



# AMMONIA

## Material Safety Data Sheet

### 1. PRODUCT AND COMPANY IDENTIFICATION

Product Name	AMMONIA
Product Code(s)	G-11
UN-Number	UN1005
Recommended Use	Compressed gas.
Synonyms	Ammonia, Anhydrous; Anhydrous Ammonia
Supplier Address*	<p>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</p> <p>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</p> <p>Linde Canada Limited            5860 Chedworth Way            Mississauga, Ontario L5R 0A2            Phone: 905-501-1700            www.lindecana.com</p>

\* 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

<b>DANGER!</b>		
<b>Emergency Overview</b>		
Corrosive Toxic by inhalation The product causes burns of eyes, skin and mucous membranes Very toxic to aquatic organisms Contents under pressure Keep at temperatures below 52°C / 125°F		
Appearance	Colorless	Odor Strong
Physical State		Gas.

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	Harmful by inhalation. 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.
Eyes	Causes burns. Risk of serious damage to eyes.
Skin	Causes burns.
Skin Absorption Hazard	No known hazard by skin absorption.
Ingestion	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	Pre-existing eye disorders. Skin disorders. Respiratory disorders.
Environmental Hazard	Very toxic to aquatic organisms. See Section 12 for additional Ecological Information.

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS-No	Volume %	Chemical Formula
Ammonia	7664-41-7	>99	NH <sub>3</sub>

## 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. Immediately flush with plenty of water. After initial flushing, remove any contact lenses and continue flushing for at least 15 minutes. Keep eye wide open while rinsing. Do not rub affected area.
Skin Contact	Immediate medical attention is required. Wash off immediately with soap and plenty of water for at least 15 minutes while removing all contaminated clothing and shoes.
Inhalation	Move to fresh air. Call a physician or Poison Control Center immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
Ingestion	Immediate medical attention is required. Do NOT induce vomiting. Drink plenty of water. Never give anything by mouth to an unconscious person. Call a physician or Poison Control Center immediately.
Notes to Physician	Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated. Do not give chemical antidotes. Asphyxia from glottal edema may occur. Marked decrease in blood pressure may occur with moist rales, frothy sputum, and high pulse pressure. Treat symptomatically.
Protection of First-aiders	Use personal protective equipment. Avoid contact with skin, eyes and clothing.

## 5. FIRE-FIGHTING MEASURES

Flammable Properties	Not flammable. 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.
Suitable Extinguishing Media	Dry chemical, CO <sub>2</sub> or water spray.
<u>Explosion Data</u>	
Sensitivity to Mechanical Impact	None
Sensitivity to Static Discharge	None
Specific Hazards Arising from the Chemical	The product causes burns of eyes, skin and mucous membranes. In the event of fire and/or explosion do not breathe fumes. Do not allow run-off from fire fighting to enter drains or water courses. Runoff may pollute waterways. Cylinders may rupture under extreme heat. Continue to cool fire exposed cylinders until flames are extinguished. 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.

## 6. ACCIDENTAL RELEASE MEASURES

Personal Precautions	Evacuate personnel to safe areas. Use personal protective equipment. Keep people away from and upwind of spill/leak. Do not get in eyes, on skin, or on clothing. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
Environmental Precautions	Do not allow material to contaminate ground water system. Should not be released into the environment. Prevent further leakage or spillage if safe to do so. 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	Wear personal protective equipment. Avoid contact with skin, eyes and clothing.
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Keep away from heat, sparks and open flame. No smoking. To avoid ignition of vapors by static electricity discharge, all metal parts of the equipment must be grounded. When moving cylinders, even for short distance, use a cart designed to transport cylinders.

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. 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.

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.

For additional recommendations consult Compressed Gas Association's (CGA) Safety Bulletin SB-2, Oxygen-Deficient Atmospheres.

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

Storage

Protect from physical damage. Cylinders should be stored upright with valve protection cap in place and firmly secured to prevent falling. Store in a cool, dry area away from potential sources of heat, open flames, sunlight or other chemicals. 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

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 <sup>3</sup> (vacated) STEL: 35 ppm (vacated) STEL: 27 mg/m <sup>3</sup>	IDLH: 300 ppm TWA: 18 mg/m <sup>3</sup> TWA: 25 ppm STEL: 27 mg/m <sup>3</sup> STEL: 35 ppm

*Immediately Dangerous to Life or Health.*

Engineering Measures                      Showers. Eyewash stations. Ventilation systems.

Ventilation                                      Ensure adequate ventilation, especially in confined areas.

Personal Protective Equipment

Eye/Face Protection                      Tightly fitting safety goggles. Face-shield.

Skin and Body Protection                      Boots. Impervious butyl rubber gloves.

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.
Hygiene Measures	When using, do not eat, drink or smoke. Remove and wash contaminated clothing before re-use. Provide regular cleaning of equipment, work area and clothing. Avoid contact with skin, eyes and clothing. For environmental protection, remove and wash all contaminated protective equipment before re-use. Keep away from food, drink and animal feeding stuffs.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Colorless.	Odor	Strong.
Odor Threshold	No information available	Physical State	Gas
Flash Point	No information available.	Autoignition Temperature	690 °C / 1274 °F
Decomposition Temperature	No information available.	Decomposition Temperature °C	840 °C
Boiling Point/Boiling Range	-33.3 °C / -28.8 °F	Freezing Point	-77.7 °C / -107.9 °F
Molecular Weight	17.03	Water Solubility	Completely soluble
Evaporation Rate	No information available	Vapor Pressure	94 PSIA @ 70°F
Vapor Density	0.62 (air = 1)	VOC Content (%)	Not applicable.
Flammability Limits in Air			
Upper	30.2%		
Lower	15%		

## 10. STABILITY AND REACTIVITY

Stability	Stable under recommended storage conditions.
Incompatible Products	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.
Conditions to Avoid	Exposure to air or moisture over prolonged periods.
Hazardous Decomposition Products	Nitrogen oxides (NOx).
Hazardous Polymerization	Hazardous polymerization does not occur.

## 11. TOXICOLOGICAL INFORMATION

### Acute Toxicity

#### Product Information

LD50 Oral:  
350 mg/kg (Rat)

LD50 Dermal: No information available.

LC50 Inhalation: 7338 ppm (Rat) 1hr - CGA

Inhalation Irritating to respiratory system. Contact with moist mucous membranes of the respiratory system can cause burns and lung damage.

Eye Contact	Corrosive to the eyes and may cause severe damage including blindness.
Skin Contact	Contact causes severe skin irritation and possible burns.
Repeated Dose Toxicity	Toxic effects to the respiratory system, liver, kidneys and bladder observed in mammalian species from prolonged exposures to above 100 ppm.
<u>Chronic Toxicity</u>	
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	There are no known carcinogenic chemicals in this product.
Irritation	No information available.
Sensitization	No information available.
Mutagenic Effects	Genetic mutations observed in bacterial and mammalian test systems.
Reproductive Toxicity	No information available.
Developmental Toxicity	No information available.
Synergistic Materials	Combined effects of inhaled ammonia and carbon particles in the rat have been reported to be greater than effects caused by ammonia or carbon alone.
Target Organ Effects	Eyes. Respiratory system. Skin.

## 12. ECOLOGICAL INFORMATION

### Ecotoxicity

Harmful to aquatic organisms. Very toxic to aquatic organisms.

Ozone depletion potential; ODP; (R-11 = 1): Does not contain ozone depleting chemical (40 CFR Part 82).

Chemical Name	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Daphnia Magna (Water Flea)

Ammonia	LC50 96 h: 0.26 - 4.6 mg/L (Lepomis macrochirus) LC50 96 h: 0.73 - 2.35 mg/L (Pimephales promelas) LC50 96 h: = 0.44 mg/L (Cyprinus carpio) LC50 96 h: = 1.17 mg/L flow-through (Lepomis macrochirus) LC50 96 h: = 1.19 mg/L static (Poecilia reticulata) LC50 96 h: = 5.9 mg/L static (Pimephales promelas) LC50 96 h: > 1.5 mg/L (Poecilia reticulata)	LC50 48 h: = 25.4 mg/L (Daphnia magna)
Chemical Name		Log Pow
Ammonia		-1.14

### 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.

### 14. TRANSPORT INFORMATION

#### DOT

Proper shipping name	Ammonia, anhydrous
Hazard Class	2.2
UN-Number	UN1005
Special Provisions	This material is toxic by inhalation in Hazard Zone D.
Description	UN1005, Ammonia, anhydrous, 2.2
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

Proper Shipping Name	Ammonia, anhydrous
Hazard Class	2.3
Subsidiary Class	8
UN-Number	UN1005
Description	UN1005, AMMONIA, ANHYDROUS, 2.3

#### MEX

Proper Shipping Name	Ammonia, anhydrous
Hazard Class	2.3
Subsidiary Class	8
UN-Number	UN1005
Description	UN1005, Ammonia, anhydrous, 2.3

IATA

Maximum Quantity for Passenger	Forbidden
Maximum Quantity for Cargo Only	Forbidden
Limited Quantity	No information available.

IMDG/IMO

Proper Shipping Name	Ammonia, anhydrous
Hazard Class	2.3
Subsidiary Class	8
UN-Number	UN1005
EmS No.	F-C, S-U
Description	UN1005, Ammonia, anhydrous, 2.3(8)

ADR

Proper Shipping Name	Ammonia, anhydrous
Hazard Class	2
UN-Number	UN1005
Classification Code	2TC
Description	UN1005, Ammonia, anhydrous, 2

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 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 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	CAS-No	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	No
Sudden Release of Pressure Hazard	Yes
Reactive Hazard	Yes

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	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	20000 lbs		15000 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.

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):

Chemical Name	Hazardous Substances RQs	Extremely Hazardous Substances RQs	TPQ
Ammonia	100 lb	100 lb	500 lb

U.S. State Regulations

California Proposition 65

This product does not contain any Proposition 65 chemicals.

U.S. State Right-to-Know Regulations

This product does not contain any substances regulated by state right-to-know regulations.

Chemical Name	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Ammonia	X	X	X		X

International Regulations

Chemical Name	Carcinogen Status	Exposure Limits
Ammonia		Mexico: TWA 25 ppm Mexico: TWA 18 mg/m <sup>3</sup> Mexico: STEL 35 ppm Mexico: STEL 27 mg/m <sup>3</sup>

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
- D1B Toxic materials
- E Corrosive material
- A Compressed gases



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Revision Note                      Not applicable.

<u>NFPA</u>	Health Hazard 3	Flammability 1	Stability 0	Physical and Chemical Hazards -
<u>HMIS</u>	Health Hazard 3*	Flammability 1	Physical Hazard 2	Personal Protection -

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.

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End of Safety Data Sheet