

Ammonia**002****SECTION 1. Identification of the substance/mixture and of the company/undertaking****1.1. Product identifier**

Trade name : Ammonia , AMMONIA (N26, N38, N50, N60, UHP)
SDS no : 002
Chemical description : Anhydrous ammonia
CAS No :7664-41-7
EC No :231-635-3
Index No :007-001-00-5
Registration-No. : 01-2119488876-14-
Chemical formula : NH₃

1.2. Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses : Industrial and professional. Perform risk assessment prior to use.
Test gas / Calibration gas. Chemical reaction / Synthesis. Laboratory use.
Contact supplier for more uses information.
Use as refrigerant. Use for metal treatment. Use for manufacture of electronic/photovoltaic components. Water treatment.
Uses advised against : Consumer use.

1.3. Details of the supplier of the safety data sheet

Company identification : AIR LIQUIDE Deutschland GmbH
Hans-Günther-Sohl-Straße 5
D-40235 Düsseldorf GERMANY
Telefon: +49 (0)211 6699-0 - Fax: +49 (0)211 6699-222
E-Mail address (competent person) : Info.SDB@AirLiquide.de

1.4. Emergency telephone number

Emergency telephone number : +49 (0)2151 398668
- Availability : (24 / 7)

SECTION 2. Hazards identification**2.1. Classification of the substance or mixture****Hazard Class and Category Code(s), Regulation (EC) No 1272/2008 (CLP)**

- Health hazards : Acute toxicity, Inhalation - Category 3 - Danger - (CLP : Acute Tox. 3) - H331
Skin corrosion - Category 1B - Danger - (CLP : Skin Corr. 1B) - H314
Serious eye damage - Category 1 - Danger - (CLP : Eye Dam. 1) - H318
- Physical hazards : Flammable gases - Category 2 - Warning - (CLP : Flam. Gas 2) - H221
Gases under pressure - Liquefied gas - Warning - (CLP : Press. Gas) - H280
- Environmental hazards : Hazardous to the aquatic environment - Acute hazard - Category 1 - Warning - (CLP : Aquatic Acute 1) - H400
Hazardous to the aquatic environment - Chronic hazard - Category 2 - (CLP : Aquatic Chronic 2) - H411

2.2. Label elements**Labelling Regulation EC 1272/2008 (CLP)**

- Hazard pictograms



- Hazard pictograms code : GHS06 - GHS05 - GHS04 - GHS09

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SECTION 2. Hazards identification (continued)

- **Signal words** : Danger
- **Hazard statements** : H221 - Flammable gas.
H280 - Contains gas under pressure; may explode if heated.
H314 - Causes severe skin burns and eye damage.
H331 - Toxic if inhaled.
H410 - Very toxic to aquatic life with long lasting effects.
- **Supplemental hazard information** : EUH071 - Corrosive to respiratory tract.
- **Precautionary statements**
 - **Prevention** : P260 - Do not breathe gas, vapours.
P280 - Wear protective gloves, protective clothing, eye protection, face protection.
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources.
No smoking.
P273 - Avoid release to the environment.
 - **Response** : P304+P340+P315 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Get immediate medical advice / attention.
P305+P351+P338+P315 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get immediate medical advice / attention.
P303+P361+P353+P315 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. Get immediate medical advice / attention.
P377 - Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381 - Eliminate all ignition sources if safe to do so.
 - **Storage** : P403 - Store in a well-ventilated place.
P405 - Store locked up.

2.3. Other hazards

- Other hazards : Contact with liquid may cause cold burns/frostbite.

SECTION 3. Composition/information on ingredients

3.1. Substance / 3.2. Mixture

Substance.

Substance name	Content [Vol-%]	CAS No EC No Index No Registration no.	Classification(DSD)	Classification(CLP)
Anhydrous ammonia	: 100 %	7664-41-7 231-635-3 007-001-00-5 01-2119488876-14-		Acute Tox. 3 (H331) Flam. Gas 2 (H221) Skin Corr. 1B (H314) Eye Dam 1 (H318) Liq. Gas (H280) Aquatic Acute 1 (H400) Aquatic Chronic 2 (H411)

Contains no other components or impurities which will influence the classification of the product.

* 1: Listed in Annex IV / V REACH, exempted from registration.

* 2: Registration deadline not expired.

* 3: Registration not required: Substance manufactured or imported < 1t/y Full text of R-phrases see chapter 16. Full text of H-statements see chapter 16



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SECTION 4. First aid measures

4.1. Description of first aid measures

- Inhalation : Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.
- Skin contact : Remove contaminated clothing. Drench affected area with water for at least 15 minutes.
- Eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes.
- Ingestion : Ingestion is not considered a potential route of exposure.

4.2. Most important symptoms and effects, both acute and delayed

- : May cause severe chemical burns to skin and cornea. Suitable first-aid treatment should be immediately available. Seek medical advice before using product.
Prolonged exposure to small concentrations may result in pulmonary oedema.
Refer to section 11.

4.3. Indication of any immediate medical attention and special treatment needed

- : Obtain medical assistance.
Treat with corticosteroid spray as soon as possible after inhalation

SECTION 5. Fire-fighting measures

5.1. Extinguishing media

- Suitable extinguishing media : Foam.
Carbon dioxide.
Water spray or fog.
- Unsuitable extinguishing media : Do not use water jet to extinguish.

5.2. Special hazards arising from the substance or mixture

- Specific hazards : Exposure to fire may cause containers to rupture/explode.
- Hazardous combustion products : If involved in a fire the following toxic and/or corrosive fumes may be produced by thermal decomposition : Nitric oxide/nitrogen dioxide.

5.3. Advice for firefighters

- Specific methods : Move containers away from the fire area if this can be done without risk.
Do not extinguish a leaking gas flame unless absolutely necessary. Spontaneous/explosive re-ignition may occur. Extinguish any other fire.
If possible, stop flow of product.
Use fire control measures appropriate to the surrounding fire. Exposure to fire and heat radiation may cause gas receptacles to rupture. Cool endangered receptacles with water spray jet from a protected position. Prevent water used in emergency cases from entering sewers and drainage systems.
Use water spray or fog to knock down fire fumes if possible.
- Special protective equipment for fire fighters : Wear gas tight chemically protective clothing in combination with self contained breathing apparatus.
Standard EN 137 - Self-contained open-circuit compressed air breathing apparatus with full face mask.
EN 943-2: Protective clothing against liquid and gaseous chemicals, aerosols and solid particles. Gas-tight chemical protective suits for emergency teams.



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SECTION 6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

- : Act in accordance with local emergency plan.
- Stay upwind.
- Ensure adequate air ventilation.
- Evacuate area.
- Wear gas tight chemically protective clothing in combination with self contained breathing apparatus.
- Try to stop release.
- Monitor concentration of released product.

6.2. Environmental precautions

- : Try to stop release.
- Reduce vapour with fog or fine water spray.

6.3. Methods and material for containment and cleaning up

- : Keep area evacuated and free from ignition sources until any spilled liquid has evaporated. (Ground free from frost).
- Wash contaminated equipment or sites of leaks with copious quantities of water.
- Hose down area with water.
- Ventilate area.

6.4. Reference to other sections

- Reference to other sections : See also sections 8 and 13.

SECTION 7. Handling and storage

7.1. Precautions for safe handling

Safe use of the product

- : Do not breathe gas.
- Avoid release of product into atmosphere.
- Take precautionary measures against static discharge.
- Keep away from ignition sources (including static discharges).
- Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Contact your gas supplier if in doubt.
- Avoid exposure, obtain special instructions before use.
- Do not smoke while handling product.
- Avoid suck back of water, acid and alkalis.
- Only experienced and properly instructed persons should handle gases under pressure.
- Ensure the complete gas system was (or is regularly) checked for leaks before use.
- Installation of a cross purge assembly between the cylinder and the regulator is recommended.
- Purge system with dry inert gas (e.g. helium or nitrogen) before gas is introduced and when system is placed out of service.
- Assess the risk of potentially explosive atmosphere and the need for explosion-proof equipment.
- Consider the use only non-sparking tools.
- The product must be handled in accordance with good industrial hygiene and safety procedures.
- Consider pressure relief device(s) in gas installations.

Safe handling of the gas receptacle

- : Refer to supplier's container handling instructions.
- Do not allow backfeed into the container.
- Replace valve outlet caps or plugs and container caps where supplied as soon as container is disconnected from equipment.
- Protect cylinders from physical damage; do not drag, roll, slide or drop.
- Do not remove or deface labels provided by the supplier for the identification of the cylinder contents.
- When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders.
- Leave valve protection caps in place until the container has been secured against either a wall

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or bench or placed in a container stand and is ready for use.
If user experiences any difficulty operating cylinder valve discontinue use and contact supplier.
Close container valve after each use and when empty, even if still connected to equipment.
Never attempt to repair or modify container valves or safety relief devices.
Keep container valve outlets clean and free from contaminants particularly oil and water.
Never attempt to transfer gases from one cylinder/container to another.
Never use direct flame or electrical heating devices to raise the pressure of a container.
Damaged valves should be reported immediately to the supplier.

7.2. Conditions for safe storage, including any incompatibilities

: Keep container below 50°C in a well ventilated place.
Segregate from oxidant gases and other oxidants in store. Store containers in location free from fire risk and away from sources of heat and ignition. Stored containers should be periodically checked for general condition and leakage.
Observe all regulations and local requirements regarding storage of containers.
Containers should not be stored in conditions likely to encourage corrosion. Containers should be stored in the vertical position and properly secured to prevent toppling. Container valve guards or caps should be in place. All electrical equipment in the storage areas should be compatible with the risk of potentially explosive atmosphere. Keep away from combustible materials.

7.3. Specific end use(s)

: None.

SECTION 8. Exposure controls/personal protection**8.1. Control parameters****Occupational Exposure Limits****Anhydrous ammonia**

: ILV (EU) - 8 H - [mg/m³] : 14
: ILV (EU) - 8 H - [ppm] : 20
: ILV (EU) - 15 min - [mg/m³] : 36
: ILV (EU) - 15 min - [ppm] : 50
: AGW (8h) - Germany [mg/m³] TRGS 900 : 14 TRGS 12/07
: AGW (8h) - Germany [ppm] TRGS 900 : 20 TRGS 12/07
: Exceeding factor AGW - Germany TRGS 900 : 2 TRGS 12/07

DNEL: Derived no effect level (Workers)

: No data available.

PNEC: Predicted no effect concentration**Anhydrous ammonia**

: Aqua (freshwater) [mg/l] : 0.0011
: Aqua (marine water) [mg/l] : 0.0011

8.2. Exposure controls**8.2.1. Appropriate engineering controls**

: Provide adequate general and local exhaust ventilation.
Alarm detectors should be used when toxic gases may be released.
Systems under pressure should be regularly checked for leakages.
Product to be handled in a closed system.
Ensure exposure is below occupational exposure limits (where available).
Consider work permit system e.g. for maintenance activities.
Preferably use only permanent leak-tight installations (e.g. welded pipes).

8.2.2. Individual protection measures, e.g. personal protective equipment

: Protect eyes, face and skin from liquid splashes.
A risk assessment should be conducted and documented in each work area to assess the risks related to the use of the product and to select the PPE that matches the relevant risk.

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SECTION 8. Exposure controls/personal protection (continued)

- The following recommendations should be considered.
PPE compliant to the recommended EN/ISO standards should be selected.
- **Eye/face protection** : Wear goggles and a face shield when transfilling or breaking transfer connections
Wear safety glasses with side shields
Provide readily accessible eye wash stations and safety showers.
Standard EN 166 - Personal eye-protection.
 - **Skin protection**
 - **Hand protection** : Standard EN 374 - Protective gloves against chemicals.
Wear working gloves when handling gas containers.
Standard EN 388 - Protective gloves against mechanical risk.
Wear chemically resistant protective gloves.
Permeation time: minimum >480min long term exposure; material / thickness [mm]:
Consult glove manufacturer's product information on material suitability and material thickness.
The breakthrough time of the selected gloves must be greater than the intended use period.
Chloroprene rubber (CR) / 0,5
Butyl rubber (IIR) / 0,7
Permeation time: minimum >30min short term exposure; material / thickness [mm]:
 - **Other** : Keep suitable chemically resistant protective clothing readily available for emergency use.
Consider the use of flame resistant anti-static safety clothing.
Standard EN ISO 14116 - Limited flame spread materials.
Standard EN ISO 1149-5 - Protective clothing: Electrostatic properties.
Wear safety shoes while handling containers.
Standard EN ISO 20345 - Personal protective equipment - Safety footwear.
Standard EN943-1 - Full protective suits against liquid, solid and gaseous chemicals.
 - **Respiratory protection** : Keep self contained breathing apparatus readily available for emergency use.
Use gas filters and full face mask, where exposure limits may be exceeded for a short-term period, e.g. connecting or disconnecting containers.
Gas filters do not protect against oxygen deficiency.
Gas filters may be used if all surrounding conditions e.g. type and concentration of the contaminant(s) and duration of use are known.
Standard EN 14387 - Gas filter(s), combined filter(s) and full face mask - EN 136.
Consult respiratory device supplier's product information for the selection of the appropriate device.
Standard EN 137 - Self-contained open-circuit compressed air breathing apparatus with full face mask.
Self contained breathing apparatus is recommended, where unknown exposure may be expected, e.g. during maintenance activities on installation systems.
 - **Thermal hazards** : None necessary.
 - 8.2.3. **Environmental exposure controls** : Refer to local regulations for restriction of emissions to the atmosphere. See section 13 for specific methods for waste gas treatment.

SECTION 9. Physical and chemical properties

9.1. Information on basic physical and chemical properties

- Appearance
- Physical state at 20°C / 101.3kPa : Gas.
- Colour : Colourless.
- Odour : Ammoniacal.
- Odour threshold : Odour threshold is subjective and inadequate to warn for overexposure.
- pH value : If dissolved in water pH-value will be affected.
- Molar mass [g/mol] : 17
- Melting point [°C] : -77.7

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Boiling point [°C]	: -33
Critical temperature [°C]	: 132
Flash point [°C]	: Not applicable for gases and gas-mixtures.
Evaporation rate (ether=1)	: Not applicable for gases and gas-mixtures.
Flammability range [vol% in air]	: 15.4 to 33.6
Vapour pressure [20°C]	: 8.6 bar
Relative density, gas (air=1)	: 0.6
Relative density, liquid (water=1)	: 0.7
Solubility in water [mg/l]	: 517000
Partition coefficient n-octanol/water [log Pow]	: Not applicable for inorganic gases.
Auto-ignition temperature [°C]	: 630
Viscosity at 20°C [mPa.s]	: Not applicable.
Explosive Properties	: Not applicable.
Oxidising properties	: None.

9.2. Other information

Other data : None.

SECTION 10. Stability and reactivity**10.1. Reactivity**

: No reactivity hazard other than the effects described in sub-sections below.

10.2. Chemical stability

: Stable under normal conditions.

10.3. Possibility of hazardous reactions: Can form explosive mixture with air.
May react violently with oxidants.**10.4. Conditions to avoid**

: Keep away from heat/sparks/open flames/hot surfaces. – No smoking.

10.5. Incompatible materials: Reacts with water to form corrosive alkalis.
May react violently with acids.
Air, Oxidiser.
For additional information on compatibility refer to ISO 11114**10.6. Hazardous decomposition products**

: Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Ammonia**002****SECTION 11. Toxicological information****11.1. Information on toxicological effects**

Acute toxicity	: Inhalation of large amounts leads to bronchospasm, laryngeal oedema and pseudomembrane formation.
Rat inhalation LC50 [ppm/4h]	: 2000
Skin corrosion/irritation	: May cause inflammation of the skin.
Serious eye damage/irritation	: Irritation to eyes.
Respiratory or skin sensitisation	: No known effects from this product.
Carcinogenicity	: No known effects from this product.
Germ cell mutagenicity	: No known effects from this product.
Reproductive toxicity	: No known effects from this product.
STOT-single exposure	: May cause inflammation of the respiratory system.
STOT-repeated exposure	: No known effects from this product.
Aspiration hazard	: Not applicable for gases and gas-mixtures.

SECTION 12. Ecological information**12.1. Toxicity**

Assessment	: Very toxic to aquatic life.
EC50 48h - Daphnia magna [mg/l]	: 101
EC50 72h - Algae [mg/l]	: No data available.
LC50-96h - fish [mg/l]	: 0.89

12.2. Persistence and degradability

Assessment	: The substance is biodegradable. Unlikely to persist.
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12.3. Bioaccumulative potential

Assessment	: Not expected to bioaccumulate due to the low log Kow (log Kow < 4). Refer to section 9.
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12.4. Mobility in soil

Assessment	: Because of its high volatility, the product is unlikely to cause ground or water pollution.
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12.5. Results of PBT and vPvB assessment

: Not classified as PBT or vPvB.

12.6. Other adverse effects

	: May cause pH changes in aqueous ecological systems.
Effect on ozone layer	: None.
Effect on the global warming	: No known effects from this product.

Ammonia**002****SECTION 13. Disposal considerations****13.1. Waste treatment methods**

- : Must not be discharged to atmosphere.
- Toxic and corrosive gases formed during combustion should be scrubbed before discharge to atmosphere.
- Gas may be scrubbed in water.
- Gas may be scrubbed in sulphuric acid solution.
- Refer to the code of practice of EIGA (Doc. 30/10 "Disposal of Gases, downloadable at <http://www.eiga.org>) for more guidance on suitable disposal methods
- Ensure that the emission levels from local regulations or operating permits are not exceeded.
- : 16 05 04: Gases in pressure containers (including halons) containing dangerous substances.

List of hazardous waste codes (from Commission Decision 2001/118/EC)

13.2. Additional information

- : None.

SECTION 14. Transport information**14.1. UN number**

- UN number : 1005
Labelling ADR, IMDG, IATA



- : 2.3 : Toxic gas.
- 8 : Corrosive substance.
- Environmentally hazardous substance

14.2. UN proper shipping name

- Transport by road/rail (ADR/RID) : AMMONIA, ANHYDROUS
Transport by air (ICAO-TI / IATA-DGR) : AMMONIA, ANHYDROUS
Transport by sea (IMDG) : AMMONIA, ANHYDROUS

14.3. Transport hazard class(es)

- Transport by road/rail (ADR/RID)
Class : 2
Classification code : 2 TC
H.I. nr : 268
Tunnel Restriction : C/D : Passage forbidden through tunnels of category C when carried in tanks. Passage forbidden through tunnels of category D and E.
- Transport by air (ICAO-TI / IATA-DGR)
Transport by sea (IMDG)
Emergency Schedule (EmS) - Fire : F-C
Emergency Schedule (EmS) - Spillage : S-U

14.4. Packing group

- Transport by road/rail (ADR/RID) : Not applicable.
Transport by air (ICAO-TI / IATA-DGR) : Not applicable.



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Transport by sea (IMDG) : Not applicable.

14.5. Environmental hazards

Transport by road/rail (ADR/RID) : Environmentally hazardous substance / mixture.

Transport by air (ICAO-TI / IATA-DGR) : Environmentally hazardous substance / mixture.

Transport by sea (IMDG) : Yes

14.6 Special precautions for user

Packing Instruction(s)

Transport by road/rail (ADR/RID) : P200

Transport by air (ICAO-TI / IATA-DGR)

Passenger and Cargo Aircraft : DO NOT LOAD IN PASSENGER AIRCRAFT.

Cargo Aircraft only : FORBIDDEN.

Transport by sea (IMDG) : P200

Special precautions for user : - Ensure there is adequate ventilation.
Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency.
Before transporting product containers :
- Ensure that containers are firmly secured.
- Ensure cylinder valve is closed and not leaking.
- Ensure valve outlet cap nut or plug (where provided) is correctly fitted.
- Ensure valve protection device (where provided) is correctly fitted.
Avoid transport on vehicles where the load space is not separated from the driver's compartment.

14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code : Not applicable.

SECTION 15. Regulatory information**15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture****EU legislation**

Restrictions on use : None.

Seveso directive 96/82/EC : Listed.

National legislation

: Ensure all national/local regulations are observed.
: [German regulations] Betriebsicherheitsverordnung, Technische Regeln zur Betriebssicherheitsverordnung (TRBSen), Gefahrstoffverordnung, Technische Regeln zur Gefahrstoffverordnung (TRGSen), BGR 104, BGI, VwVwS, BGI104

- 4. BlmschV (Germany) : Listed.

- Water hazard class (WGK) : WGK Germany: 2 - Hazard to waters.

15.2. Chemical safety assessment

: A Chemical safety assessment (CSA) has been carried out for this product.



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SECTION 16. Other information

- Indication of changes** : Revised safety data sheet in accordance with commission regulation (EU) No 453/2010
- Training advice** : Users of breathing apparatus must be trained.
Ensure operators understand the toxicity hazard.
- Further information** : This Safety Data Sheet has been established in accordance with the applicable European Union legislation.
- List of full text of H-statements in section 3.** : H221 - Flammable gas.
H280 - Contains gas under pressure; may explode if heated.
H314 - Causes severe skin burns and eye damage.
H318 - Causes serious eye damage.
H331 - Toxic if inhaled.
H400 - Very toxic to aquatic life.
H411 - Toxic to aquatic life with long lasting effects.
- DISCLAIMER OF LIABILITY** : Before using this product in any new process or experiment, a thorough material compatibility and safety study should be carried out. Details given in this document are believed to be correct at the time of going to press. Whilst proper care has been taken in the preparation of this document, no liability for injury or damage resulting from its use can be accepted.

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