1. PRODUCT AND COMPANY IDENTIFICATION

Product Name | SULFUR DIOXIDE
---|---
Product Code(s) | G-79
UN-Number | UN1079
Recommended Use | Compressed gas.
Synonyms | Bisulfite; Sulfurous Anhydride; Sulfurous Oxide; Sulfur Oxide
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

**DANGER!**

**Emergency Overview**

- Fatal if inhaled
- Corrosive
- The product causes burns of eyes, skin and mucous membranes
- 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
Fatal if inhaled. Inhalation of corrosive fumes/ gases may cause coughing, choking, headache, dizziness, and weakness for several hours. Pulmonary edema may occur with tightness in the chest, shortness of breath, bluish skin, decreased blood pressure, and increased heart rate. Chemical pneumonitis and pulmonary edema result from exposure to the lower respiratory tract and deep lung. Residual pulmonary malfunction might occur.

Eyes
Gas can cause irritation. Corrosive to the eyes and may cause irreversible eye damage. This product is a gas at room temperature. Contact with liquid may cause frostbite.

Skin
Gas can cause irritation. Contact with liquid causes severe corrosive action. This product is a gas at room temperature. Contact with liquid may cause frostbite.

Skin Absorption Hazard
No known hazard in contact with skin.

Ingestion
Not an expected route of exposure. Ingestion causes burns of the upper digestive and respiratory tract.

Chronic Effects
Chronic exposure to corrosive fumes/gases may cause erosion of the teeth followed by jaw necrosis. Bronchial irritation with chronic cough and frequent attacks of pneumonia are common. Gastrointestinal disturbances may also be seen; Avoid repeated exposure; Possible risks of irreversible effects

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>Sulfur dioxide</td>
<td>7446-09-5</td>
<td>&gt; 99</td>
<td>SO₂</td>
</tr>
</tbody>
</table>

4. FIRST AID MEASURES

General Advice
Immediate medical attention is required. Show this safety data sheet to the doctor in attendance.

Eye Contact
Immediate medical attention is required. In case of contact with substance, immediately flush eyes with running water for at least 30 minutes. Keep eye wide open while rinsing.

Skin Contact
Immediate medical attention is required. Wash off immediately with soap and plenty of water for at least 30 minutes while removing all contaminated clothing and shoes.

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. Call a POISON CENTER or doctor/physician if exposed or you feel unwell.

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

Flammable Properties
Not flammable.

Suitable Extinguishing Media
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

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. 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.

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.

Do not breathe gas. Avoid contact with skin, eyes and clothing. 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.

For additional storage recommendations, consult Compressed Gas Association's Pamphlets P-1, G-3, and TB-11.
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.

**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.

### 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>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 (vacated) TWA: 2 ppm</td>
<td>TWA: 5 mg/m³ (vacated) TWA: 5 mg/m³ (vacated) STEL: 5 ppm (vacated) STEL: 15 mg/m³</td>
<td>TWA: 2 ppm TWA: 5 mg/m³ STEL: 5 ppm STEL: 13 mg/m³</td>
</tr>
</tbody>
</table>

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. Face-shield.

**Skin and Body Protection**
Appropriate protective and chemical resistant gloves, clothing and splash protection, or fully encapsulating vapor protective clothing to prevent exposure. For materials of construction consult protective clothing manufacturer's specifications. (Saranex® and Barricade® are effective for exposures greater than 8 hours).

**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 air line respirator or self-contained breathing apparatus for exposure over exposure limits or emergency use. For exposures above IDLH, an additional escape bottle is required.
Hygiene Measures
When using, do not eat, drink or smoke. Remove and wash contaminated clothing before re-use. Keep away from food, drink and animal feeding stuffs. Provide regular cleaning of equipment, work area and clothing. Avoid contact with skin, eyes and clothing.

9. PHYSICAL AND CHEMICAL PROPERTIES

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Colorless</td>
</tr>
<tr>
<td>Odor Threshold</td>
<td>No information available</td>
</tr>
<tr>
<td>Flash Point</td>
<td>No information available</td>
</tr>
<tr>
<td>Decomposition Temperature</td>
<td>No information available</td>
</tr>
<tr>
<td>Freezing Point</td>
<td>-75.5 °C / -103.9 °F</td>
</tr>
<tr>
<td>Water Solubility</td>
<td>Soluble in water</td>
</tr>
<tr>
<td>Vapor Pressure</td>
<td>49.1 psia</td>
</tr>
<tr>
<td>VOC Content (%)</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Odor</td>
<td>Pungent</td>
</tr>
<tr>
<td>Physical State</td>
<td>Compressed gas</td>
</tr>
<tr>
<td>Autoignition Temperature</td>
<td>No information available</td>
</tr>
<tr>
<td>Boiling Point/ Boiling Range</td>
<td>-10.0 °C / -14.0 °F</td>
</tr>
<tr>
<td>Molecular Weight</td>
<td>64.064</td>
</tr>
<tr>
<td>Evaporation Rate</td>
<td>No information available</td>
</tr>
<tr>
<td>Vapor Density</td>
<td>2.26 (air = 1)</td>
</tr>
<tr>
<td>Flammability Limits in Air</td>
<td></td>
</tr>
<tr>
<td>Upper</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Lower</td>
<td>Not applicable</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

LD50 Oral: No information available.
LD50 Dermal: No information available.
LC50 Inhalation: Per CGA P-20: 2520 ppm/1 hr. (Rat)

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 mucousal 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.

Chronic Toxicity
Chronic Toxicity

Chronic exposure to corrosive fumes/gases may cause erosion of the teeth followed by jaw necrosis. Bronchial irritation with chronic cough and frequent attacks of pneumonia are common. Gastrointestinal disturbances may also be seen. Avoid repeated exposure. Possible risks of irreversible effects.

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

Harmful to aquatic organisms.

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.

Contaminated Packaging

Do not re-use empty containers.
14. TRANSPORT INFORMATION

DOT

Proper shipping name: Sulfur dioxide
Hazard Class: 2.3
Subsidiary Class: 8
UN-Number: UN1079
Description: UN1079,Sulfur dioxide,2.3,(8)
Additional Description: "Toxic-Inhalation Hazard Zone C".
Additional Marking Requirements: "Inhalation Hazard".
Emergency Response Guide Number: 125

TDG

Proper Shipping Name: Sulfur dioxide
Hazard Class: 2.3
Subsidiary Class: (8)
UN-Number: UN1079
Description: UN1079,SULFUR DIOXIDE,2.3(8)

MEX

Proper Shipping Name: Sulfur dioxide
Hazard Class: 2.3
Subsidiary Class: 8
UN-Number: UN1079
Description: UN1079 Sulfur dioxide,2.3

IATA

UN-Number: UN1079
Proper Shipping Name: Sulphur dioxide
Hazard Class: 2.3
Subsidiary Class: 8
ERG Code: 2CP
Description: UN1079,Sulphur dioxide,2.3(8)
Maximum Quantity for Passenger: Forbidden
Maximum Quantity for Cargo Only: Forbidden
Limited Quantity: No information available.

IMDG/IMO

Proper Shipping Name: Sulphur dioxide
Hazard Class: 2.3
Subsidiary Class: 8
UN-Number: UN1079
EmS No.: F-C, S-U
Description: UN1079, Sulphur dioxide,2.3(8)

ADR

Proper Shipping Name: Sulphur dioxide
Hazard Class: 2.3
UN-Number: UN1079
Classification Code: 2TC
Description: UN1079 Sulphur dioxide,2.3,
ADR/ RID-Labels: 8
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: Yes
- Chronic Health Hazard: Yes
- 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, 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></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>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
D1A Very toxic materials
E  Corrosive material

Legend
NPRI - National Pollutant Release Inventory

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>NPRI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfur dioxide</td>
<td>X</td>
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</tbody>
</table>
Prepared By
Product Stewardship
23 British American Blvd.
Latham, NY 12110
1-800-572-6501

Issuing Date
14-Feb-2011

Revision Date
27-Sep-2013

Revision Number
1

Revision Note
Not applicable.

<table>
<thead>
<tr>
<th>NFPA</th>
<th>Health Hazard</th>
<th>Flammability</th>
<th>Stability</th>
<th>Physical and Chemical Hazards</th>
</tr>
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<tbody>
<tr>
<td></td>
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<td>0</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HMIS</th>
<th>Health Hazard</th>
<th>Flammability</th>
<th>Physical Hazard</th>
<th>Personal Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

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