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

1.1. Product identifier

Trade name : Anhydrous ammonia

SDS Nr : EIGA002

Chemical description : Anhydrous 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.
Test gas/Calibration gas.
Laboratory use.
Chemical reaction / Synthesis.
Use for manufacture of electronic/photovoltaic components.
Use as refrigerant.
Use for metal treatment.
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 : Oy Woikoski Ab
Virransalmentie 2023
52920 Voikoski Finland
+358 15 7700 700

E-Mail address (competent person) : info@woikoski.fi

1.4. Emergency telephone number

Country	Official advisory body	Address	Emergency number
FINLAND	Myrkytystietokeskus Giftinformationscentralen, Poison Information Centre	P.O.B 790 (Tukholmankatu 17) HUS SF - 00029 Helsinki	+358 9 471 977

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

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

Flam. Gas 2	H221
Liquefied gas	H280
Acute Tox. 3 (Inhalation:gas)	H331
Skin Corr. 1B	H314
Aquatic Acute 1	H400

Classification according to Directive 67/548/EEC or 1999/45/EC

T; R23
C; R34
N; R50
R10

2.2. Label elements

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

Hazard pictograms (CLP) :

GHS06 GHS05 GHS04 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
H400 - Very toxic to aquatic life

EUH071 - Corrosive to the respiratory tract

Precautionary statements (CLP) : P210 - Keep away from heat/sparks/open flames/hot surfaces. - No smoking
P260 - Do not breathe gas, vapours.
P273 - Avoid release to the environment
P280 - Wear protective gloves/protective clothing/eye protection/face protection
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 leaking gas fire, eliminate all ignition sources if safe to do so
P403 - Store in a well-ventilated place
P405 - Store locked up

2.3. Other hazards

: Contact with liquid may cause cold burns/frostbite.

SECTION 3: Composition/information on ingredients

3.1. Substances

Name	Product identifier	%	Classification according to Directive 67/548/EEC	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	T; R23 C; R34 N; R50 R10	Flam. Gas 2, H221 Liquefied gas, H280 Acute Tox. 3 (Inhalation:gas), H331 Skin Corr. 1B, H314 Aquatic Acute 1, H400

Full text of R-, H- and EUH-phrases: see section 16

3.2. Mixture

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. 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

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

SECTION 5: Firefighting measures

5.1. Extinguishing media

- Suitable extinguishing media : Water spray or fog.
Foam.
Carbon dioxide.
- 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 fire-fighters

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.

Special protective equipment for fire fighters : Wear gas tight chemically protective clothing in combination with self contained breathing apparatus.
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.
Wear gas tight chemically protective clothing in combination with self contained breathing apparatus.
Ensure adequate air ventilation.

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

: 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 substance 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 regularily) 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.
Take precautionary measures against static discharge.
Keep away from ignition sources (including static discharges).
Consider the use of only non-sparking tools.

Safe handling of the gas receptacle

: Refer to supplier's container handling instructions.
Do not allow backfeed into the container.
Protect cylinders from physical damage; do not drag, roll, slide or drop.
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 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.
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 cylinder/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 cylinder contents.

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 toppling.
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

Anhydrous ammonia (7664-41-7)		
Finland	HTP-value (8h) (mg/m3)	14 mg/m³
Finland	HTP-value (8h) (ppm)	20 ppm
Finland	HTP-value (15 min)	36 mg/m³
Finland	HTP-value (15 min) (ppm)	50 ppm

Anhydrous ammonia (7664-41-7)	
DNEL: Derived no effect level (Workers)	
Acute - local effects, inhalation	36 mg/m³
Long-term - local effects, inhalation	14 mg/m³
Acute - systemic effects, dermal	6,8 mg/kg bw/day
Long-term - systemic effects, dermal	6,8 mg/kg bw/day
PNEC: Predicted no effect concentration	
Aqua (freshwater) [mg/l]	0,0011 mg/l
Aqua (marine water) [mg/l]	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.
Preferably use only permanent leak-tight installations (e.g. welded pipes).
Systems under pressure shoud be regularily checked for leakages.
Ensure exposure is below occupational exposure limits (where available).
Alarm detectors should be used when toxic gases may be released.
Consider 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:
Protect eyes, face and skin from liquid splashes.
PPE compliant to the recommended EN/ISO standards should be selected.

- Eye/face protection : Wear safety glasses with side shields.
Wear goggles and a face shield when transfilling or breaking transfer connections.
Standard EN 166 - Personal eye-protection.
Provide readily accessible eye wash stations and safety showers.

- Skin protection

  - Hand protection : Wear working gloves when handling gas containers.
Standard EN 388 - Protective gloves against mechanical risk.
Wear chemically resistant protective gloves.
Standard EN 374 - Protective gloves against chemicals.
Permeation time: minimum >30min short term exposure; material / thickness [mm]:
Permeation time: minimum >480min long term exposure; material / thickness [mm]:
Chloroprene rubber (CR) /
Butyl rubber (IIR) /
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 : 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.
Keep suitable chemically resistant protective clothing readily available for emergency use.
Standard EN943-1 - Full protective suits against liquid, solid and gaseous chemicals.

- 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 and full face mask, where exposure limits may be exceeded for a short-term period, e.g. connecting or disconnecting containers. Recommended: Filter K (green). Consult respiratory device supplier´s product information for the selection of the appropriate device. 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. 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	:	17 g/mol
Melting point	:	-77,7 °C
Boiling point	:	-33 °C
Critical temperature	:	132 °C
Flash point	:	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 - 33,6 vol %
Vapour pressure [20°C]	:	860 kPa
Relative density, gas (air=1)	:	0,6
Relative density, liquid (water=1)	:	0,7
Solubility in water [mg/l]	:	517000 mg/l
Partition coefficient n-octanol/water [log Kow]	:	Not applicable for inorganic gases.
Auto-ignition temperature [°C]	:	630 °C
Viscosity at 20°C	:	Not applicable.
Explosive Properties	:	Not applicable.
Oxidising Properties	:	None.
Coefficient of oxygen equivalency (Ci)	:	No data available

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

: May react violently with oxidants.
Can form explosive mixture with air.

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.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

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

Anhydrous ammonia (7664-41-7)	
LC50 inhalation rat (ppm)	2000 ppm/4h

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.

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 : 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

Ecology - general : Very toxic to aquatic life.

Anhydrous ammonia (7664-41-7)	
EC50 48h - Daphnia magna [mg/l]	101 mg/l
EC50 72h Algae [mg/l]	No data available.
LC50-96 h - fish [mg/l]	0,89 mg/l

12.2. Persistence and degradability

Anhydrous ammonia (7664-41-7)	
Persistence and degradability	The substance is biodegradable. Unlikely to persist.

12.3. Bioaccumulative potential

Anhydrous ammonia (7664-41-7)	
Log Pow	Not applicable for inorganic gases.
Bioaccumulative potential	Not expected to bioaccumulate due to the low log Kow (log Kow < 4). Refer to section 9.

12.4. Mobility in soil

Anhydrous ammonia (7664-41-7)	
Ecology - soil	Because of its high volatility, the product is unlikely to cause ground or water pollution.

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.

Ozone depletion factor [R11=1] : No additional information available

Global warming potential [CO2=1] : No additional information available

Effect on the global warming : No known effects from this product.

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 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.org for more guidance on suitable disposal methods.

List of hazardous wastes : 16 05 04: Gases in pressure containers (including halons) containing dangerous substances.

13.2. Additional information

: None.

SECTION 14: Transport information

In accordance with ADR / RID / ADNR / IMDG / ICAO / IATA

14.1. UN number

UN-No. : 1005

14.2. UN proper shipping name

Proper Shipping Name : AMMONIA, ANHYDROUS

Transport document description : UN 1005 AMMONIA, ANHYDROUS, 2.3 (8), (C/D)

14.3. Transport hazard class(es)

Class (UN) : 2

Hazard labels (UN) : 2.3, 8

14.4. Packing group

Not applicable

14.5. Environmental hazards

IMDG-Marine pollutant : Yes

Environmental hazards : 

Environmentally hazardous substance / mixture.

Other information : No supplementary information available.

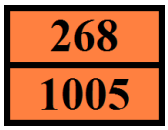
14.6. Special precautions for user

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 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.

14.6.1. Overland transport

Hazard identification number (Kemler No.) : 268

Classification code (UN) : 2TC

Orange plates : 

Special provision (ADR) 23

Transport category (ADR) 1

Tunnel restriction code : C/D

Limited quantities (ADR) 0

Excepted quantities (ADR) : E0

14.6.2. Transport by sea

MFAG-No. : 125

14.6.3. Air transport

No additional information available

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

No additional information available

SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

EU-Regulations

No REACH Annex XVII restrictions

Restrictions on use : None.

Seveso directive 96/82/EC : Listed.

National regulations

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

Water hazard class (WGK) : -

Kenn-Nr. : 211

15.2. Chemical safety assessment

CSA has been carried out.

SECTION 16: Other information

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

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

Other information : This Safety Data Sheet has been established in accordance with the applicable European Union legislation.

Full text of R-, H- and EUH-phrases:

Acute Tox. 3 (Inhalation:gas)	Acute toxicity (inhalation:gas) Category 3
Aquatic Acute 1	Hazardous to the aquatic environment - Acute Hazard Category 1
Flam. Gas 2	Flammable gases Category 2
Liquefied gas	Gases under pressure Liquefied gas
Skin Corr. 1B	skin corrosion/irritation Category 1B
H221	Flammable gas
H280	Contains gas under pressure; may explode if heated
H314	Causes severe skin burns and eye damage
H331	Toxic if inhaled
H400	Very toxic to aquatic life
R10	Flammable.
R23	Toxic by inhalation.
R34	Causes burns.
R50	Very toxic to aquatic organisms.
C	Corrosive
N	Dangerous for the environment
T	Toxic

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