1. IDENTIFICATION

**Product identifier**
**Product Name**
SULFUR DIOXIDE (<1%) in AIR

**Other means of identification**
**Safety data sheet number**
LIND-M0345
**UN/ ID no.**
UN1956

**Recommended use of the chemical and restrictions on use**
**Recommended Use**
Industrial and professional use.
**Uses advised against**
Consumer use

**Details of the supplier of the safety data sheet**
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.
Road 869, Km 1.8
Barrio Palmas, Catano, PR 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.

**Emergency telephone number**
**Company Phone Number**
800-232-4726 (Linde National Operations Center, US)
905-501-0802 (Canada)
CHEMTREC: 1-800-424-9300 (North America) +1-703-527-3887 (International)
OSHA Regulatory Status
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200).

| Gases under pressure | Compressed gas |

Label elements

Signal word Warning

Hazard Statements
Contains gas under pressure; may explode if heated

Precautionary Statements - Prevention
Do not handle until all safety precautions have been read and understood
Use and store only outdoors or in a well ventilated place
Use a backflow preventive device in piping
Use only with equipment of compatible materials of construction and rated for cylinder pressure
Close valve after each use and when empty

Precautionary Statements - Response

Precautionary Statements - Storage
Protect from sunlight when ambient temperature exceeds 52°C/125°F

Hazards not otherwise classified (HNOC)
Supports combustion

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>Air</td>
<td>132259-10-0</td>
<td>BALANCE</td>
<td>N/ A</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>7446-09-5</td>
<td>&lt;1</td>
<td>SO₂</td>
</tr>
</tbody>
</table>

Composition covers range of mixtures that fall within the same hazard classifications.

4. FIRST AID MEASURES

Description of first aid measures

General advice Show this safety data sheet to the doctor in attendance.

Inhalation Remove to fresh air and keep comfortable for breathing. If breathing is difficult, give oxygen. If
breathing has stopped, give artificial respiration. Get medical attention immediately.

**Skin contact**
Wash off immediately with plenty of water for at least 15 minutes. Get medical attention if irritation develops and/or persists.

**Eye contact**
Immediately flush eye with running water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Keep eye wide open while rinsing. Do not rub affected area. Get medical attention if symptoms occur.

**Ingestion**
Not an expected route of exposure.

**Most important symptoms and effects, both acute and delayed**

**Symptoms**
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.

**Indication of any immediate medical attention and special treatment needed**

**Note to physicians**
Treat symptomatically.

## 5. FIRE-FIGHTING MEASURES

**Suitable extinguishing media**
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

**Specific extinguishing methods**
Continue to cool fire exposed cylinders until flames are extinguished. Damaged cylinders should be handled only by specialists.

**Specific hazards arising from the chemical**
Non-flammable gas. Supports combustion. Cylinders may rupture under extreme heat.

**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, protective equipment and emergency procedures**

**Personal precautions**
Evacuate personnel to safe areas. Ensure adequate ventilation. Contents under pressure.

**Environmental precautions**

**Methods and material for containment and cleaning up**

**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.

## 7. HANDLING AND STORAGE

**Precautions for safe handling**
Advice on safe handling

Most metals corrode when in contact with wet sulfur dioxide.

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. Never attempt to lift a cylinder by its valve protection cap. 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. Use only with adequate ventilation. Use a backflow preventive device in piping. Use only with equipment rated for cylinder pressure. Close valve after each use and when empty. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier. Ensure the complete gas system has been checked for leaks before use.

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.

Only experienced and properly instructed persons should handle gases under pressure. Always store and handle compressed gas cylinders in accordance with Compressed Gas Association, pamphlet CGA-P1, Safe Handling of Compressed Gases in Containers.

Conditions for safe storage, including any incompatibilities

Storage Conditions

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. Cylinders should be stored upright with valve protection cap in place and firmly secured to prevent falling. 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. Stored containers should be periodically checked for general condition and leakage.

Incompatible materials

Sulfur dioxide is incompatible with: Alkalis. Metal oxides.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

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>Sulfur dioxide</td>
<td>STEL: 0.25 ppm</td>
<td>TWA: 5 ppm</td>
<td>IDLH: 100 ppm</td>
</tr>
<tr>
<td>7446-09-5</td>
<td>TWA: 13 mg/m³</td>
<td>TWA: 2 ppm</td>
<td>TWA: 5 mg/m³</td>
</tr>
<tr>
<td></td>
<td>(vacated) TWA: 2 ppm</td>
<td>(vacated) TWA: 5 mg/m³</td>
<td>STEL: 5 ppm</td>
</tr>
<tr>
<td></td>
<td>(vacated) TWA: 6 mg/m³</td>
<td>(vacated) STEL: 15 mg/m³</td>
<td>STEL: 13 mg/m³</td>
</tr>
</tbody>
</table>

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

Other Information

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

Appropriate engineering controls

Engineering Controls

Showers. Eyewash stations. Ventilation systems. Systems under pressure should be regularly checked for leakages.

Individual protection measures, such as personal protective equipment

Eye/face protection

Wear safety glasses with side shields (or goggles).

Skin and body protection

Work gloves and safety shoes are recommended when handling cylinders.

Respiratory protection

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.

**General Hygiene Considerations**
Handle in accordance with good industrial hygiene and safety practice.

### 9. PHYSICAL AND CHEMICAL PROPERTIES

#### Information on basic physical and chemical properties

<table>
<thead>
<tr>
<th>Product Information</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physical state</strong></td>
<td>Compressed gas</td>
</tr>
<tr>
<td><strong>Appearance</strong></td>
<td>Colorless.</td>
</tr>
<tr>
<td><strong>Odor</strong></td>
<td>Odorless.</td>
</tr>
<tr>
<td><strong>Odor threshold</strong></td>
<td>No information available</td>
</tr>
<tr>
<td><strong>pH</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>Melting point</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>Evaporation rate</strong></td>
<td>Not applicable</td>
</tr>
<tr>
<td><strong>Flammability Limit in Air</strong></td>
<td></td>
</tr>
<tr>
<td>Lower flammability limit</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Upper flammability limit</td>
<td>Not applicable</td>
</tr>
<tr>
<td><strong>Flash point</strong></td>
<td>No information available</td>
</tr>
<tr>
<td><strong>Autoignition temperature</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>Decomposition temperature</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>Partition coefficient</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>Kinematic viscosity</strong></td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Molecular weight</th>
<th>Boiling point</th>
<th>Vapor Pressure</th>
<th>Vapor density (air =1)</th>
<th>Gas Density kg/ m³@20°C</th>
<th>Critical Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air</td>
<td>28.975</td>
<td>-194.3 °C</td>
<td>Above critical temperature</td>
<td>1</td>
<td>1.204</td>
<td>-140.6 °C</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>64.06</td>
<td>-10 °C</td>
<td>3200 hPa @ 20 °C</td>
<td>2.26</td>
<td>2.697</td>
<td>157.4 °C</td>
</tr>
</tbody>
</table>

### 10. STABILITY AND REACTIVITY

#### Reactivity
Not reactive under normal conditions

#### Chemical stability
Stable under recommended storage conditions.

#### Explosion data
- Sensitivity to Mechanical Impact: None.
- Sensitivity to Static Discharge: None.

#### Possibility of Hazardous Reactions
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.

#### Conditions to avoid
None under recommended storage and handling conditions (see Section 7).

#### Incompatible materials
Sulfur dioxide is incompatible with: Alkalis. Metal oxides.

#### Hazardous Decomposition Products
Sulfur oxides.
11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

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.

Skin contact
May cause irritation.

Eye contact
May cause irritation.

Ingestion
Not an expected route of exposure.

Information on toxicological effects

Symptoms
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.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation
Not classified. 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
Not classified.

Germ cell mutagenicity
Not classified. Sulfur dioxide has failed consistently to induce genotoxicity in intact rodents.

Carcinogenicity
The table below indicates whether each agency has listed any ingredient as a carcinogen. 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 7446-09-5</td>
<td>-</td>
<td>Group 3</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

IARC (International Agency for Research on Cancer)
Not classifiable as a human carcinogen

Reproductive toxicity
Not classified. 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.

STOT - single exposure
Not classified.

STOT - repeated exposure
Not classified.

Chronic 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.

Target Organ Effects
Eyes, Respiratory system, Skin.

Aspiration hazard
Not applicable.

Numerical measures of toxicity

Component Level Information:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Oral LD50</th>
<th>Dermal LD50</th>
<th>Inhalation LC50</th>
<th>Inhalation LC50 (CGA P-20)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfur dioxide 7446-09-5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2520 ppm (Rat) 1hr</td>
</tr>
</tbody>
</table>
Product Information
Oral LD50
  No information available
Dermal LD50
  No information available
Inhalation LC50
  No information available

12. ECOLOGICAL INFORMATION

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

Persistence and degradability
Not applicable.

Bioaccumulation
No information available.

13. DISPOSAL CONSIDERATIONS

Waste treatment methods
Disposal of wastes
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
UN/ ID no. UN1956
Proper shipping name Compressed gas, n.o.s.
Hazard Class 2.2
Description UN1956, Compressed gas, n.o.s.(Air, Sulfur dioxide), 2.2
Emergency Response Guide Number 126

TDG
UN/ ID no. UN1956
Proper shipping name Compressed gas, n.o.s.
Hazard Class 2.2
Description UN1956, Compressed gas, n.o.s.(Air, Sulfur dioxide), 2.2

MEX
UN/ ID no. UN1956
Proper shipping name Compressed gas, n.o.s.
Hazard Class 2.2
Description UN1956, Compressed gas, n.o.s.(Air, Sulfur dioxide), 2.2

IATA
UN/ ID no. UN1956
Proper shipping name Compressed gas, n.o.s.
Hazard Class 2.2
ERG Code 2L
Description UN1956, Compressed gas, n.o.s.(Air, Sulfur dioxide), 2.2

IMDG
UN/ ID no. UN1956
Proper shipping name: Compressed gas, n.o.s.
Hazard Class: 2.2
EmS-No.: F-C, S-V
Special Provisions: 274
Description: UN1956, Compressed gas, n.o.s. (Air, Sulfur dioxide), 2.2

ADR
UN/ID no.: UN1956
Proper shipping name: Compressed gas, n.o.s.
Hazard Class: 2.2
Classification code: 1A
Tunnel restriction code: (E)
Special Provisions: 274, 655
Description: UN1956, Compressed gas, n.o.s. (Air, Sulfur dioxide), 2.2, (E)
Labels: 2.2

15. REGULATORY INFORMATION

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

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 Chemical Substances/European List of Notified Chemical Substances

US 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: Yes
- Fire Hazard: No
- Sudden release of pressure hazard: Yes
- Reactive Hazard: No

CERCLA
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.

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Hazardous Substances RQs</th>
<th>CERCLA/ SARA RQ</th>
<th>Reportable Quantity (RQ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfur dioxide</td>
<td>7446-09-5</td>
<td>500 lb</td>
<td>-</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.

CWA (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>Sulfur dioxide</td>
<td>5000 lb</td>
<td>1000 lb</td>
<td></td>
</tr>
</tbody>
</table>

US State Regulations

California Proposition 65
This product contains the following Proposition 65 chemicals

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>California Proposition 65</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfur dioxide - 7446-09-5</td>
<td>Developmental</td>
</tr>
</tbody>
</table>

U.S. State Right-to-Know Regulations

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>New Jersey</th>
<th>Massachusetts</th>
<th>Pennsylvania</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfur dioxide 7446-09-5</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

International Regulations

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Carcinogenicity</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>

<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
Canada NPRI - National Pollutant Release Inventory

16. OTHER INFORMATION

NFPA
Health hazards 1  Flammability 0  Instability 0  Physical and Chemical Properties -

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.

Issue Date 01-Jun-2015
Revision Date 01-Jun-2015
Revision Note Initial Release

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.

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End of Safety Data Sheet