1
Flammability 0
Physical Hazard 3

Physical and Chemical Hazards Simple asphyxiant

Note: Ratings were assigned in accordance with Compressed Gas Association (CGA) guidelines as published in CGA Pamphlet P-19-2009, CGA Recommended Hazard Ratings for Compressed Gases, 3rd Edition.

General Disclaimer
For terms and conditions, including limitation of liability, please refer to the purchase agreement in effect between Linde LLC, Linde Merchant Production, Inc. or Linde Gas North America LLC (or any of their affiliates and subsidiaries) and the purchaser.

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES
Although reasonable care has been taken in the preparation of this document, we extend no warranties and make no representations as to the accuracy or completeness of the information contained herein, and assume no responsibility regarding the suitability of this information for the user's intended purposes or for the consequences of its use. Each individual should make a determination as to the suitability of the information for their particular purpose(s).

End of Safety Data Sheet