



# BORON TRIFLUORIDE

## Safety Data Sheet

### 1. IDENTIFICATION

Product identifier

Product Name BORON TRIFLUORIDE

Other means of identification

Safety data sheet number LIND-P010  
UN/ID no. UN1008

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).

Acute toxicity - Inhalation (Gases)	Category 2
Skin corrosion/irritation	Category 1 Sub-category A
Serious eye damage/eye irritation	Category 1
Specific target organ toxicity (single exposure)	Category 3
Specific target organ toxicity (repeated exposure)	Category 2
Gases under pressure	Compressed gas

Label elements

Signal word

Danger

## Hazard Statements

Contains gas under pressure; may explode if heated

Fatal if inhaled

Causes severe skin burns and eye damage

May cause damage to kidneys

Symptoms may be delayed

Corrosive to the respiratory tract

## Precautionary Statements - Prevention

Do not handle until all safety precautions have been read and understood

Do not breathe gas.

Do not get in eyes, on skin, or on clothing

Use and store only outdoors or in a well ventilated place

Wear protective gloves, protective clothing, eye protection, respiratory protection, and/or face protection

Use backflow preventive device in piping

Use only with equipment of compatible materials of construction and rated for cylinder pressure

Do not open valve until connected to equipment prepared for use

Close valve after each use and when empty

When returning cylinder, install leak tight valve outlet cap or plug

## Precautionary Statements - Response

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/physician.

IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. Wash contaminated clothing before reuse.

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

Immediately call a POISON CENTER or doctor/physician

## Precautionary Statements - Storage

Store locked up

Protect from sunlight when ambient temperature exceeds 52°C/125°F

## Precautionary Statements - Disposal

Dispose of contents/containers in accordance with container supplier/owner instructions

Hazards not otherwise classified (HNOC)

Not applicable

**3. COMPOSITION/INFORMATION ON INGREDIENTS**

Chemical Name	CAS No.	Volume %	Chemical Formula
Boron trifluoride	7637-07-2	100	BF <sub>3</sub>

**4. FIRST AID MEASURES**Description of first aid measures

General advice	Immediate medical attention is required. 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	Immediately flush skin with plenty of water for at least 30 minutes. Remove contaminated clothing and shoes. Dermal burns may be treated with calcium gluconate gel or slurry in water or glycerine. This compound binds the active fluorides in an insoluble form and limits burn extension and pain. Immediate medical attention is required.
Eye contact	Immediately flush eyes with running water for at least 30 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Keep eye wide open while rinsing. Do not rub affected area. Immediate medical attention is required.
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 and clothing. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Most important symptoms and effects, both acute and delayed

Symptoms	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. Concentrations as low as 50 ppm may cause death from cardiac collapse and complications from fluid retention and swelling in the lung (edema) and chemical pneumonitis. May cause burns of eyes, skin and mucous membranes. Symptoms may be delayed.
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Indication of any immediate medical attention and special treatment needed

Note to physicians	For dermal exposure, the use of 2.5-33% calcium gluconate or carbonate gel or slurry has been recommended. The gel is either placed into a surgical glove into which the affected extremity is then placed or applied directly on the burn. This compound binds with the active fluorides in an insoluble form and limits burn extension and pain. Calcium chloride should not be used.
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## 5. FIRE-FIGHTING MEASURES

### Suitable extinguishing media

Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. Boron trifluoride is water reactive. Use water cautiously as necessary to knock down vapors and cool fire exposed cylinders. Do not use water directly on boron trifluoride as contact can produce toxic hydrogen fluoride, fluoboric acid, boric acid and other similar compounds.

### 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. The product causes burns of eyes, skin and mucous membranes. Thermal decomposition can lead to release of irritating and toxic gases and vapors. Do not allow runoff from fire-fighting to enter drains or water courses. Runoff may pollute waterways.

Hazardous combustion products      Fluorine compounds. Oxides of boron.

### 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. Corrosive hazard. Wear chemically protective gloves/clothing and eye/face protection. Additional chemical protective clothing may be required to protect from toxic decomposition products.

## 6. ACCIDENTAL RELEASE MEASURES

### Personal precautions, protective equipment and emergency procedures

Personal precautions	Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Ensure adequate ventilation, especially in confined areas. 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.
Other Information	Gas/vapor is heavier than air. Prevent from entering sewers, basements and workpits, or any place where accumulation may be dangerous.

### Environmental precautions

Environmental precautions	Prevent spreading of vapors through sewers, ventilation systems and confined areas. Prevent product from entering drains. See Section 12 for additional ecological information.
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### 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	Dry Boron Trifluoride may be used with mild steel, copper, copper-zinc and copper-silicon alloys, nickel or Monel®. The moist (water) gas is best handled in Monel®. Fluoride "passivation" is also recommended. Kel-F® and Teflon® are preferred gasketing materials. Use of polyvinyl chloride should be avoided. Mercury containing manometers should not be used since Boron Trifluoride is soluble in mercury. Keep equipment scrupulously dry. Many of the metal fluorides are water soluble so that the passive film corrosion protection may be destroyed if wetted with water.
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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 only with equipment rated for cylinder pressure. Use backflow preventive device in piping. 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. Use a "first in-first out" inventory system to prevent full cylinders from being stored for excessive periods of time. Full and empty cylinders should be segregated. Stored containers should be periodically checked for general condition and leakage.

**Incompatible materials** Water. Alkalis. Alkaline earth metals. Alkyl nitrates. Calcium oxide.

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

#### Control parameters

##### Exposure Guidelines

Chemical Name	ACGIH TLV	OSHA PEL	NIOSH IDLH
Boron trifluoride 7637-07-2	TWA: 2.5 mg/m <sup>3</sup> F Ceiling: 1 ppm	TWA: 2.5 mg/m <sup>3</sup> F TWA: 2.5 mg/m <sup>3</sup> dust (vacated) TWA: 2.5 mg/m <sup>3</sup> (vacated) Ceiling: 1 ppm (vacated) Ceiling: 3 mg/m <sup>3</sup> Ceiling: 1 ppm Ceiling: 3 mg/m <sup>3</sup>	IDLH: 25 ppm Ceiling: 1 ppm Ceiling: 3 mg/m <sup>3</sup>

*Immediately Dangerous to Life or Health. 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. NIOSH IDLH:*

**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. Exhaust gas should be vented to a gas treatment system. Consider installation of leak detection systems in areas of use and storage. Systems under pressure should be regularly checked for leakages.

#### Individual protection measures, such as personal protective equipment

**Eye/face protection** Tight sealing safety goggles. Face protection 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. 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 get in eyes, on skin, or on clothing. Do not eat, drink or smoke when using this product. Wash hands before breaks and immediately after handling the product. Remove and wash contaminated clothing before re-use. Contaminated work clothing should not be allowed out of the workplace. Regular cleaning of equipment, work area and clothing is recommended.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### Information on basic physical and chemical properties

Physical state	Gas
Appearance	Colorless, Forms white fumes in humid air.
Odor	Acrid.
Odor threshold	1.5 ppm
pH	No data available
Melting point	-128.4 °C / -198.5 °F
Evaporation rate	Not applicable
Lower flammability limit:	Not applicable
Upper flammability limit:	Not applicable
Flash point	Not flammable
Autoignition temperature	No data available
Decomposition temperature	No data available
Water solubility	Hydrolyzes Very soluble
Partition coefficient	No data available
Kinematic viscosity	Not applicable

Chemical Name	Molecular weight	Boiling point	Vapor Pressure	Vapor density (air =1)	Gas Density kg/m <sup>3</sup> @20°C	Critical Temperature
Boron trifluoride	67.81	-100.3 °C	Above critical temperature	2.32	3.072	-12.3 °C

## 10. STABILITY AND REACTIVITY

### Reactivity

Not reactive under normal conditions

### Chemical stability

Stable under normal conditions.

### Explosion data

Sensitivity to Mechanical Impact	None.
Sensitivity to Static Discharge	None.

### Possibility of Hazardous Reactions

Catalyst for many polymerization reactions. Contact with water or moist air liberates irritating gas.

### Conditions to avoid

Exposure to air or moisture over prolonged periods. Contact with water or moist air liberates irritating gas.

Incompatible materials

Water. Alkalis. Alkaline earth metals. Alkyl nitrates. Calcium oxide.

Hazardous Decomposition Products

Boron compounds. Fluorine compounds.

## 11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Inhalation	Corrosive to respiratory system. Rats exposed to 67 ppm for 6 hours/day (two week study) died before the sixth daily exposure. Histopathology showed kidney damage. Depressed body weight, increased lung weight, and depressed liver weight were seen in rats exposed 6 hour/day at 24 ppm or 9 ppm for 2 weeks. Renal toxicity was observed in 2 of 40 rats exposed to 6 ppm boron trifluoride, 6 H/day, 5 days/week for 13 weeks. Fluorosis and pneumonitis was seen in rats, rabbits and guinea pigs exposed 5 days/week for up to 6 months to 12.8 ppm and 3.4 ppm. Marginal evidence of pneumonitis was seen in animals exposed to 1.5 ppm concentrations in this study. The 4 hour LC50 for rats was reported to be 436 ppm for boron trifluoride dihydrate, a related compound formed via hydrolysis in moist air.
Skin contact	Corrosive. Causes severe irritation and or burns. Symptoms may be delayed.
Eye contact	Corrosive to the eyes and may cause severe damage including blindness.
Ingestion	Not an expected route of exposure.

Information on toxicological effects

Symptoms	May be 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. Concentrations as low as 50 ppm may cause death from cardiac collapse and complications from fluid retention and swelling in the lung (edema) and chemical pneumonitis. Symptoms may be delayed.
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Delayed and immediate effects as well as chronic effects from short and long-term exposure

Skin corrosion/irritation	Category 1A.
Serious eye damage/eye irritation	Category 1.
Irritation	Causes severe irritation and or burns.
Corrosivity	Corrosive to living tissue.
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	Category 3. Respiratory system.
STOT - repeated exposure	Category 2. Kidney.
Chronic toxicity	May cause adverse kidney 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. Possible risk of irreversible effects.
Target Organ Effects	Eyes, Skin, Kidney, Respiratory system, Liver.
Aspiration hazard	Not applicable.

Numerical measures of toxicity

Chemical Name	Oral LD50	Dermal LD50	Inhalation LC50	Inhalation LC50 (CGA P-20)

Boron trifluoride 7637-07-2	-	-	= 1180 mg/m <sup>3</sup> (Rat) 4 h	864 ppm (Rat) 1hr
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**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 .

## 12. ECOLOGICAL INFORMATION

Ecotoxicity

May cause pH changes in in aqueous ecological systems.

Chemical Name	Algae/aquatic plants	Fish	Crustacea
Boron trifluoride 7637-07-2	-	15000: 24 h Lepomis macrochirus mg/L LC50 static	21.3: 48 h Daphnia magna mg/L EC50

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.	UN1008
Proper shipping name	Boron trifluoride
Hazard Class	2.3
Subsidiary class	8
Special Provisions	2, 238, B9, B14
Description	UN1008, Boron trifluoride, 2.3 (8)
Additional Description:	"Toxic-Inhalation Hazard Zone B"
Emergency Response Guide Number	125

TDG

UN/ID no.	UN1008
Proper shipping name	Boron trifluoride
Hazard Class	2.3
Subsidiary class	8
Description	UN1008, Boron trifluoride, 2.3 (8)

MEX

UN/ID no.	UN1008
Proper shipping name	Boron trifluoride
Hazard Class	2.3
Subsidiary class	8
Description	UN1008, Boron trifluoride, 2.3 (8)

IATA Forbidden

IMDG

UN/ID no. UN1008  
 Proper shipping name Boron trifluoride  
 Hazard Class 2.3  
 Subsidiary hazard class 8  
 EmS-No. F-C, S-U  
 Description UN1008, Boron trifluoride, 2.3 (8)

ADR

UN/ID no. UN1008  
 Proper shipping name Boron trifluoride  
 Hazard Class 2.3  
 Classification code 2TC  
 Tunnel restriction code (C/D)  
 Description UN1008, Boron trifluoride, 2.3 (8), (C/D)  
 Labels 8

### 15. REGULATORY INFORMATION

International Inventories

TSCA Complies  
 DSL 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 RegulationsSARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product contains a chemical or chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372.

Chemical Name	SARA 313 - Threshold Values %
Boron trifluoride - 7637-07-2	1.0

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

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).

Chemical Name	Hazardous Substances RQs	CERCLA/SARA RQ	Reportable Quantity (RQ)
Boron trifluoride 7637-07-2	-	500 lb	-

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, 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:

Chemical Name	U.S. - CAA (Clean Air Act) - Accidental Release Prevention - Toxic Substances	U.S. - CAA (Clean Air Act) - Accidental Release Prevention - Flammable Substances	U.S. - OSHA - Process Safety Management - Highly Hazardous Chemicals
Boron trifluoride	5000 lb		250 lb

US State RegulationsCalifornia Proposition 65

This product does not contain any Proposition 65 chemicals

U.S. State Right-to-Know Regulations

Chemical Name	New Jersey	Massachusetts	Pennsylvania
Boron trifluoride 7637-07-2	X	X	X

International Regulations

Chemical Name	Carcinogenicity	Exposure Limits
Boron trifluoride		Mexico: Ceiling 1 ppm Mexico: Ceiling 3 mg/m <sup>3</sup> Mexico: TWA 2.5 mg/m <sup>3</sup>

Chemical Name	NPRI
Boron trifluoride	X

## Legend

Canada NPRI - National Pollutant Release Inventory

<b>16. OTHER INFORMATION</b>
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<u>NFPA</u>	Health hazards 3	Flammability 0	Instability 0	Physical and Chemical Properties W1**
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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	13-Mar-2015
Revision Date	13-Mar-2015
Revision Note	Not applicable.

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

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End of Safety Data Sheet