



AMMONIA

Safety Data Sheet

1. IDENTIFICATION

Product identifier

Product Name AMMONIA

Other means of identification

Safety data sheet number LIND-P003

UN/ID no. UN1005

Synonyms Ammonia, Anhydrous; Anhydrous Ammonia

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 4
Skin corrosion/irritation	Category 1 Sub-category B
Serious eye damage/eye irritation	Category 1
Specific target organ toxicity (single exposure)	Category 3
Flammable gases	Category 2
Gases under pressure	Liquefied gas

Label elements

Signal word

Danger

Hazard Statements

Flammable Gas

Contains gas under pressure; may explode if heated

Harmful if inhaled

Causes severe skin burns and eye damage

Corrosive to the respiratory tract

Precautionary Statements - Prevention

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

Keep away from heat, sparks, open flames, hot surfaces. — No smoking

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, 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

Precautionary Statements - Response

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or doctor/physician if you feel unwell.

IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. Wash contaminated clothing before reuse. Immediately call a POISON CENTER or doctor/physician. If skin irritation occurs: Get medical advice/attention.

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

Leaking gas fire: do not extinguish, unless leak can be stopped safely

Eliminate all ignition sources if safe to do so

Precautionary Statements - Storage

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

Other Information

Very toxic to aquatic life

Avoid release to the environment

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS No.	Volume %	Chemical Formula
Ammonia	7664-41-7	100	NH ₃

4. FIRST AID MEASURESDescription of first aid measures

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

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. May cause burns of eyes, skin and mucous membranes.
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Indication of any immediate medical attention and special treatment needed

Note to physicians	Treat symptomatically.
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5. FIRE-FIGHTING MEASURESSuitable extinguishing mediaDry chemical or CO₂. Water spray (fog). DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.Specific extinguishing methods

If possible, stop the flow of gas. Do not extinguish the fire until supply is shut off as otherwise an explosive-ignition may occur. If the fire is

extinguished and the flow of gas continues, use increased ventilation to prevent build-up of explosive atmosphere. Ventilation fans must be explosion proof. Use non-sparking tools to close container valves.

Use water spray to cool surrounding containers. Be cautious of a Boiling Liquid Evaporating Vapor Explosion, BLEVE, if flame is impinging on surrounding containers. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible withdraw from area and let fire burn. Damaged cylinders should be handled only by specialists.

Specific hazards arising from the chemical

Flammable Gas. The minimum ignition energy for ammonia is very high. It is approximately 500 times greater than the energy required for igniting hydrocarbons and 1,000 to 10,000 times greater than that required for hydrogen; however, low concentrations are required for ignition. Release in a confined space may present an explosion hazard. 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. 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. Corrosive hazard. Wear chemically protective gloves/clothing and eye/face protection.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions	ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). 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. Consider the risk of potentially explosive atmospheres. All equipment used when handling the product must be grounded. Use non-sparking tools and equipment. Use personal protection recommended in Section 8. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe.
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Environmental precautions

Environmental precautions	Prevent spreading of vapors through sewers, ventilation systems and confined areas. Do not allow into any sewer, on the ground or into any body of water. 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	<p>Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Ground and bond all lines and equipment associated with product system. All equipment should be non-sparking and explosion proof. Separate flammable gas cylinders from oxygen and other oxidizers by a minimum distance of 20 ft. or by a 5 ft. high barrier with a minimum fire resistance rating of a half an hour. "NO SMOKING" signs should be posted in storage and use areas.</p> <p>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</p>
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remove over-tight or rusted caps. Use only with adequate ventilation. Use 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.

For additional handling recommendations, consult Compressed Gas Association Pamphlets P-1, G-2, G-2.1, G-2.2, and P-26.

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. Outside or detached storage is preferred.
Incompatible materials	Incompatible with strong acids and bases. Incompatible with oxidizing agents. Corrosive to copper, zinc, and many metal surfaces. Reacts with hypochlorite or other halogen sources to form explosive compounds which are pressure and temperature sensitive.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines

Chemical Name	ACGIH TLV	OSHA PEL	NIOSH IDLH
Ammonia 7664-41-7	STEL: 35 ppm TWA: 25 ppm	TWA: 50 ppm TWA: 35 mg/m ³ (vacated) STEL: 35 ppm (vacated) STEL: 27 mg/m ³	IDLH: 300 ppm TWA: 18 mg/m ³ TWA: 25 ppm STEL: 27 mg/m ³ STEL: 35 ppm

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).
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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.
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Individual protection measures, such as personal protective equipment

Eye/face protection	Tight sealing safety goggles. Face protection shield.
Skin and body protection	Work gloves and safety shoes are recommended when handling cylinders. Take precautionary measures against static discharge. 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.
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.
Odor	Pungent.
Odor threshold	No information available
pH	If dissolved in water, will affect pH value
Melting point	-77.7 °C / -107.9 °F
Evaporation rate	Not applicable
Fire Hazard	Yes
Lower flammability limit:	16%
Upper flammability limit:	25%
Flash point	Not applicable
Autoignition temperature	690 °C / 1274 °F
Decomposition temperature	840°F / 449°C
Water solubility	Completely soluble
Partition coefficient	-1.14
Kinematic viscosity	Not applicable

Chemical Name	Molecular weight	Boiling point	Vapor Pressure	Vapor density (air =1)	Gas Density kg/m ³ @20°C	Critical Temperature
Ammonia	17.03	-33.4 °C	8570 hPa @ 20 °C	0.6	608.7	133.0 °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

May form explosive mixtures with air.

Conditions to avoid

Exposure to air or moisture over prolonged periods.

Incompatible materials

Incompatible with strong acids and bases. Incompatible with oxidizing agents. Corrosive to copper, zinc, and many metal surfaces. Reacts with hypochlorite or other halogen sources to form explosive compounds which are pressure and temperature sensitive.

Hazardous Decomposition Products

Nitrogen oxides (NO_x).

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Inhalation	Corrosive to respiratory system. Contact with moist mucous membranes of the respiratory system can cause burns and lung damage.
Skin contact	Corrosive. Causes severe irritation and or burns.
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	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.
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Delayed and immediate effects as well as chronic effects from short and long-term exposure

Skin corrosion/irritation	Category 1B.
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	Genetic mutations observed in bacterial and mammalian test systems.
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	Not classified.
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.
Target Organ Effects	Respiratory system, Eyes, Skin.
Aspiration hazard	Not classified.

Numerical measures of toxicity

Chemical Name	Oral LD50	Dermal LD50	Inhalation LC50	Inhalation LC50 (CGA P-20)
Ammonia 7664-41-7	350 mg/kg (Rat)	-	-	7738 ppm (Rat) 1 hr

Product Information

Oral LD50	No information available
Dermal LD50	No information available
Inhalation LC50	No information available

12. ECOLOGICAL INFORMATION

Ecotoxicity

Very toxic to aquatic organisms.

Chemical Name	Algae/aquatic plants	Fish	Crustacea
Ammonia 7664-41-7	-	0.44: 96 h Cyprinus carpio mg/L LC50 0.26 - 4.6: 96 h Lepomis macrochirus mg/L LC50 1.17: 96 h Lepomis macrochirus mg/L LC50 flow-through 0.73 - 2.35: 96 h Pimephales promelas	25.4: 48 h Daphnia magna mg/L LC50

		mg/L LC50 5.9: 96 h Pimephales promelas mg/L LC50 static 1.5: 96 h Poecilia reticulata mg/L LC50 1.19: 96 h Poecilia reticulata mg/L LC50 static	
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Persistence and degradability

Not applicable.

Bioaccumulation

No information available.

Chemical Name	Partition coefficient
Ammonia 7664-41-7	-1.14

13. DISPOSAL CONSIDERATIONSWaste 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 INFORMATIONDOT

UN/ID no. UN1005
 Proper shipping name Ammonia, anhydrous
 Hazard Class 2.2
 Special Provisions 4, N87, T50
 Description UN1005, Ammonia, anhydrous, 2.3 (8),
 Additional Description: "Toxic-Inhalation Hazard Zone D" If net weight of product is greater than or equal to 100 lbs., the shipping description must also contain the letters "RQ".
 Additional Marking Requirements: "Inhalation Hazard" If net weight of product is greater than or equal to 100 lbs., the container must also be marked with the letters "RQ".
 Emergency Response Guide Number 125

TDG

UN/ID no. UN1005
 Proper shipping name Ammonia, anhydrous
 Hazard Class 2.3
 Subsidiary class 8
 Description UN1005, Ammonia, anhydrous, 2.3 (8),

MEX

UN/ID no. UN1005
 Proper shipping name Ammonia, anhydrous
 Hazard Class 2.3
 Subsidiary class 8
 Description UN1005, Ammonia, anhydrous, 2.3 (8)

IATA

Forbidden

IMDG

UN/ID no. UN1005
 Proper shipping name Ammonia, anhydrous

Hazard Class	2.3
Subsidiary hazard class	8
EmS-No.	F-C, S-U
Special Provisions	23
Description	UN1005, Ammonia, anhydrous, 2.3 (8), Marine Pollutant

ADR

UN/ID no.	UN1005
Proper shipping name	Ammonia, anhydrous
Hazard Class	2.3
Classification code	2TC
Tunnel restriction code	(C/D)
Special Provisions	23
Description	UN1005, Ammonia, anhydrous, 2.3 (8), (C/D)
Labels	8

15. REGULATORY INFORMATIONInternational Inventories

TSCA	Complies
DSL	Complies
EINECS/ELINCS	Complies

Legend:

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory

DSL/NDL - 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 %
Ammonia - 7664-41-7	1.0

SARA 311/312 Hazard Categories

Acute Health Hazard	Yes
Chronic Health Hazard	Yes
Fire Hazard	Yes
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)
Ammonia 7664-41-7	100 lb	100 lb	100 lb 45.4 kg

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)

Chemical Name	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants	CWA - Hazardous Substances
Ammonia 7664-41-7	100 lb	-	-	X

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
Ammonia	10000 lbs		10000 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
Ammonia 7664-41-7	X	X	X

International Regulations

Chemical Name	Carcinogenicity	Exposure Limits
Ammonia		Mexico: TWA 25 ppm Mexico: TWA 18 mg/m ³ Mexico: STEL 35 ppm Mexico: STEL 27 mg/m ³

16. OTHER INFORMATION

NFPA

Health hazards 3

Flammability 1

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 16-Mar-2015
Revision Date 16-Mar-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

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End of Safety Data Sheet