1. IDENTIFICATION

Product identifier
Product Name
NITROGEN DIOXIDE (1-<2.3%) in NITROGEN

Other means of identification
Safety data sheet number
LIND-M0141
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.lindecana.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)

2. HAZARDS IDENTIFICATION

---
Classification

OSHA Regulatory Status
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200).

<table>
<thead>
<tr>
<th>Hazard Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute toxicity - Inhalation (Gases)</td>
<td>Category 4</td>
</tr>
<tr>
<td>Skin corrosion/ irritation</td>
<td>Category 2</td>
</tr>
<tr>
<td>Serious eye damage/ eye irritation</td>
<td>Category 2A</td>
</tr>
<tr>
<td>Gases under pressure</td>
<td>Compressed gas</td>
</tr>
</tbody>
</table>

Label elements

Signal word: **Warning**

Hazard Statements
Contains gas under pressure; may explode if heated
Harmful if inhaled
Causes skin irritation
Causes serious eye irritation

Precautionary Statements - Prevention
Do not handle until all safety precautions have been read and understood
Avoid breathing gas
Use and store only outdoors or in a well ventilated place
Wear protective gloves, protective clothing, eye protection, and/or face protection
Use a backflow preventive device in piping
Use only with equipment rated for cylinder pressure
Close valve after each use and when empty

Precautionary Statements - Response
IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or doctor/physician if you feel unwell.
IF ON SKIN: Wash with plenty of water. IF SKIN IRRITATION OCCURS: Get medical advice/attention. Take off contaminated clothing and wash before reuse.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention

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

Hazards not otherwise classified (HNOC)
Not applicable

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3. COMPOSITION/INFORMATION ON INGREDIENTS
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. Remove contaminated clothing and shoes. Get medical attention if symptoms occur.

**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.

**Self-protection of the first aider**
RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS. Use personal protective equipment. Avoid contact with skin, eyes or clothing.

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

**Symptoms**
Irritating to eyes, respiratory system and skin. 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.

**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. Cylinders may rupture under extreme heat.

**Hazardous combustion products**
Nitrogen oxides (NOx).

#### 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, especially in confined areas. Keep people away from and upwind of spill/leak. Monitor oxygen level. Monitor concentration of released product. Use personal protection recommended in Section 8. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe.

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

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
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
Nitrogen dioxide is incompatible with: Strong oxidizing agents. Combustible materials. Organic material.

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>Nitrogen dioxide</td>
<td>TWA: 0.2 ppm</td>
<td>(vacated) STEL: 1 ppm</td>
<td>IDLH: 20 ppm</td>
</tr>
<tr>
<td></td>
<td>(vacated) STEL: 1.8 mg/ m³</td>
<td>Ceiling: 5 ppm</td>
<td>STEL: 1 ppm</td>
</tr>
<tr>
<td></td>
<td>Ceiling: 9 mg/ m³</td>
<td></td>
<td>STEL: 1.8 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
Showers. Eyewash stations. 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. Do not eat, drink or smoke when using this product. Wash hands before breaks and immediately after handling the product.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

<table>
<thead>
<tr>
<th>Product Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical state</td>
</tr>
<tr>
<td>Appearance</td>
</tr>
<tr>
<td>Odor</td>
</tr>
<tr>
<td>Odor threshold</td>
</tr>
<tr>
<td>pH</td>
</tr>
<tr>
<td>Melting point</td>
</tr>
<tr>
<td>Evaporation rate</td>
</tr>
<tr>
<td>Flammability Limit in Air</td>
</tr>
<tr>
<td>Lower flammability limit:</td>
</tr>
<tr>
<td>Upper flammability limit:</td>
</tr>
<tr>
<td>Flash point</td>
</tr>
<tr>
<td>Autoignition temperature</td>
</tr>
<tr>
<td>Decomposition temperature</td>
</tr>
<tr>
<td>Partition coefficient</td>
</tr>
<tr>
<td>Kinematic viscosity</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>Nitrogen</td>
<td>28.01</td>
<td>-196 °C</td>
<td>Above critical temperature</td>
<td>0.97</td>
<td>1.153</td>
<td>-146.9 °C</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>46.01</td>
<td>21.1°C/ 70°F °C</td>
<td>14.8 psia@ STP</td>
<td>2.8</td>
<td>3.4</td>
<td>158.2 °C</td>
</tr>
</tbody>
</table>
10. STABILITY AND REACTIVITY

Reactivity
Not reactive under normal conditions

Chemical stability
Stable under recommended storage and handling conditions (see Section 7).

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

Possibility of Hazardous Reactions
None under normal processing.

Conditions to avoid
Due to the presence of nitrogen dioxide: Temperatures above 160 °C / 320 °F. Contact with water or moist air liberates irritating gas. Violent reaction with cyclohexane, fluorine, nitrobenzene, petroleum and toluene.

Incompatible materials
Nitrogen dioxide is incompatible with: Strong oxidizing agents. Combustible materials. Organic material.

Hazardous Decomposition Products
Nitrogen oxides (NOx).

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Inhalation
Harmful by inhalation. Irritating to respiratory system.

Skin contact
Causes skin irritation.

Eye contact
Causes serious eye irritation.

Ingestion
Not an expected route of exposure.

Information on toxicological effects

Symptoms
No information available.

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

Skin corrosion/ irritation
Category 2.

Serious eye damage/ eye irritation
Category 2.

Irritation
Concentrations of 10-20 ppm nitrogen dioxide are mildly irritating to the skin and eye.

Sensitization
Not classified.

Germ cell mutagenicity
Not classified.

Carcinogenicity
This product does not contain any carcinogens or potential carcinogens listed by OSHA, IARC or NTP.

Reproductive toxicity
Not classified.

STOT - single exposure
Not classified.

STOT - repeated exposure
Not classified.

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

Target Organ Effects
Respiratory system, Eyes, Skin.

Aspiration hazard
Not applicable.

Numerical measures of toxicity

Component Level Information:
Chemical Name | Oral LD50 | Dermal LD50 | Inhalation LC50 | Inhalation LC50 (CGA P-20)  
--- | --- | --- | --- | ---  
Nitrogen dioxide 10102-44-0 | - | - | - | 115 ppm (Rat) 1hr  
Product Information  
Oral LD50 No information available  
Dermal LD50 No information available  
Inhalation LC50 No information available  

The following values are calculated based on chapter 3.1 of the GHS document.  
ATEmix (inhalation-gas) >2500-5750 ppm ppm  

12. ECOLOGICAL INFORMATION

Ecotoxicity  
No known acute aquatic toxicity.  

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.(Nitrogen dioxide, Nitrogen), 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., 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.(Nitrogen dioxide, Nitrogen), 2.2  

IATA  
UN/ ID no. UN1956  
Proper shipping name Compressed gas, n.o.s.  
Hazard Class 2.2
15. REGULATORY INFORMATION

International Inventories

**TSCA**
- Complies

**DSL/ NDSL**
- Complies

**EINECS/ ELINCS**
- 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**

<table>
<thead>
<tr>
<th>Hazard Category</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Health Hazard</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chronic Health Hazard</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Fire Hazard</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Sudden release of pressure hazard</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Reactive Hazard</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

**CERCLA**
This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302).

<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>Nitrogen dioxide</td>
<td>10 lb</td>
<td>10 lb</td>
<td>10 lb</td>
</tr>
<tr>
<td>10102-44-0</td>
<td></td>
<td></td>
<td>4.54 kg</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 contains the following substances which are regulated pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42):

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CWA - Reportable Quantities</th>
<th>CWA - Toxic Pollutants</th>
<th>CWA - Priority Pollutants</th>
<th>CWA - Hazardous Substances</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen dioxide</td>
<td>10 lb</td>
<td>-</td>
<td>-</td>
<td>X</td>
</tr>
</tbody>
</table>

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>Nitrogen dioxide</td>
<td></td>
<td></td>
<td>250 lb</td>
</tr>
</tbody>
</table>

US 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>New Jersey</th>
<th>Massachusetts</th>
<th>Pennsylvania</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>7727-37-9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>10102-44-0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

International Regulations

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Carcinogenicity</th>
<th>Exposure Limits</th>
</tr>
</thead>
</table>
| Nitrogen dioxide  |                 | Mexico: TWA 3 ppm,
|                   |                 | Mexico: TWA 6 mg/m³,
|                   |                 | Mexico: STEL 5 ppm,
|                   |                 | Mexico: STEL 10 mg/m³, |

16. OTHER INFORMATION

<table>
<thead>
<tr>
<th>NFPA</th>
<th>Health hazards</th>
<th>Flammability</th>
<th>Instability</th>
<th>Physical and Chemical Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>0</td>
<td>0</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.

Issue Date: 26-May-2015
Revision Date: 26-May-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.

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