

Anhydrous ammonia

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product form	: Substance
Trade name	: Anhydrous ammonia Anhydrous ammonia 2.5 Anhydrous ammonia 3.8 Anhydrous ammonia 4.0 Anhydrous ammonia 5.0 Anhydrous ammonia 5.5
SDS code	: 002
Internal reference no.	: 002845
Chemical description	: Ammonia
CAS-No.	: 7664-41-7
EC-No.	: 231-635-3
EC Index-No.	: 007-001-00-5
Registration-No.	: 01-2119488876-14
Chemical formula	: NH ₃

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. Contact supplier for more information on uses.
Uses advised against	: Consumer use.

1.3. Details of the supplier of the safety data sheet

Company identification	: Sapio Produzione Idrogeno Ossigeno Srl Via S. Pellico, 48 20900 Monza - ITALIA +39 039 83981 +39 039 836068 http://www.sapio.it/ sds@sapio.it
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1.4. Emergency telephone number

Emergency telephone number	: +39 0295705444 (24/7)
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SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Physical hazards	Flammable gases, Category 2	H221
	Gases under pressure: Liquefied gas	H280
	Acute toxicity (inhalation:gas) Category 3	H331
Health hazards	Skin corrosion/irritation, Category 1B	H314
	Serious eye damage/eye irritation, Category 1	H318
Environmental hazards	Hazardous to the aquatic environment — Acute Hazard, Category 1	H400
	Hazardous to the aquatic environment — Chronic Hazard, Category 2	H411

2.2. Label elements

Labelling according to Regulation (EC) No. 1272/2008 [CLP]

Hazard pictograms (CLP)	:    
	: GHS04 GHS05 GHS06 GHS09

Signal word (CLP)	: Danger
Hazard statements (CLP)	: 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.
	: EUH071 - Corrosive to the respiratory tract.

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Precautionary statements (CLP)

- Prevention : P273 - Avoid release to the environment.
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.
- Response : 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.
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.
P377 - Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381 - In case of leakage, eliminate all ignition sources.
- Storage : P405 - Store locked up.
P403 - Store in a well-ventilated place.

2.3. Other hazards

Other hazards not contributing to the classification : None.

SECTION 3: Composition/information on ingredients

3.1. Substances

Name	Product identifier	%	Classification according to Regulation (EC) No. 1272/2008 [CLP]
Anhydrous ammonia	CAS-No.: 7664-41-7 EC-No.: 231-635-3 EC Index-No.: 007-001-00-5 Registration-No.: 01-2119488876-14	100	Fam. Gas 2, H221 Press. Gas (Liq.), H280 Acute Tox. 3 (Inhalation:gas), H331 Skin Corr. 1B, H314 Eye Dam. 1, H318 Aquatic Acute 1, H400 Aquatic Chronic 2, H411

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

3.2. Mixtures

Not applicable

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. Perform cardiopulmonary resuscitation if breathing stopped.
- Skin contact : Remove contaminated clothing. Drench affected area with water for at least 15 minutes. In case of frostbite spray with water for at least 15 minutes. Apply a sterile dressing. Obtain medical assistance.
- 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.
Material is destructive to tissue of the mucuous membranes and upper respiratory tract. Cough, shortness of breath, headache, nausea.
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: Firefighting measures

5.1. Extinguishing media

- Suitable extinguishing media : Water spray or fog.
Foam.
- Unsuitable extinguishing media : Carbon dioxide.
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 : Nitric oxide/nitrogen dioxide.

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5.3. Advice for firefighters

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

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

- Try to stop release.
Evacuate area.
Monitor concentration of released product.
Consider the risk of potentially explosive atmospheres.
Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe.
Eliminate ignition sources.
Use chemically protective clothing.
Ensure adequate air ventilation.
Act in accordance with local emergency plan.
Stay upwind.

6.2. Environmental precautions

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

6.3. Methods and material for containment and cleaning up

- Hose down area with water.
Ventilate area.
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.

6.4. 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 : The product must be handled in accordance with good industrial hygiene and safety procedures.
Only experienced and properly instructed persons should handle gases under pressure.
Consider pressure relief device(s) in gas installations.
Ensure the complete gas system was (or is regularly) checked for leaks before use.
Do not smoke while handling product.
Avoid exposure, obtain special instructions before use.
Use only properly specified equipment which is suitable for this product, its supply pressure and temperature.
Contact your gas supplier if in doubt.
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.
Avoid suck back of water, acid and alkalis.
Assess the risk of potentially explosive atmospheres and the need for explosion-proof equipment.
Purge air from system before introducing gas.
Take precautionary measures against static discharge.
Keep away from ignition sources (including static discharges).
Consider the use of only non-sparking tools.
Do not breathe gas.
Avoid release of product into atmosphere.
Ensure equipment is adequately earthed.
- Safe handling of the gas receptacle : Do not allow backfeed into the container.
Protect receptacles from physical damage; do not drag, roll, slide or drop.
When moving receptacles, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport receptacles.
Leave valve protection caps in place until the container has been secured against either a wall or bench or placed in a container stand and is ready for use.
If user experiences any difficulty operating receptacle valve discontinue use and contact supplier.

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Never attempt to repair or modify container valves or safety relief devices.
 Damaged valves should be reported immediately to the supplier.
 Keep container valve outlets clean and free from contaminants particularly oil and water.
 Replace valve outlet caps or plugs and container caps where supplied as soon as container is disconnected from equipment.
 Close container valve after each use and when empty, even if still connected to equipment.
 Never attempt to transfer gases from one container to another.
 Never use direct flame or electrical heating devices to raise the pressure of a container.
 Do not remove or deface labels provided by the supplier for the identification of the receptacle contents.
 Suck back of water into the container must be prevented.
 Open valve slowly to avoid pressure shock.

7.2. Conditions for safe storage, including any incompatibilities

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

7.3. Specific end use(s)

None.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Ammonia (7664-41-7)		
OEL : Occupational Exposure Limits		
ACGIH	ACGIH TWA (ppm)	25 ppm
	ACGIH STEL (ppm)	35 ppm
	Remark (ACGIH)	Eye dam; URT irr
	Regulatory reference	ACGIH 2017
Italy	TWA (IT) OEL 8h [mg/m ³]	14 mg/m ³
	TWA (IT) OEL 8h [ppm]	20 ppm
	STEL (IT) OEL 15min [mg/m ³]	36 mg/m ³
	STEL (IT) OEL 15min [ppm]	50 ppm
	Regulatory reference	Allegato XXXVIII del D.Lgs. 9 aprile 2008, n. 81 e s.m.i.

Ammonia (7664-41-7)	
DNEL: Derived no effect level (Workers)	
Acute - local effects, inhalation	36 mg/m ³
Acute - systemic effects, inhalation	47,6 mg/m ³
Long-term - local effects, inhalation	14 mg/m ³
Long-term - systemic effects, inhalation	47,6 mg/m ³
Acute - systemic effects, dermal	6,8 mg/kg bw/day
Long-term - systemic effects, dermal	6,8 mg/kg bw/day

Ammonia (7664-41-7)	
PNEC: Predicted no effect concentration	
Aqua (freshwater)	0,0011 mg/l
Aqua (marine water)	0,0011 mg/l

8.2. Exposure controls

8.2.1. Appropriate engineering controls

Provide adequate general and local exhaust ventilation.
 Product to be handled in a closed system.
 Systems under pressure should be regularly checked for leakages.
 Ensure exposure is below occupational exposure limits (where available).
 Gas detectors should be used when toxic gases may be released.
 Consider the use of a work permit system e.g. for maintenance activities.

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

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. 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.

Standard EN 166 - Personal eye-protection - specifications.

Provide readily accessible eye wash stations and safety showers.

• Skin protection

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- Hand protection : Wear working gloves when handling gas containers.
Standard EN 388 - Protective gloves against mechanical risk.
Wear cold insulating gloves when transfilling or breaking transfer connections.
Standard EN 511 - Cold insulating gloves.
Wear chemically resistant protective gloves.
Standard EN 374 - Protective gloves against chemicals.
Permeation time: minimum >30min short term exposure: material / thickness [mm] Chloroprene rubber (CR) 0.5.
Permeation time: minimum >480min long term exposure: material / thickness [mm] Butyl rubber (IIR) 0.7.
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.
- Other : Keep suitable chemically resistant protective clothing readily available for emergency use.
Standard EN943-1 - Full protective suits against liquid, solid and gaseous chemicals.
Wear safety shoes while handling containers.
Standard EN ISO 20345 - Personal protective equipment - Safety footwear.
- Respiratory protection : Gas filters may be used if all surrounding conditions e.g. type and concentration of the contaminant(s) and duration of use are known.
Use gas filters with full face mask, where exposure limits may be exceeded for a short-term period, e.g. connecting or disconnecting containers.
Recommended: Filter K (green).
Gas filters do not protect against oxygen deficiency.
Standard EN 14387 - Gas filter(s), combined filter(s) and full face mask - EN 136.
Keep self contained breathing apparatus readily available for emergency use.
Self contained breathing apparatus is recommended, where unknown exposure may be expected, e.g. during maintenance activities on installation systems.
Standard EN 137 - Self-contained open-circuit compressed air breathing apparatus with full face mask.
- Thermal hazards : None in addition to the above sections.

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 of overexposure.

pH

: If dissolved in water pH-value will be affected.

Melting point / Freezing point

: -77,7 °C

Boiling point

: -33 °C

Flash point

: Not applicable for gases and gas mixtures.

Evaporation rate

: Not applicable for gases and gas mixtures.

Flammability (solid, gas)

: Flammable gas.

Explosive limits

: 15,4 - 33,6 vol %

Vapour pressure [20°C]

: 8,6 bar(a)

Vapour pressure [50°C]

: 20 bar(a)

Vapour density

: Not applicable.

Relative density, liquid (water=1)

: 0,7

Relative density, gas (air=1)

: 0,6

Water solubility

: 517 g/l

Partition coefficient n-octanol/water (Log Kow)

: Not applicable for inorganic gases.

Auto-ignition temperature

: 630 °C

Decomposition temperature

: Not applicable.

Viscosity

: No reliable data available.

Explosive properties

: Not applicable.

Oxidising properties

: Not applicable.

9.2. Other information

Molar mass : 17 g/mol

Critical temperature : 132 °C

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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.
Avoid moisture in installation systems.

10.5. Incompatible materials

Air, Oxidisers.
Reacts with water to form corrosive alkalis.
May react violently with acids.
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.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Toxic if inhaled.
Inhalation of large amounts leads to bronchospasm, laryngeal oedema and pseudomembrane formation.

LC50 inhalation rat	2000 ppm/4h
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Skin corrosion/irritation : Causes severe skin burns and eye damage.
Serious eye damage/irritation : Causes serious eye damage.
Respiratory or skin sensitisation : No known effects from this product.
Germ cell mutagenicity : No known effects from this product.
Carcinogenicity : No known effects from this product.
Toxic for reproduction : Fertility : No known effects from this product.
Toxic for reproduction : unborn child : No known effects from this product.
STOT-single exposure : Severe corrosion to the respiratory tract at high concentrations.
May cause inflammation of the respiratory system.
Target organ(s) : Respiratory tract.
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.
Toxic to aquatic life with long lasting effects.
EC50 48h - Daphnia magna : 101 mg/l
EC50 72h - Algae : No data available.
LC50 96 h - Fish : 0,89 mg/l

12.2. Persistence and degradability

Assessment : The substance is readily biodegradable. Unlikely to persist.

12.3. Bioaccumulative potential

Assessment : No data available.

12.4. Mobility in soil

Assessment : Because of its high volatility, the product is unlikely to cause ground or water pollution.
Partition into soil is unlikely.

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12.5. Results of PBT and vPvB assessment

Assessment : Not classified as PBT or vPvB.

12.6. Other adverse effects

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

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Contact supplier if guidance is required.
 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 sulphuric acid solution.
 Gas may be scrubbed in water.
 Ensure that the emission levels from local regulations or operating permits are not exceeded.
 Refer to the EIGA code of practice Doc.30 "Disposal of Gases", downloadable at <http://www.eiga.eu> for more guidance on suitable disposal methods.
 Return unused product in original receptacle to supplier.

List of hazardous waste codes (from Commission Decision 2001/118/EC) : 16 05 04 *: Gases in pressure containers (including halons) containing dangerous substances.

13.2. Additional information

External treatment and disposal of waste should comply with applicable local and/or national regulations.

SECTION 14: Transport information

14.1. UN number

UN-No. : 1005

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)

Labelling :



2.3 : Toxic gases.
 8 : Corrosive substances.
 Environmentally hazardous substances

Transport by road/rail (ADR/RID)

Class : 2
 Classification code : 2TC
 Hazard identification number : 268
 Tunnel Restriction : C/D - Tank carriage : Passage forbidden through tunnels of category C, D and E. Other carriage : Passage forbidden through tunnels of category D and E

Transport by sea (IMDG)

Class / Div. (Sub. risk(s)) : 2.3 (8)
 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
 Transport by sea (IMDG) : Not applicable

14.5. Environmental hazards

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

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

Transport by sea (IMDG) : Marine pollutant

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 : Forbidden.
 Cargo Aircraft only : Forbidden.

Transport by sea (IMDG) : P200

Special transport precautions : Avoid transport on vehicles where the load space is not separated from the driver's compartment.
 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 there is adequate ventilation.
 - Ensure that containers are firmly secured.
 - Ensure container 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.

14.7. 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-Regulations

Restrictions on use : None.
 Seveso Directive : 2012/18/EU (Seveso III) : Listed.

National regulations

National legislation : Ensure all national/local regulations are observed.

15.2. Chemical safety assessment

A CSA has been carried out.

SECTION 16: Other information

Indication of changes : Revised safety data sheet in accordance with commission regulation (EU) No 453/2010.

Abbreviations and acronyms : ATE: Acute Toxicity Estimate
 CLP - Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008
 REACH - Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation (EC) No 1907/2006
 EINECS: European Inventory of Existing Commercial Chemical Substances
 CAS: Chemical Abstract Service
 PPE: Personal Protection Equipment
 LC50 - Lethal Concentration to 50 % of a test population
 RMM: Risk Management Measures
 PBT - Persistent, Bioaccumulative and Toxic
 vPvB - Very Persistent and Very Bioaccumulative
 STOT- SE: Specific Target Organ Toxicity - Single Exposure
 CSA: Chemical Safety Assessment
 EN: European Standard
 UN: United Nations
 ADR - European Agreement concerning the International Carriage of Dangerous Goods by Road
 IATA - International Air Transport Association
 IMDG code - International Maritime Dangerous Goods
 RID - Regulations concerning the International Carriage of Dangerous Goods by Rail
 WGK: Water Hazard Class
 STOT - RE: Specific Target Organ Toxicity - Repeated Exposure

Training advice : Users of breathing apparatus must be trained.
 Ensure operators understand the flammability hazard.
 Ensure operators understand the toxicity hazard.

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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.