



AMMONIA - DEUTERATED

Material Safety Data Sheet

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name	AMMONIA - DEUTERATED
Product Code(s)	1048
UN-Number	UN1005
Recommended Use	Compressed gas.
Synonyms	Ammonia-d3; Ammonia Deuteride; Heavy 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

DANGER!		
Emergency Overview		
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	Physical State Gas.	Odor Strong

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.
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 - D3	13550-49-7	>99	ND ₃

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 classified as a 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.
Suitable Extinguishing Media	Dry chemical, CO ₂ 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. 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.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions	Evacuate personnel to safe areas. 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

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Handling

Wear personal protective equipment. Avoid contact with skin, eyes and clothing.

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.

Handle in accordance with good industrial hygiene and safety practice.

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 - D3 13550-49-7	25 ppm TWA (Ammonia) 35 ppm STEL (Ammonia)	50 ppm (Ammonia) 35 ppm STEL (Ammonia)	300 ppm (Ammonia)

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.

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	0.6 - 53 ppm	Physical State	Gas
Flash Point	No information available.	Autoignition Temperature	651°C / 1204°F
Decomposition Temperature	No information available.	Boiling Point/Boiling Range	-30.9°C / -23.62°F
Freezing Point	-78°C / -108°F	Molecular Weight	20.054
Water Solubility	Soluble in water.	Evaporation Rate	No information available
Vapor Pressure	786.7 kPa @ 21.1°C	Vapor Density	0.5970 (air = 1)
Gas Density	@ 21.1°C: 0.0519 lb/ft ³ (0.831 kg/m ³)	VOC Content (%)	Not applicable.
Critical Pressure	113 bar	Flammability Limits in Air	
		Upper	28%
		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 (NO _x).
Hazardous Polymerization	Hazardous polymerization does not occur.

11. TOXICOLOGICAL INFORMATION

Acute Toxicity

Product Information

LD50 Oral:	350 mg/kg (Rat), Anhydrous Ammonia.
LD50 Dermal:	No information available.
LC50 Inhalation:	7338 ppm (Rat) 1hr - CGA, Anhydrous Ammonia.
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.
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).

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	Ammonia, anhydrous (Deuterated Ammonia)
Hazard Class	2.2
Subsidiary Class	None

UN-Number	UN1005
Special Provisions	This material is toxic by inhalation in Hazard Zone D.
Description	UN1005,Ammonia, anhydrous,2.2
Additional Description:	"Inhalation Hazard" Packing Requirements 173.304
Additional Marking Requirements:	If net weight of product is greater than or equal to .? lbs., the container must also be marked with the letters "RQ".
Emergency Response Guide Number	125

TDG

Proper Shipping Name	Ammonia, anhydrous (Deuterated Ammonia)
Hazard Class	2.2
Subsidiary Class	2.3, (8)
UN-Number	UN1005
Description	UN1005,AMMONIA, ANHYDROUS,2.2,2.3, (8)

MEX

Proper Shipping Name	Ammonia, anhydrous (Deuterated Ammonia)
Hazard Class	2.2
Subsidiary Class	8
UN-Number	UN1005
Description	UN1005 Ammonia, anhydrous,2.2

IATA

UN-Number	UN1005
Proper Shipping Name	Ammonia, anhydrous (Deuterated Ammonia)
Hazard Class	2.2
Subsidiary Class	8
ERG Code	2CP
Description	UN1005,Ammonia, anhydrous,2.2(8)
Maximum Quantity for Passenger	Forbidden
Maximum Quantity for Cargo Only	Forbidden
Limited Quantity	No information available.

IMDG/IMO

Proper Shipping Name	Ammonia, anhydrous (Deuterated Ammonia)
Hazard Class	2.2
Subsidiary Class	8
UN-Number	UN1005
EmS No.	F-C, S-U
Description	UN1005, Ammonia, anhydrous,2.2(8)

ADR

Proper Shipping Name	Ammonia, anhydrous (Deuterated Ammonia)
Hazard Class	2.2
UN-Number	UN1005
Classification Code	2TC
Description	UN1005 Ammonia, anhydrous,2.2

15. REGULATORY INFORMATION

International Inventories

15. REGULATORY INFORMATION

TSCA	Complies
DSL	Does not Comply
EINECS/ELINCS	Complies

NOTE: Material may be used under R&D or other exemption.

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	Yes
Sudden Release of Pressure Hazard	Yes
Reactive Hazard	Yes

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, does not contain any regulated substances with specified thresholds under 40 CFR Part 68.

This product does not contain any substances regulated as Highly Hazardous Chemicals pursuant to the 29 CFR Part 1910.110.

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, does not contain any 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). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material.

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.

International Regulations

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

E Corrosive material
 D1B Toxic materials
 A Compressed gases



16. OTHER INFORMATION

Prepared By Product Stewardship
 23 British American Blvd.
 Latham, NY 12110
 1-800-572-6501

Issuing Date 14-Feb-2011

Revision Date

Revision Number 0

Revision Note Initial Release.

<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