1. PRODUCT AND COMPANY IDENTIFICATION

Product Name: <2.0% SULFUR DIOXIDE In NITROGEN

Product Code(s): 1616A, G-159

UN-Number: UN1956

Recommended Use: Industrial use. Environmental.

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
Irritating to eyes, respiratory system and skin
Contents under pressure
Keep at temperatures below 52°C / 125°F

Appearance: Colorless
Physical State: Compressed gas.
Odor: Pungent

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. Initial symptoms of exposure to sulfur dioxide may include nose and throat irritation which becomes steadily worse, suffocating and painful. The irritation extends to the chest causing a cough reflex which may be violent and painful and may include the discharge of blood or vomiting with eventual collapse. Other general symptoms may include headache, general discomfort and anxiety. High concentrations may cause chemical pneumonitis and pulmonary edema.

Nitrogen acts as a simple asphyxiant. Accumulation of high concentrations can displace oxygen content necessary to support life.

Eyes
Gas can cause irritation. Contact with rapidly expanding gas near the point of release may cause frostbite.

Skin
Gas can 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. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.

Chronic Effects
No known effect based on information supplied

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>&gt;98</td>
<td>N₂</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>7446-09-5</td>
<td>&lt;2</td>
<td>SO₂</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 immediately with plenty of water, also under the eyelids, for at least 15 minutes. If symptoms persist, call a physician.

Skin Contact
Wash off immediately with soap and plenty of water for at least 15 minutes. If skin irritation persists, call a physician.

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. Any physical exertion during this period should be discouraged as it may increase the severity of the pulmonary edema or chemical pneumonitis. Bed rest is indicated.

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.

Explosion Data

Sensitivity to Mechanical Impact
None

Sensitivity to Static Discharge
None

Specific Hazards Arising from the Chemical
Sulfur dioxide reacts with water to form sulfuric acid. 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. Additional chemical protective clothing may be required to protect from toxic decomposition products.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions
Evacuate personnel to safe areas. Keep people away from and upwind of spill/ leak. Ensure adequate ventilation. Monitor oxygen level. Use personal protective equipment. Avoid contact with skin, eyes and clothing.

Environmental Precautions
Prevent spreading of vapors through sewers, ventilation systems and confined areas. Prevent product from entering drains. Do not allow material to contaminate ground water system.

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
Refer to protective measures listed in Sections 7 and 8.

7. HANDLING AND STORAGE

Handling
Most metals corrode when in contact with wet sulfur dioxide. 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.

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.
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>
</table>
| Sulfur dioxide      | STEL: 0.25 ppm | TWA: 5 ppm  
TWA: 13 mg/ m³  
(vacated) TWA: 2 ppm  
(vacated) TWA: 5 mg/ m³  
(vacated) STEL: 5 ppm  
(vacated) STEL: 15 mg/ m³ | IDLH: 100 ppm  
TWA: 2 ppm  
TWA: 5 mg/ m³  
STEL: 5 ppm  
STEL: 13 mg/ m³ |

Immediately Dangerous to Life or Health.

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. Ventilation systems. Exhaust gas should be vented to a gas treatment system.

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

Personal Protective Equipment

Eye/ Face Protection
Tightly fitting safety goggles.

Skin and Body Protection
Impervious gloves.

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
Do not eat, drink or smoke when using this product. Remove and wash contaminated clothing before re-use. Provide regular cleaning of equipment, work area and clothing. Wear suitable gloves and eye/ face protection.

Storage
Protect from physical damage. Cylinders should be stored upright with valve protection cap in place and firmly secured to prevent falling. Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Keep at temperatures below 52°C / 125°F. Full and empty cylinders should be segregated. Use a “first in-first out” inventory system to prevent full cylinders from being stored for excessive periods of time. Always store and handle compressed gas cylinders in accordance with Compressed Gas Association, pamphlet CGA-P1, Safe Handling of Compressed Gases in Containers.
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 m⁻³ @ 20°C</th>
</tr>
</thead>
<tbody>
<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 INERT components that may be part 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 m⁻³ @ 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

Alkalis. Metal oxides.

Conditions to Avoid

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

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: No information available.

Inhalation

The irritant actions of sulfur dioxide is believed to be caused by the formation of sulfuric acid when the gas dissolves. Bronchoconstriction 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/1hr (Rat)</td>
</tr>
</tbody>
</table>

Chronic Toxicity

Chronic Toxicity

None known.

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>

IARC: (International Agency for Research on Cancer)
Group 3: Not Classifiable as to its Carcinogenicity to Humans

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.

Mutagenic Effects

Sulfur dioxide has failed consistently to induce genotoxicity in intact rodents.

Reproductive Toxicity

Experimental inhalation exposures of rats and mice at 1.5 to 32 ppm 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

Eyes. Respiratory system. Skin.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Sulfur dioxide is harmful to aquatic organisms.

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

13. DISPOSAL CONSIDERATIONS
14. TRANSPORT INFORMATION

**DOT**

<table>
<thead>
<tr>
<th>Proper shipping name</th>
<th>Compressed gas, n.o.s.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazard Class</td>
<td>2.2</td>
</tr>
<tr>
<td>Subsidiary Class</td>
<td>None</td>
</tr>
<tr>
<td>UN-Number</td>
<td>UN1956</td>
</tr>
<tr>
<td>Description</td>
<td>UN1956, Compressed gas, n.o.s. (Nitrogen, Sulfur dioxide), 2.2</td>
</tr>
<tr>
<td>Emergency Response Guide Number</td>
<td>126</td>
</tr>
</tbody>
</table>

**TDG**

<table>
<thead>
<tr>
<th>Proper Shipping Name</th>
<th>Compressed gas, n.o.s.</th>
</tr>
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<tbody>
<tr>
<td>Hazard Class</td>
<td>2.2</td>
</tr>
<tr>
<td>UN-Number</td>
<td>UN1956</td>
</tr>
<tr>
<td>Description</td>
<td>UN1956, COMPRESSED GAS, N.O.S., 2.2</td>
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</table>

**MEX**

<table>
<thead>
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<th>Proper Shipping Name</th>
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</thead>
<tbody>
<tr>
<td>Hazard Class</td>
<td>2.2</td>
</tr>
<tr>
<td>UN-Number</td>
<td>UN1956</td>
</tr>
<tr>
<td>Description</td>
<td>UN1956 Compressed gas, n.o.s. (Nitrogen, Sulfur dioxide), 2.2</td>
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</table>

**IATA**

<table>
<thead>
<tr>
<th>UN-Number</th>
<th>UN1956</th>
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<tbody>
<tr>
<td>Proper Shipping Name</td>
<td>Compressed gas, n.o.s.</td>
</tr>
<tr>
<td>Hazard Class</td>
<td>2.2</td>
</tr>
<tr>
<td>ERG Code</td>
<td>2L</td>
</tr>
<tr>
<td>Description</td>
<td>UN1956, Compressed gas, n.o.s. (Nitrogen, Sulfur dioxide), 2.2</td>
</tr>
<tr>
<td>Maximum Quantity for Passenger</td>
<td>75 kg</td>
</tr>
<tr>
<td>Maximum Quantity for Cargo Only</td>
<td>150 kg</td>
</tr>
<tr>
<td>Limited Quantity</td>
<td>No information available</td>
</tr>
</tbody>
</table>

**IMDG/IMO**

<table>
<thead>
<tr>
<th>Proper Shipping Name</th>
<th>Compressed gas, n.o.s.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazard Class</td>
<td>2.2</td>
</tr>
<tr>
<td>UN-Number</td>
<td>UN1956</td>
</tr>
<tr>
<td>EmS No.</td>
<td>F-C, S-V</td>
</tr>
<tr>
<td>Description</td>
<td>UN1956, Compressed gas, n.o.s. (Nitrogen, Sulfur dioxide), 2.2</td>
</tr>
</tbody>
</table>

**ADR**

<table>
<thead>
<tr>
<th>Proper Shipping Name</th>
<th>Compressed gas, n.o.s.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazard Class</td>
<td>2.2</td>
</tr>
<tr>
<td>UN-Number</td>
<td>UN1956</td>
</tr>
<tr>
<td>Classification Code</td>
<td>1A</td>
</tr>
</tbody>
</table>
15. REGULATORY INFORMATION

International Inventories

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

**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**

<table>
<thead>
<tr>
<th>Acute Health Hazard</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronic Health Hazard</td>
<td>No</td>
</tr>
<tr>
<td>Fire Hazard</td>
<td>No</td>
</tr>
<tr>
<td>Sudden Release of Pressure Hazard</td>
<td>Yes</td>
</tr>
<tr>
<td>Reactive Hazard</td>
<td>No</td>
</tr>
</tbody>
</table>

**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, contains one or more regulated substances with specified thresholds under 40 CFR Part 68 or regulated as a highly hazardous chemical pursuant to the 29 CFR Part 1910.110 with specified thresholds:

<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>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, contains one or more 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):

<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>Sulfur dioxide</td>
<td>500 lb</td>
<td>500 lb TPQ</td>
<td></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>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>
</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
A  Compressed gases
D2B  Toxic materials

Legend
NPRI - National Pollutant Release Inventory

16. OTHER INFORMATION

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

Issuing Date  10-Feb-2011

Revision Date  10-Feb-2014

Revision Number  1

Revision Note  Not applicable.
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