Ammonia, anhydrous

Safety Data Sheet

according to the REACH Regulation (EC) 1907/2006 amended by Regulation (EU) 2020/878
Reference number: EIGA002
Issue date: 16/01/2013 Revision date: 21/05/2025 Supersedes version of: 05/06/2024 Version: 2.2

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

1.1. Product identifier

Product form	:	Substance
Name	:	Ammonia, anhydrous
EC Index-No.	:	007-001-00-5
EC-No.	:	231-635-3
CAS-No.	:	7664-41-7
REACH registration No.	:	01-2119488876-14
Product code	:	000010021772
Formula	:	NH3
Other means of identification	:	Ammonia 3.8; Ammonia 5.0; Ammonia 6.0; Ammonia4.5; Ammonia 2.8

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

1.2.1. Relevant identified uses

Relevant identified uses : See the list of identified uses and exposure scenarios in the annex of the safety data sheet.
Perform risk assessment prior to use.

Use of the substance/mixture : Use in explosives
Casting operations
Refrigerant
Formulation of mixtures with gas in pressure receptacles.
Using gas as feedstock in chemical processes.
Using gas alone or in mixtures for the calibration of analysis equipment.
Using gas for metal treatment.
Electronic component manufacture
Industrial and professional. Perform risk assessment prior to use.
Manufacture of fertilisers and nitrogen compounds, Nitric acid
Cleaning/washing agents
Manufacture of plastics
Raw material for pharmaceutical products
Water treatment
Laboratory use

Title	Life cycle stage	Use descriptors
Industrial uses, closed contained conditions (ES Ref.: EIGA002-1)		PROC1, PROC2, PROC3, PROC4, PROC8b, PROC9, ERC1, ERC2, ERC4, ERC6a, ERC6b, ERC7
Professional uses (ES Ref.: EIGA002-2)		PROC4, PROC8a, ERC9a, ERC9b

Full text of use descriptors: see section 16

1.2.2. Uses advised against

Uses advised against : Consumer use.
Uses other than those listed above are not supported, contact your supplier for more information on other uses.

1.3. Details of the supplier of the safety data sheet

Linde Gas GmbH
Carl-von-Linde-Platz 1
A-4651 Stadl-Paura
Austria
T +43 50 4273
office@at.linde-gas.com

1.4. Emergency telephone number

Emergency number : UMCO/NCEC: +44 1865 407333 (English); +49 89 220 61012 (German)

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
Health hazards	Acute toxicity (inhalation:gas) Category 3	H331
	Skin corrosion/irritation, Category 1, Sub-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

Full text of H- and EUH-statements: see section 16

Adverse physicochemical, human health and environmental effects

No additional information available

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.

EUH-statements : EUH071 - Corrosive to the respiratory tract.

Precautionary statements (CLP)

- Prevention : P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P260 - Do not breathe gas, vapours.
P273 - Avoid release to the environment.
P280 - Wear eye protection, face protection, protective clothing, protective gloves.

- Response : P303+P361+P353+P315 - IF ON SKIN : (or hair) Take off immediately all contaminated clothing. Rinse skin with water or shower. Get immediate medical advice.
P304+P340+P315 - IF INHALED : Remove person to fresh air and keep comfortable for breathing. Get immediate medical advice.
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.
P377 - Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381 - In case of leakage, eliminate all ignition sources.

- Storage : P403 - Store in a well-ventilated place.
P405 - Store locked up.

2.3. Other hazards

Other hazards : Not classified as PBT or vPvB. The substance/mixture has no endocrine disrupting properties.

SECTION 3: Composition/information on ingredients

3.1. Substances

Name	Product identifier	%	Classification according to Regulation (EC) No. 1272/2008 [CLP] ATE, EUH-statements, M-Factors
Ammonia, anhydrous	CAS-No.: 7664-41-7 EC-No.: 231-635-3 EC Index-No.: 007-001-00-5 REACH-no: 01-2119488876-14	100	Flam. Gas 2, H221 Press. Gas (Liq.), H280 Acute Tox. 3 (Inhalation:gas), H331 (ATE=2000 ppmv/4h) Skin Corr. 1B, H314 Eye Dam. 1, H318 Aquatic Acute 1, H400 Aquatic Chronic 2, H411 EUH071

Specific concentration limits:

Name	Product identifier	Specific concentration limits
Ammonia, anhydrous	CAS-No.: 7664-41-7 EC-No.: 231-635-3 EC Index-No.: 007-001-00-5 REACH-no: 01-2119488876-14	(1 ≤ C ≤ 100) STOT SE 3; H335

Full text of H- and EUH-statements: see section 16

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

First-aid measures after 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.

First-aid measures after 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.

First-aid measures after eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes.
First-aid measures after ingestion : Ingestion is not considered a potential route of exposure.

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

Most important symptoms and effects, both acute and delayed

Prolonged exposure to small concentrations may result in pulmonary oedema.
May cause severe chemical burns to skin and cornea. Suitable first-aid treatment should be immediately available. Seek medical advice before using product.
Material is destructive to tissue of the mucuous membranes and upper respiratory tract.
Cough, shortness of breath, headache, nausea.
See 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 : Foam. Water spray or fog. Shutting off the source of the gas is the preferred method of control.
Unsuitable extinguishing media : Do not use water jet to extinguish.

5.2. Special hazards arising from the substance or mixture

Reactivity in case of fire : No reactivity hazard other than the effects described in sub-sections below.
Specific hazards : Exposure to fire may cause containers to rupture/explode.
Hazardous combustion products : Nitric oxide/nitrogen dioxide.

5.3. Advice for firefighters

Specific methods : Do not extinguish a leaking gas flame unless absolutely necessary. Spontaneous/explosive re-ignition may occur. Extinguish any other fire.
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.
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

6.1.1. For non-emergency personnel

Emergency procedures : Act in accordance with local emergency plan. Try to stop release. Evacuate area. Ensure adequate air ventilation. Eliminate ignition sources. Stay upwind. See section 8 of the SDS for more information on personal protective equipment.

6.1.2. For emergency responders

Emergency procedures : Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe. Use chemically protective clothing. Monitor concentration of released product. Consider the risk of potentially explosive atmospheres. See section 5.3 of the SDS for more information.

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

Methods and material for containment and cleaning up	:	Ventilate area. Hose down area with water. 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	:	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. Purge air from system before introducing gas. 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 regularily) checked for leaks before use. Installation of a cross purge assembly between the container 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 atmospheres and the need for explosion-proof equipment. Consider the use of 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. Do not breathe gas. Avoid release of product into work area. Ensure equipment is adequately earthed. Use only lubricants and sealings approved for the specific gas service.
Safe handling of the gas receptacle	:	Refer to supplier's container handling instructions. Do not allow backfeed into the container. Protect containers 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 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 content of the container. 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

Conditions for safe storage, including any incompatibilities : Store locked up.
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.
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.

7.3. Specific end use(s)

None.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

8.1.1 National occupational exposure and biological limit values

Ammonia, anhydrous (7664-41-7)	
EU - Indicative Occupational Exposure Limit (IOEL)	
Local name	Ammonia, anhydrous
IOEL TWA	14 mg/m³
	20 ppm
IOEL STEL	36 mg/m³
	50 ppm
Regulatory reference	COMMISSION DIRECTIVE 2000/39/EC
Austria - Occupational Exposure Limits	
Local name	Ammoniak
MAK (OEL TWA)	14 mg/m³
	20 ppm
MAK (OEL STEL)	36 mg/m³ (4x 15(Miw) min)
	50 ppm (4x 15(Miw) min)
Regulatory reference	BGBl. II Nr. 156/2021

8.1.2. Recommended monitoring procedures

No additional information available

8.1.3. Air contaminants formed

No additional information available

8.1.4. DNEL and PNEC

Ammonia, anhydrous (7664-41-7)	
DNEL/DMEL (Workers)	
Acute - systemic effects, dermal	6.8 mg/kg bw/day
Acute - systemic effects, inhalation	47.6 mg/m³

Ammonia, anhydrous (7664-41-7)	
Acute - local effects, inhalation	36 mg/m³
Long-term - systemic effects, dermal	6.8 mg/kg bw/day
Long-term - systemic effects, inhalation	47.6 mg/m³
Long-term - local effects, inhalation	14 mg/m³
PNEC (Water)	
PNEC aqua (freshwater)	0.0011 mg/l
PNEC aqua (marine water)	0.0011 mg/l

8.1.5. Control banding

No additional information available

8.2. Exposure controls

Appropriate engineering controls

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

Personal protection equipment

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.
Personal protective equipment symbol(s):

Eye and face protection

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

Skin protection

Hand protection:
Wear working gloves when handling gas containers. Wear chemically resistant protective gloves. Standard EN 374 - Protective gloves against chemicals. Standard EN 388 - Protective gloves against mechanical risks, performance level 1 or higher. Recommended types include wrist gloves from leather or synthetic material with equivalent performance, fabric gloves, fabric gloves with leather palms. Standard EN 511 - Cold insulating gloves, performance level 1 or higher. Recommended types include insulated gauntlets or gloves specifically selected to prevent liquid penetration and ingress of cryogenic liquids and to provide mechanical resistance. Permeation time: minimum >30min short term exposure: material / thickness Chloroprene rubber (Neoprene®) (CR) / 0,5 [mm]. Permeation time: minimum >480min long term exposure : material / thickness Butyl rubber (IIR) / 0,7 [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.

Respiratory protection

Respiratory protection:
Recommended: Filter K (green). Self contained breathing apparatus is recommended, where unknown exposure may be expected, e.g. during maintenance activities on installation systems. 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. Standard EN 137 - Self-contained open-circuit compressed air breathing apparatus with full face mask. Gas filters do not protect against oxygen deficiency. Standard EN 14387 - Gas filter(s), combined filter(s) and standard EN136, full face masks . Keep self contained breathing apparatus readily available for emergency use.

Thermal hazards

Thermal hazard protection:
None in addition to the above sections.

Environmental exposure controls

Environmental exposure controls:

Refer to local regulations for restriction of emissions to the atmosphere. See section 13 for specific methods for waste gas treatment.

Other information:

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.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Appearance		
Physical state	:	Gas
Colour	:	Colourless.
Form	:	Liquefied gas
Odour	:	Ammoniacal.
Odour threshold	:	Odour threshold is subjective and inadequate to warn of overexposure.
Melting point	:	-77.7 °C
Freezing point	:	Not applicable
Boiling point	:	-33 °C
Flammability	:	Flammable gas.
Oxidising properties	:	No oxidising properties.
Explosive limits	:	Not known.
Lower explosion limit	:	15.4 vol %
Upper explosion limit	:	33.6 vol %
Flash point	:	Not applicable for gases and gas mixtures.
Auto-ignition temperature	:	630 °C
Decomposition temperature	:	Not applicable.
pH	:	If dissolved in water pH-value will be affected.
Viscosity, kinematic	:	Not applicable for gases and gas mixtures.
Viscosity, dynamic	:	0.255 mPa·s literature; Not applicable for gases and gas mixtures.
Solubility in water	:	517 g/l
Partition coefficient n-octanol/water (Log Kow)	:	Not applicable for inorganic products.
Partition coefficient n-octanol/water (Log Pow)	:	Not applicable for gas mixtures.
Vapour pressure	:	8.6 bar(a)
Vapour pressure at 50°C	:	20 bar(a)
Critical pressure	:	11350 kPa
Density	:	0.708 kg/m³ 20° C
Relative density	:	Not applicable
Relative vapour density at 20°C	:	Not applicable.
Relative gas density	:	0.6
Particle characteristics	:	Not applicable Not applicable for gases and gas mixtures. Nanoforms are not relevant for gases and gas mixtures.

9.2. Other information

9.2.1. Information with regard to physical hazard classes

Tci	:	40.1 %
Critical temperature	:	132 °C

9.2.2. Other safety characteristics

Molecular mass	:	17 g/mol
Gas group	:	Press. Gas (Liq.)

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

Reacts with water to form corrosive alkalis. May react violently with acids. Air, Oxidisers. 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 hazard classes as defined in Regulation (EC) No 1272/2008

Acute toxicity : Toxic if inhaled.
Acute toxicity (oral) : Not classified
Acute toxicity (dermal) : Not classified
Acute toxicity (inhalation) : Inhalation:gas: Toxic if inhaled.

Ammonia, anhydrous (7664-41-7)	
LC50 Inhalation - Rat [ppm]	4000 ppm/1h (ADR) 2000 ppm/4h (CLP)

Skin corrosion/irritation : Causes severe skin burns and eye damage.
pH: If dissolved in water pH-value will be affected.
Serious eye damage/irritation : Causes serious eye damage.
pH: If dissolved in water pH-value will be affected.
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.
Reproductive toxicity : Not classified
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. Severe corrosion to the respiratory tract at high concentrations.
Target organ(s) : Respiratory tract.
STOT-repeated exposure : No known effects from this product.
Aspiration hazard : Not applicable for gases and gas mixtures.

Ammonia, anhydrous (7664-41-7)	
Viscosity, kinematic	Not applicable for gases and gas mixtures.

11.2. Information on other hazards

11.2.1. Endocrine disrupting properties

No additional information available

11.2.2. Other information

Other information : Inhalation of large amounts leads to bronchospasm, laryngeal oedema and pseudomembrane formation,The substance/mixture has no endocrine disrupting properties.

SECTION 12: Ecological information

12.1. Toxicity

Assessment : Very toxic to aquatic life. Toxic to aquatic life with long lasting effects.
Hazardous to the aquatic environment, short–term (acute) : Very toxic to aquatic life.
Hazardous to the aquatic environment, long–term (chronic) : Toxic to aquatic life with long lasting effects.
Not rapidly degradable

Ammonia, anhydrous (7664-41-7)	
LC50 - Fish [1]	0.75 – 3.4 mg/l Test organisms (species): Pimephales promelas
LC50 - Fish [2]	34 – 109 mg/l Test organisms (species): Pimephales promelas
LC50 96 h - Fish [mg/l]	0.89 mg/l
EC50 48h - Daphnia magna [mg/l]	101 mg/l
EC50 72h - Algae [mg/l]	No data available.
NOEC chronic fish	1.2 mg/l Test organisms (species): Oncorhynchus gorbuscha Duration: '61 d'

12.2. Persistence and degradability

Ammonia, anhydrous (7664-41-7)	
Assessment	The substance is readily biodegradable. Unlikely to persist.

12.3. Bioaccumulative potential

Ammonia, anhydrous (7664-41-7)	
Partition coefficient n-octanol/water (Log Pow)	Not applicable for gas mixtures.
Partition coefficient n-octanol/water (Log Kow)	Not applicable for inorganic products.
Assessment	No data available.

12.4. Mobility in soil

Ammonia, anhydrous (7664-41-7)	
Assessment	Because of its high volatility, the product is unlikely to cause ground or water pollution. Partition into soil is unlikely.

12.5. Results of PBT and vPvB assessment

Assessment : Not classified as PBT or vPvB.

12.6. Endocrine disrupting properties

Other adverse effects : May cause pH changes in aqueous ecological systems.
Assessment : The substance/mixture has no endocrine disrupting properties.

12.7. Other adverse effects

Other adverse effects : May cause pH changes in aqueous ecological systems.

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

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste treatment methods : 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. Contact supplier if guidance is required. Must not be discharged to atmosphere. 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 container to supplier.

List of hazardous waste codes (from Commission Decision 2000/532/EC as amended) : 16 05 04 *: Gases in pressure containers (including halons) containing hazardous substances.

HP Code : HP3 - “Flammable:”
– flammable liquid waste: liquid waste having a flash point below 60 °C or waste gas oil, diesel and light heating oils having a flash point > 55 °C and ≤ 75 °C;
– flammable pyrophoric liquid and solid waste: solid or liquid waste which, even in small quantities, is liable to ignite within five minutes after coming into contact with air;
– flammable solid waste: solid waste which is readily combustible or may cause or contribute to fire through friction;
– flammable gaseous waste: gaseous waste which is flammable in air at 20 °C and a standard pressure of 101.3 kPa;
– water reactive waste: waste which, in contact with water, emits flammable gases in dangerous quantities;
– other flammable waste: flammable aerosols, flammable self-heating waste, flammable organic peroxides and flammable self-reactive waste.
HP6 - “Acute Toxicity:” waste which can cause acute toxic effects following oral or dermal administration, or inhalation exposure.
HP8 - “Corrosive:” waste which on application can cause skin corrosion.
HP14 - “Ecotoxic:” waste which presents or may present immediate or delayed risks for one or more sectors of the environment

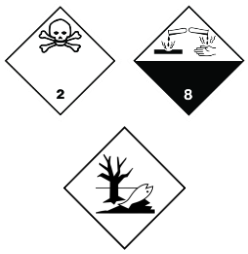
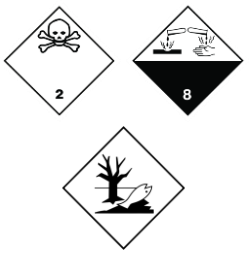
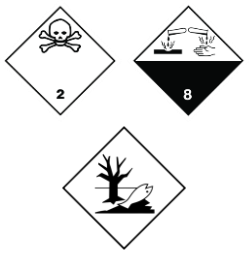
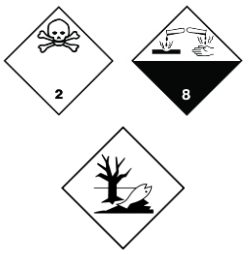
13.2. Additional information

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

SECTION 14: Transport information

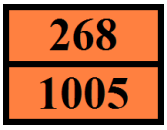
In accordance with ADR / IMDG / IATA / ADN / RID

ADR	IMDG	IATA	ADN	RID
14.1. UN number or ID number				
UN 1005	UN 1005	UN 1005	UN 1005	UN 1005
14.2. UN proper shipping name				
AMMONIA, ANHYDROUS	AMMONIA, ANHYDROUS	Ammonia, anhydrous	AMMONIA, ANHYDROUS	AMMONIA, ANHYDROUS
Transport document description				
UN 1005 AMMONIA, ANHYDROUS, 2.3 (8), (C/D), ENVIRONMENTALLY HAZARDOUS	UN 1005 AMMONIA, ANHYDROUS, 2.3 (8), MARINE POLLUTANT/ENVIRONMENTALLY HAZARDOUS	UN 1005 Ammonia, anhydrous, 2.3 (8), ENVIRONMENTALLY HAZARDOUS	UN 1005 AMMONIA, ANHYDROUS, 2.3 (8), ENVIRONMENTALLY HAZARDOUS	UN 1005 AMMONIA, ANHYDROUS, 2.3 (8), ENVIRONMENTALLY HAZARDOUS
14.3. Transport hazard class(es)				
2.3 (8)	2.3 (8)	2.3 (8)	2.3 (8)	2.3 (8)

ADR	IMDG	IATA	ADN	RID
				
14.4. Packing group				
Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
14.5. Environmental hazards				
Dangerous for the environment: Yes	Dangerous for the environment: Yes Marine pollutant: Yes	Dangerous for the environment: Yes	Dangerous for the environment: Yes	Dangerous for the environment: Yes
No supplementary information available				

14.6. Special precautions for user

Overland transport

Classification code (ADR)	:	2TC
Special provisions (ADR)	:	23, 379
Limited quantities (ADR)	:	0
Excepted quantities (ADR)	:	E0
Packing instructions (ADR)	:	P200
Mixed packing provisions (ADR)	:	MP9
Portable tank and bulk container instructions (ADR)	:	(M), T50
Tank code (ADR)	:	PxBH(M)
Tank special provisions (ADR)	:	TA4, TT8, TT9
Vehicle for tank carriage	:	AT
Transport category (ADR)	:	1
Special provisions for carriage - Loading, unloading and handling (ADR)	:	CV9, CV10, CV36
Special provisions for carriage - Operation (ADR)	:	S14
Hazard identification number (Kemler No.)	:	268
Orange plates	:	
Tunnel restriction code (ADR)	:	C/D

Transport by sea

Special provisions (IMDG)	:	23, 379
Limited quantities (IMDG)	:	0
Excepted quantities (IMDG)	:	E0
Packing instructions (IMDG)	:	P200
Tank instructions (IMDG)	:	T50
EmS-No. (Fire)	:	F-C
EmS-No. (Spillage)	:	S-U
Stowage category (IMDG)	:	D
Stowage and handling (IMDG)	:	SW2
Segregation (IMDG)	:	SGG18, SG35, SG46
Properties and observations (IMDG)	:	Liquefied, non-flammable, toxic and corrosive gas with a pungent odour. Lighter than air (0.6). Suffocating in low concentrations. Even though this substance has a flammability hazard, it only exhibits such hazard under extreme fire conditions in confined areas. Reacts violently with acids. Highly irritating to skin, eyes and mucous membranes.

Air transport

PCA Limited quantities (IATA)	:	FORBIDDEN
PCA limited quantity max net quantity (IATA)	:	FORBIDDEN
PCA packing instructions (IATA)	:	FORBIDDEN
PCA max net quantity (IATA)	:	FORBIDDEN
CAO packing instructions (IATA)	:	FORBIDDEN
CAO max net quantity (IATA)	:	FORBIDDEN
Special provisions (IATA)	:	A2
ERG code (IATA)	:	2CP

Inland waterway transport

Classification code (ADN)	:	2TC
Special provisions (ADN)	:	23, 379
Limited quantities (ADN)	:	0
Excepted quantities (ADN)	:	E0
Carriage permitted (ADN)	:	T
Equipment required (ADN)	:	PP, EP, TOX, A
Ventilation (ADN)	:	VE02
Number of blue cones/lights (ADN)	:	2

Rail transport

Classification code (RID)	:	2TC
Special provisions (RID)	:	23, 379
Limited quantities (RID)	:	0
Excepted quantities (RID)	:	E0
Packing instructions (RID)	:	P200
Mixed packing provisions (RID)	:	MP9
Portable tank and bulk container instructions (RID)	:	T50(M)
Tank codes for RID tanks (RID)	:	PxBH(M)
Special provisions for RID tanks (RID)	:	TU38, TE22, TE25, TA4, TT8, TT9, TM6
Transport category (RID)	:	1
Special provisions for carriage - Loading, unloading and handling (RID)	:	CW9, CW10, CW36
Hazard identification number (RID)	:	268

14.7. Maritime transport in bulk according to IMO instruments

Not applicable

SECTION 15: Regulatory information

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

15.1.1. EU-Regulations

REACH Annex XVII (Restriction List)

EU restriction list (REACH Annex XVII)		
Reference code	**Applicable on**	**Entry title or description**
40.	Ammonia, anhydrous	Substances classified as flammable gases category 1 or 2, flammable liquids categories 1, 2 or 3, flammable solids category 1 or 2, substances and mixtures which, in contact with water, emit flammable gases, category 1, 2 or 3, pyrophoric liquids category 1 or pyrophoric solids category 1, regardless of whether they appear in Part 3 of Annex VI to Regulation (EC) No 1272/2008 or not.

REACH Annex XIV (Authorisation List)

Not listed on REACH Annex XIV (Authorisation List)

REACH Candidate List (SVHC)

Contains no substance(s) listed on the REACH Candidate List

PIC Regulation (Prior Informed Consent)

Not listed on the PIC list (Regulation EU 649/2012)

POP Regulation (Persistent Organic Pollutants)

Not listed on the POP list (Regulation EU 2019/1021)

Ozone Regulation (1005/2009)

Not listed on the Ozone Depletion list (Regulation EU 2024/590)

VOC Directive (2004/42)

Restrictions on use : None.

Seveso Directive (Disaster Risk Reduction)

Seveso Directive : 2012/18/EU (Seveso III) : Listed.

Seveso III Part II (Named dangerous substances)	Qualifying quantity (tonnes)	
	Lower-tier	Upper-tier
Anhydrous Ammonia	50	200

Explosives Precursors Regulation (2019/1148)

Contains no substance(s) listed on the Explosives Precursors list (Regulation EU 2019/1148 on the marketing and use of explosives precursors)

Drug Precursors Regulation (273/2004)

Contains no substance(s) listed on the Drug Precursors list (Regulation EC 273/2004 on the manufacture and the placing on market of certain substances used in the illicit manufacture of narcotic drugs and psychotropic substances)

15.1.2. National regulations

Ensure all national/local regulations are observed.
Safety data sheet in accordance with commission regulation (EU) No 2020/878.
Council Directive 89/391/EEC on the introduction of measures to encourage improvements in the safety and health of workers at work
Directive 2016/425/EEC on personal protective equipment
Directive 2014/34/EU on equipment and protective systems intended for use in potentially explosive atmospheres (ATEX)
Only products that comply with the food regulations (EC) No. 1333/2008 and (EU) No. 231/2012 and are labelled as such may be used as food additives.
This Safety Data Sheet has been produced to comply with Regulation (EU) 2015/830.

15.2. Chemical safety assessment

A CSA has been carried out.

SECTION 16: Other information

Indication of changes:
Safety data sheet in accordance with commission regulation (EU) No 2020/878.

Abbreviations and acronyms:	
ADN	European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways
ADR	ADR - Agreement concerning the International Carriage of Dangerous Goods by Road
ATE	ATE - Acute Toxicity Estimate
BLV	Biological limit value
BOD	Biochemical oxygen demand (BOD)
CAO	Cargo Aircraft only / Cargo Aircraft only
CAS-No.	Chemical Abstract Service number
CLP	CLP - Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008
COD	Chemical oxygen demand (COD)
CSA	CSA - Chemical Safety Assessment
DMEL	Derived Minimal Effect level

Abbreviations and acronyms:	
DNEL	Derived-No Effect Level
EC50	Median effective concentration
EC	European Inventory of Existing Commercial Chemical Substances
ED	Endocrine disruptor
EINECS	EINECS - European Inventory of Existing Commercial Chemical Substances
EN	European Standard
IARC	International Agency for Research on Cancer
IATA	International Air Transport Association
IMDG	International Maritime Dangerous Goods
IOELV	Indicative Occupational Exposure Limit Value
LC50	Median lethal concentration
LD50	Median lethal dose
LOAEL	Lowest Observed Adverse Effect Level
NOAEC	No-Observed Adverse Effect Concentration
NOAEL	No-Observed Adverse Effect Level
NOEC	No-Observed Effect Concentration
N.O.S.	Not Otherwise Specified
OECD	Organisation for Economic Co-operation and Development
OEL	Occupational Exposure Limit
PBT	Persistent Bioaccumulative Toxic
PCA	Passenger and Cargo Aircraft / Passenger and Cargo Aircraft
PNEC	Predicted No-Effect Concentration
PPE	PPE - Personal Protection Equipment
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation (EC) No 1907/2006
RID	Regulations concerning the International Carriage of Dangerous Goods by Rail
RMM	RMM - Risk Management Measures
STP	Sewage treatment plant
ThOD	Theoretical oxygen demand (ThOD)
TLM	Median Tolerance Limit
TRGS	Technical Rules for Hazardous Substances
STOT-RE	Specific Target Organ Toxicity-Repeated Exposure
STOT-SE	Specific Target Organ Toxicity-Single Exposure
UFI	Unique Formula Identifier
UN	UN - United Nations
VOC	Volatile Organic Compounds
vPvB	Very Persistent and Very Bioaccumulative
WGK	Water Hazard Class

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

Other information : Classification in accordance with the procedures and calculation methods of Regulation (EC) 1272/2008 (CLP). Key literature references and sources of data are maintained in EIGA doc 169 : 'Classification and Labelling Guide', downloadable at http://www.Eiga.eu .

Full text of H- and EUH-statements:	
Acute Tox. 3 (Inhalation:gas)	Acute toxicity (inhalation:gas) Category 3
Aquatic Acute 1	Hazardous to the aquatic environment – Acute Hazard, Category 1
Aquatic Chronic 2	Hazardous to the aquatic environment – Chronic Hazard, Category 2
Eye Dam. 1	Serious eye damage/eye irritation, Category 1
Flam. Gas 2	Flammable gases, Category 2
Press. Gas (Liq.)	Gases under pressure : Liquefied gas
Skin Corr. 1B	Skin corrosion/irritation, Category 1, Sub-Category 1B
STOT SE 3	Specific target organ toxicity – Single exposure, Category 3, Respiratory tract irritation
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.
H335	May cause respiratory irritation.
H400	Very toxic to aquatic life.
H411	Toxic to aquatic life with long lasting effects.
EUH071	Corrosive to the respiratory tract.

Full text of use descriptors	
ERC1	Manufacture of the substance
ERC2	Formulation into mixture
ERC4	Use of non-reactive processing aid at industrial site (no inclusion into or onto article)
ERC6a	Use of intermediate
ERC6b	Use of reactive processing aid at industrial site (no inclusion into or onto article)
ERC7	Use of functional fluid at industrial site
ERC9a	Widespread use of functional fluid (indoor)
ERC9b	Widespread use of functional fluid (outdoor)
PROC1	Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions
PROC2	Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions
PROC3	Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition
PROC4	Chemical production where opportunity for exposure arises
PROC8a	Transfer of substance or mixture (charging and discharging) at non-dedicated facilities
PROC8b	Transfer of substance or mixture (charging and discharging) at dedicated facilities
PROC9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

The classification complies with	:	ATP 12
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.

Safety Data Sheet (SDS), EU AT

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.

Annex to the safety data sheet

This Annex documents the Exposure Scenarios (ESs) related to the identified uses of the registered substance. The ESs detail protective measures for workers and the environment in addition to those described in sections 7, 8, 11, 12 and 13 of the SDS that are required to ensure that the potential exposure to workers and the environment remains within acceptable levels for each of the identified uses.

Table of contents of the Annex

1. EIGA002-1: Industrial uses, closed contained conditions

1.1. Title section

	Industrial uses, closed contained conditions	
	ES Ref.: EIGA002-1 Revision date: 4/25/2017	

Processes, tasks, activities covered	Industrial uses, including product transfers and associated laboratory activities within different closed or contained systems

Environment	Use descriptors
CS1	ERC1
CS2	ERC2
CS3	ERC4
CS4	ERC6a
CS5	ERC6b
CS6	ERC7

Worker	Use descriptors
CS7	PROC1
CS8	PROC2
CS9	PROC3
CS10	PROC4
CS11	PROC8b
CS12	PROC9

Assessment method	ECETOC TRA 2.0 EUSES

1.2. Conditions of use affecting exposure

1.2.1. Control of environmental exposure: ERC1

ERC1	Manufacture of the substance

Product (article) characteristics	
Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	≤ 100 %

Amount used, frequency and duration of use (or from service life)	
Annual site tonnage:	950000 t/yr
Regional use tonnage:	6500000 t/yr
Emission Days (days/year)	330

Technical and organisational conditions and measures	
Use appropriate abatement systems to ensure that the emission levels defined by local regulations are not exceeded.	
Soil emission controls are not applicable as there is no direct release to soil	
Ensure operatives are trained to minimise releases	

Conditions and measures related to sewage treatment plant	
Direct emissions to the municipal STP should not be made.	

Conditions and measures related to treatment of waste (including article waste)	
See section 13 of the SDS	

Other conditions affecting environmental exposure	
Closed systems are used in order to prevent unintended emissions	
Flow rate of receiving water at least:	18000 m³/d
Dilution of STP emissions at least:	10

1.2.2. Control of environmental exposure: ERC2

ERC2	Formulation into mixture

Product (article) characteristics	
Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	≤ 100 %

Amount used, frequency and duration of use (or from service life)	
Annual site tonnage:	1000000 t/yr
Regional use tonnage:	3800000 t/yr
Emission Days (days/year)	330

Technical and organisational conditions and measures	
Use appropriate abatement systems to ensure that the emission levels defined by local regulations are not exceeded.	
Soil emission controls are not applicable as there is no direct release to soil	
Ensure operatives are trained to minimise releases	

Conditions and measures related to sewage treatment plant	
Direct emissions to the municipal STP should not be made.	

Conditions and measures related to treatment of waste (including article waste)	
See section 13 of the SDS	

Other conditions affecting environmental exposure	
Closed systems are used in order to prevent unintended emissions	
Flow rate of receiving water at least:	18000 m³/d
Dilution of STP emissions at least:	10

1.2.3. Control of environmental exposure: ERC4

ERC4	Use of non-reactive processing aid at industrial site (no inclusion into or onto article)

Product (article) characteristics	
Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	≤ 100 %

Amount used, frequency and duration of use (or from service life)	
Annual site tonnage:	25000 t/yr
Regional use tonnage:	354000 t/yr
Emission Days (days/year)	330

Technical and organisational conditions and measures	
Use appropriate abatement systems to ensure that the emission levels defined by local regulations are not exceeded.	
Soil emission controls are not applicable as there is no direct release to soil	
Ensure operatives are trained to minimise releases	

Conditions and measures related to sewage treatment plant	
Direct emissions to the municipal STP should not be made.	

Conditions and measures related to treatment of waste (including article waste)	
See section 13 of the SDS	

Other conditions affecting environmental exposure	
Closed systems are used in order to prevent unintended emissions	
Flow rate of receiving water at least:	18000 m³/d
Dilution of STP emissions at least:	10

1.2.4. Control of environmental exposure: ERC6a

ERC6a	Use of intermediate

Product (article) characteristics	
Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	≤ 100 %

Amount used, frequency and duration of use (or from service life)	
Annual site tonnage:	800000 t/yr
Regional use tonnage:	3800000 t/yr
Emission Days (days/year)	330

Technical and organisational conditions and measures	
Use appropriate abatement systems to ensure that the emission levels defined by local regulations are not exceeded.	
Soil emission controls are not applicable as there is no direct release to soil	
Ensure operatives are trained to minimise releases	

Conditions and measures related to sewage treatment plant	
Direct emissions to the municipal STP should not be made.	

Conditions and measures related to treatment of waste (including article waste)	
See section 13 of the SDS	

Other conditions affecting environmental exposure	
Closed systems are used in order to prevent unintended emissions	
Flow rate of receiving water at least:	18000 m³/d
Dilution of STP emissions at least:	10

1.2.5. Control of environmental exposure: ERC6b

ERC6b	Use of reactive processing aid at industrial site (no inclusion into or onto article)

Product (article) characteristics	
Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	≤ 100 %

Amount used, frequency and duration of use (or from service life)	
Annual site tonnage:	25000 t/yr
Regional use tonnage:	354000 t/yr
Emission Days (days/year)	330

Technical and organisational conditions and measures	
Use appropriate abatement systems to ensure that the emission levels defined by local regulations are not exceeded.	
Soil emission controls are not applicable as there is no direct release to soil	
Ensure operatives are trained to minimise releases	

Conditions and measures related to sewage treatment plant	
Direct emissions to the municipal STP should not be made.	

Conditions and measures related to treatment of waste (including article waste)	
See section 13 of the SDS	

Other conditions affecting environmental exposure	
Closed systems are used in order to prevent unintended emissions	
Flow rate of receiving water at least:	18000 m³/d
Dilution of STP emissions at least:	10

1.2.6. Control of environmental exposure: ERC7

ERC7	Use of functional fluid at industrial site

Product (article) characteristics	
Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	≤ 100 %

Amount used, frequency and duration of use (or from service life)	
Annual site tonnage:	25000 t/yr
Regional use tonnage:	354000 t/yr
Emission Days (days/year)	330

Technical and organisational conditions and measures	
Use appropriate abatement systems to ensure that the emission levels defined by local regulations are not exceeded.	
Soil emission controls are not applicable as there is no direct release to soil	
Ensure operatives are trained to minimise releases	

Conditions and measures related to sewage treatment plant	
Direct emissions to the municipal STP should not be made.	

Conditions and measures related to treatment of waste (including article waste)	
See section 13 of the SDS	

Other conditions affecting environmental exposure	
Closed systems are used in order to prevent unintended emissions	
Flow rate of receiving water at least:	18000 m³/d
Dilution of STP emissions at least:	10

1.2.7. Control of worker exposure: PROC1

PROC1	Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions

Product (article) characteristics	
Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	≤ 100 %

Amount used (or contained in articles), frequency and duration of use/exposure	
The actual tonnage handled per shift is not considered to influence the exposure as such for this scenario. Instead, the combination of the scale of operation and level of containment/automation (as reflected in the technical conditions) is the main determinant of the process-intrinsic emission potential.	
Exposure duration	≤ 8 h/day
Covers frequency up to:	5 days/week

Technical and organisational conditions and measures	
Handle product within a closed system	
Apply a good standard of general or controlled ventilation when maintenance activities are carried out.	
Ensure operatives are trained to minimise exposure	
Ensure supervision is in place to check that the RMMs are in place and are being used correctly and that the OCs are being followed	

Conditions and measures related to personal protection, hygiene and health evaluation	
See section 8 of the SDS.	

Other conditions affecting workers exposure	
Indoor or outdoor use	

1.2.8. Control of worker exposure: PROC2

PROC2	Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions

Product (article) characteristics	
Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	≤ 100 %

Amount used (or contained in articles), frequency and duration of use/exposure	
The actual tonnage handled per shift is not considered to influence the exposure as such for this scenario. Instead, the combination of the scale of operation and level of containment/automation (as reflected in the technical conditions) is the main determinant of the process-intrinsic emission potential.	
Exposure duration	≤ 8 h/day
Covers frequency up to:	5 days/week

Technical and organisational conditions and measures	
Handle product within a closed system	
During indoor processes or in cases where natural ventilation is not sufficient, LEV should be in place at points were emissions could occur. Outdoor, LEV is not generally required.	
Ensure samples are obtained under containment or extract ventilation.	
Drain down and flush system prior to equipment break-in or maintenance.	
Apply a good standard of general or controlled ventilation when maintenance activities are carried out.	
Ensure operatives are trained to minimise exposure	
Ensure supervision is in place to check that the RMMs are in place and are being used correctly and that the OCs are being followed	

Conditions and measures related to personal protection, hygiene and health evaluation	
Use suitable eye protection. Wear suitable face shield. Wear suitable coveralls to prevent exposure to the skin	Personal protection measures have to be applied in case of potential exposure only.
Wear gloves providing a minimum efficiency of (%):	90
Wear a respirator providing a minimum efficiency of (%):	95 Mandatory if activities take place outdoors or indoors with no local exhaust ventilation
See section 8 of the SDS.	

Other conditions affecting workers exposure	
Indoor or outdoor use	

1.2.9. Control of worker exposure: PROC3

PROC3	Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition

Product (article) characteristics	
Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	≤ 100 %

Amount used (or contained in articles), frequency and duration of use/exposure	
The actual tonnage handled per shift is not considered to influence the exposure as such for this scenario. Instead, the combination of the scale of operation and level of containment/automation (as reflected in the technical conditions) is the main determinant of the process-intrinsic emission potential.	
Exposure duration	≤ 8 h/day
Covers frequency up to:	5 days/week

Technical and organisational conditions and measures	
Handle product within a closed system	
During indoor processes or in cases where natural ventilation is not sufficient, LEV should be in place at points were emissions could occur. Outdoor, LEV is not generally required.	
Ensure samples are obtained under containment or extract ventilation.	
Drain down and flush system prior to equipment break-in or maintenance.	
Apply a good standard of general or controlled ventilation when maintenance activities are carried out.	
Ensure operatives are trained to minimise exposure	
Ensure supervision is in place to check that the RMMs are in place and are being used correctly and that the OCs are being followed	

Conditions and measures related to personal protection, hygiene and health evaluation	
Use suitable eye protection. Wear suitable face shield. Wear suitable coveralls to prevent exposure to the skin	Personal protection measures have to be applied in case of potential exposure only.
Wear gloves providing a minimum efficiency of (%):	90
Wear a respirator providing a minimum efficiency of (%):	95 Mandatory if activities take place outdoors or indoors with no local exhaust ventilation
See section 8 of the SDS.	

Other conditions affecting workers exposure	
Indoor or outdoor use	

1.2.10. Control of worker exposure: PROC4

PROC4	Chemical production where opportunity for exposure arises

Product (article) characteristics	
Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	≤ 100 %

Amount used (or contained in articles), frequency and duration of use/exposure	
The actual tonnage handled per shift is not considered to influence the exposure as such for this scenario. Instead, the combination of the scale of operation and level of containment/automation (as reflected in the technical conditions) is the main determinant of the process-intrinsic emission potential.	
Exposure duration	≤ 8 h/day
Covers frequency up to:	5 days/week

Technical and organisational conditions and measures	
Handle product within a closed system	
During indoor processes or in cases where natural ventilation is not sufficient, LEV should be in place at points were emissions could occur. Outdoor, LEV is not generally required.	
Ensure samples are obtained under containment or extract ventilation.	
Drain down and flush system prior to equipment break-in or maintenance.	
Apply a good standard of general or controlled ventilation when maintenance activities are carried out.	
Ensure operatives are trained to minimise exposure	
Ensure supervision is in place to check that the RMMs are in place and are being used correctly and that the OCs are being followed	

Conditions and measures related to personal protection, hygiene and health evaluation	
Use suitable eye protection. Wear suitable face shield. Wear suitable coveralls to prevent exposure to the skin	Personal protection measures have to be applied in case of potential exposure only.
Wear gloves providing a minimum efficiency of (%):	90
Wear a respirator providing a minimum efficiency of (%):	95 Mandatory if activities take place outdoors or indoors with no local exhaust ventilation
See section 8 of the SDS.	

Other conditions affecting workers exposure	
Indoor or outdoor use	

1.2.11. Control of worker exposure: PROC8b

PROC8b	Transfer of substance or mixture (charging and discharging) at dedicated facilities

Product (article) characteristics	
Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	≤ 100 %

Amount used (or contained in articles), frequency and duration of use/exposure	
The actual tonnage handled per shift is not considered to influence the exposure as such for this scenario. Instead, the combination of the scale of operation and level of containment/automation (as reflected in the technical conditions) is the main determinant of the process-intrinsic emission potential.	
Exposure duration	≤ 8 h/day
Covers frequency up to:	5 days/week

Technical and organisational conditions and measures	
Handle product within a closed system	
During indoor processes or in cases where natural ventilation is not sufficient, LEV should be in place at points were emissions could occur. Outdoor, LEV is not generally required.	
Fill containers at dedicated fill points supplied with local extract ventilation.	
Drain down and flush system prior to equipment break-in or maintenance.	
Apply a good standard of general or controlled ventilation when maintenance activities are carried out.	
Ensure operatives are trained to minimise exposure	
Ensure supervision is in place to check that the RMMs are in place and are being used correctly and that the OCs are being followed	

Conditions and measures related to personal protection, hygiene and health evaluation	
Use suitable eye protection. Wear suitable face shield. Wear suitable coveralls to prevent exposure to the skin	Personal protection measures have to be applied in case of potential exposure only.
Wear gloves providing a minimum efficiency of (%):	90
Wear a respirator providing a minimum efficiency of (%):	95 Mandatory if activities take place outdoors or indoors with no local exhaust ventilation
See section 8 of the SDS.	

Other conditions affecting workers exposure	
Indoor or outdoor use	

1.2.12. Control of worker exposure: PROC9

PROC9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

Product (article) characteristics	
Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	≤ 100 %

Amount used (or contained in articles), frequency and duration of use/exposure	
The actual tonnage handled per shift is not considered to influence the exposure as such for this scenario. Instead, the combination of the scale of operation and level of containment/automation (as reflected in the technical conditions) is the main determinant of the process-intrinsic emission potential.	
Exposure duration	≤ 8 h/day
Covers frequency up to:	5 days/week

Technical and organisational conditions and measures	
Handle product within a closed system	
During indoor processes or in cases where natural ventilation is not sufficient, LEV should be in place at points were emissions could occur. Outdoor, LEV is not generally required.	
Fill containers at dedicated fill points supplied with local extract ventilation.	
Drain down and flush system prior to equipment break-in or maintenance.	
Apply a good standard of general or controlled ventilation when maintenance activities are carried out.	
Ensure operatives are trained to minimise exposure	
Ensure supervision is in place to check that the RMMs are in place and are being used correctly and that the OCs are being followed	

Conditions and measures related to personal protection, hygiene and health evaluation	
Use suitable eye protection. Wear suitable face shield. Wear suitable coveralls to prevent exposure to the skin	Personal protection measures have to be applied in case of potential exposure only.
Wear gloves providing a minimum efficiency of (%):	90
Wear a respirator providing a minimum efficiency of (%):	95 Mandatory if activities take place outdoors or indoors with no local exhaust ventilation
See section 8 of the SDS.	

Other conditions affecting workers exposure	
Indoor or outdoor use	

1.3. Exposure estimation and reference to its source

1.3.1. Environmental release and exposure: ERC1

Assessment method	EUSES

Protection target	Unit	Exposure estimation	PNEC	RCR	Assessment conditions
Freshwater	mg/l	0.000133	0.0011	0.121	
Marine water	mg/l	0.0000315	0.0011	0.029	

1.3.2. Environmental release and exposure: ERC2

Assessment method	EUSES

Protection target	Unit	Exposure estimation	PNEC	RCR	Assessment conditions
Freshwater	mg/l	0.0000497	0.0011	0.045	
Marine water	mg/l	0.000012	0.0011	0.011	

1.3.3. Environmental release and exposure: ERC4

Protection target	Unit	Exposure estimation	PNEC	RCR	Assessment conditions
Freshwater	mg/l	0.0000108	0.0011	0.01	
Marine water	mg/l	0.0000231	0.0011	0.021	

1.3.4. Environmental release and exposure: ERC6a

Assessment method	EUSES

Protection target	Unit	Exposure estimation	PNEC	RCR	Assessment conditions
Freshwater	mg/l	0.0000837	0.0011	0.076	
Marine water	mg/l	0.0000205	0.0011	0.019	

1.3.5. Environmental release and exposure: ERC6b

Protection target	Unit	Exposure estimation	PNEC	RCR	Assessment conditions
Freshwater	mg/l	0.00000173	0.0011	0.002	
Marine water	mg/l	0.00000019	0.0011	≈ 0.00018	

1.3.6. Environmental release and exposure: ERC7

Protection target	Unit	Exposure estimation	PNEC	RCR	Assessment conditions
Freshwater	mg/l	0.00000558	0.0011	0.005	
Marine water	mg/l	0.00000121	0.0011	0.001	

1.3.7. Worker exposure: PROC1

Route of exposure and type of effects	Exposure estimate	Assessment conditions	RCR
Dermal - Long-term - systemic effects	0.34 mg/kg bodyweight/day	Outdoor use, Indoor use, Without LEV, No gloves worn	0.05
Inhalation - Long-term - systemic effects	0 mg/m³	Outdoor use, Indoor use, Without LEV	< 0.01
Dermal - Acute - systemic effects	0.34 mg/kg bodyweight/day	Outdoor use, Indoor use, Without LEV, No gloves worn	0.05
Inhalation - Acute - systemic effects	0 mg/m³	Outdoor use, Indoor use, Without LEV	< 0.01
Acute - Local - Inhalation	0 mg/m³	Outdoor use, Indoor use, Without LEV	< 0.01

Long term - Local - Inhalation	0 mg/m³	Outdoor use, Indoor use, Without LEV	< 0.01

1.3.8. Worker exposure: PROC2

Route of exposure and type of effects	Exposure estimate	Assessment conditions	RCR
Dermal - Long-term - systemic effects	1.37 mg/kg bodyweight/day	Outdoor use, Indoor use, Without LEV, No gloves worn	0.201
	0.14 mg/kg bodyweight/day	Indoor use, With LEV, No gloves worn	0.021
Inhalation - Long-term - systemic effects	1.24 mg/m³	Outdoor use, With RPE95%	0.026
	3.54 mg/m³	Indoor use, With LEV, No RPE	0.074
Dermal - Acute - systemic effects	1.37 mg/kg bodyweight/day	Outdoor use, Indoor use, Without LEV, No gloves worn	0.201
	0.14 mg/kg bodyweight/day	Indoor use, With LEV, No gloves worn	0.021
Inhalation - Acute - systemic effects	1.24 mg/m³	Outdoor use, With RPE95%	0.026
	3.54 mg/m³	Indoor use, With LEV, No RPE	0.074
Acute - Local - Inhalation	1.24 mg/m³	Outdoor use, With RPE95%	0.034
	3.54 mg/m³	Indoor use, With LEV, No RPE	0.098
Long term - Local - Inhalation	1.24 mg/m³	Outdoor use, With RPE95%	0.089
	3.54 mg/m³	Indoor use, With LEV, No RPE	0.253

1.3.9. Worker exposure: PROC3

Route of exposure and type of effects	Exposure estimate	Assessment conditions	RCR
Dermal - Long-term - systemic effects	0.34 mg/kg bodyweight/day	Outdoor use, Indoor use, Without LEV, No gloves worn	0.05
	0.03 mg/kg bodyweight/day	Indoor use, With LEV, No gloves worn	0.004
Inhalation - Long-term - systemic effects	2.48 mg/m³	Outdoor use, With RPE95%	0.052
	7.08 mg/m³	Indoor use, With LEV, No RPE	0.149
Dermal - Acute - systemic effects	0.34 mg/kg bodyweight/day	Outdoor use, Indoor use, Without LEV, No gloves worn	0.05
	0.03 mg/kg bodyweight/day	Indoor use, With LEV, No gloves worn	0.004
Inhalation - Acute - systemic effects	2.48 mg/m³	Outdoor use, With RPE95%	0.052
	7.08 mg/m³	Indoor use, With LEV, No RPE	0.149
Acute - Local - Inhalation	2.48 mg/m³	Outdoor use, With RPE95%	0.069
	7.08 mg/m³	Indoor use, With LEV, No RPE	0.197
Long term - Local - Inhalation	2.48 mg/m³	Outdoor use, With RPE95%	0.177
	7.08 mg/m³	Indoor use, With LEV, No RPE	0.506

1.3.10. Worker exposure: PROC4

Route of exposure and type of effects	Exposure estimate	Assessment conditions	RCR
Dermal - Long-term - systemic effects	0.69 mg/kg bodyweight/day	Outdoor use, Indoor use, Without LEV, Gloves worn (90% Reduction)	0.101
	0.69 mg/kg bodyweight/day	Indoor use, With LEV, No gloves worn	0.101
Inhalation - Long-term - systemic effects	2.48 mg/m³	Outdoor use, With RPE95%	0.052
	7.08 mg/m³	Indoor use, With LEV, No RPE	0.149
Dermal - Acute - systemic effects	0.69 mg/kg bodyweight/day	Outdoor use, Indoor use, Without LEV, Gloves worn (90% Reduction)	0.101
	0.69 mg/kg bodyweight/day	Indoor use, With LEV, No gloves worn	0.101
Inhalation - Acute - systemic effects	2.48 mg/m³	Outdoor use, With RPE95%	0.052
	7.08 mg/m³	Indoor use, With LEV, No RPE	0.149
Acute - Local - Inhalation	2.48 mg/m³	Outdoor use, With RPE95%	0.069
	7.08 mg/m³	Indoor use, With LEV, No RPE	0.197
Long term - Local - Inhalation	2.48 mg/m³	Outdoor use, With RPE95%	0.177
	7.08 mg/m³	Indoor use, With LEV, No RPE	0.506

1.3.11. Worker exposure: PROC8b

Route of exposure and type of effects	Exposure estimate	Assessment conditions	RCR
Dermal - Long-term - systemic effects	0.69 mg/kg bodyweight/day	Outdoor use, Indoor use, Without LEV, Gloves worn (90% Reduction)	0.101
	0.69 mg/kg bodyweight/day	Indoor use, With LEV, No gloves worn	0.101
Inhalation - Long-term - systemic effects	3.72 mg/m³	Outdoor use, With RPE95%	0.078
	3.19 mg/m³	Indoor use, With LEV, No RPE	0.067
Dermal - Acute - systemic effects	0.69 mg/kg bodyweight/day	Outdoor use, Indoor use, Without LEV, Gloves worn (90% Reduction)	0.101
	0.69 mg/kg bodyweight/day	Indoor use, With LEV, No gloves worn	0.101
Inhalation - Acute - systemic effects	3.72 mg/m³	Outdoor use, With RPE95%	0.078
	3.19 mg/m³	Indoor use, With LEV, No RPE	0.067
Acute - Local - Inhalation	3.72 mg/m³	Outdoor use, With RPE95%	0.103
	3.19 mg/m³	Indoor use, With LEV, No RPE	0.089
Long term - Local - Inhalation	3.72 mg/m³	Outdoor use, With RPE95%	0.266
	3.19 mg/m³	Indoor use, With LEV, No RPE	0.228

1.3.12. Worker exposure: PROC9

Route of exposure and type of effects	Exposure estimate	Assessment conditions	RCR
Dermal - Long-term - systemic effects	0.69 mg/kg bodyweight/day	Outdoor use, Indoor use, Without LEV, Gloves worn (90% Reduction)	0.101
	0.69 mg/kg bodyweight/day	Indoor use, With LEV, No gloves worn	0.101
Inhalation - Long-term - systemic effects	4.96 mg/m³	Outdoor use, With RPE95%	0.104
	0.71 mg/m³	Indoor use, With LEV, With RPE	0.015
Dermal - Acute - systemic effects	0.69 mg/kg bodyweight/day	Outdoor use, Indoor use, Without LEV, Gloves worn (90% Reduction)	0.101
	0.69 mg/kg bodyweight/day	Indoor use, With LEV, No RPE	0.101
Inhalation - Acute - systemic effects	4.96 mg/m³	Outdoor use, With RPE95%	0.104
	0.71 mg/m³	Indoor use, With LEV, With RPE	0.015
Acute - Local - Inhalation	4.96 mg/m³	Outdoor use, With RPE95%	0.138
	0.71 mg/m³	Indoor use, With LEV, With RPE	0.02
Long term - Local - Inhalation	4.96 mg/m³	Outdoor use, With RPE95%	0.354
	0.71 mg/m³	Indoor use, With LEV, With RPE	0.051

1.4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the ES

1.4.1. Environment

Guidance - Environment	Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. For scaling see : https://ec.europa.eu/jrc/en/scientific-tool/european-union-system-evaluation-substances

1.4.2. Health

Guidance - Health	Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. For scaling see : http://www.ecetoc.org/tra

2. EIGA002-2: Professional uses

2.1. Title section

	Professional uses	
	ES Ref.: EIGA002-2 Revision date: 4/25/2017	

Processes, tasks, activities covered	Professional uses, including transfer of product in non-industrial settings

Environment	**Use descriptors**
CS1	ERC9a, ERC9b

Worker	**Use descriptors**
CS2	PROC4
CS3	PROC8a

Assessment method	ECETOC TRA 2.0

2.2. Conditions of use affecting exposure

2.2.1. Control of environmental exposure: ERC9a, ERC9b

ERC9a	Widespread use of functional fluid (indoor)
ERC9b	Widespread use of functional fluid (outdoor)

Product (article) characteristics	
Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	≤ 100 %

Amount used, frequency and duration of use (or from service life)	
No additional information	

Technical and organisational conditions and measures	
Ensure operatives are trained to minimise exposure	

Conditions and measures related to sewage treatment plant	
No additional information	

Conditions and measures related to treatment of waste (including article waste)	
See section 13 of the SDS	

Other conditions affecting environmental exposure	
Closed systems are used in order to prevent unintended emissions	

2.2.2. Control of worker exposure: PROC4

PROC4	Chemical production where opportunity for exposure arises

Product (article) characteristics	
Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	≤ 100 %

Amount used (or contained in articles), frequency and duration of use/exposure	
The actual tonnage handled per shift is not considered to influence the exposure as such for this scenario. Instead, the combination of the scale of operation and level of containment/automation (as reflected in the technical conditions) is the main determinant of the process-intrinsic emission potential.	
Exposure duration	≤ 8 h/day
Covers frequency up to:	5 days/week

Technical and organisational conditions and measures	
Handle product within a closed system	
During indoor processes or in cases where natural ventilation is not sufficient, LEV should be in place at points were emissions could occur. Outdoor, LEV is not generally required.	
Drain down and flush system prior to equipment break-in or maintenance.	
Apply a good standard of general or controlled ventilation when maintenance activities are carried out.	
Ensure operatives are trained to minimise exposure	
Ensure supervision is in place to check that the RMMs are in place and are being used correctly and that the OCs are being followed	

Conditions and measures related to personal protection, hygiene and health evaluation	
Use suitable eye protection. Wear suitable face shield. Wear suitable coveralls to prevent exposure to the skin	Personal protection measures have to be applied in case of potential exposure only.
Wear gloves providing a minimum efficiency of (%):	90
Wear a respirator providing a minimum efficiency of	95 Mandatory if activities take place outdoors or indoors with no local exhaust ventilation
See section 8 of the SDS.	

Other conditions affecting workers exposure	
Indoor or outdoor use	

2.2.3. Control of worker exposure: PROC8a

PROC8a	Transfer of substance or mixture (charging and discharging) at non-dedicated facilities

Product (article) characteristics	
Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	≤ 100 %

Amount used (or contained in articles), frequency and duration of use/exposure	
The actual tonnage handled per shift is not considered to influence the exposure as such for this scenario. Instead, the combination of the scale of operation and level of containment/automation (as reflected in the technical conditions) is the main determinant of the process-intrinsic emission potential.	
Exposure duration	≤ 8 h/day
Covers frequency up to:	5 days/week

Technical and organisational conditions and measures	
Handle product within a closed system	
During indoor processes or in cases where natural ventilation is not sufficient, LEV should be in place at points were emissions could occur. Outdoor, LEV is not generally required.	
Drain down and flush system prior to equipment break-in or maintenance.	
Apply a good standard of general or controlled ventilation when maintenance activities are carried out.	
Ensure operatives are trained to minimise exposure	
Ensure supervision is in place to check that the RMMs are in place and are being used correctly and that the OCs are being followed	

Conditions and measures related to personal protection, hygiene and health evaluation	
Use suitable eye protection. Wear suitable face shield. Wear suitable coveralls to prevent exposure to the skin	Personal protection measures have to be applied in case of potential exposure only.
Wear gloves providing a minimum efficiency of (%):	90
Wear a respirator providing a minimum efficiency of	95 Mandatory if activities take place outdoors or indoors with no local exhaust ventilation
See section 8 of the SDS.	

Other conditions affecting workers exposure	
Indoor or outdoor use	

2.3. Exposure estimation and reference to its source

2.3.1. Environmental release and exposure: ERC9a, ERC9b

Qualitative approach used to conclude safe use,The exposure of aquatic, terrestrial, sediment and sewage treatment microorganisms is considered to be negligible because the substance partitions primarily to air when released to the environment,The resulting environmental exposure is not expected to add significantly to already present background levels of the gas in the environment,An additional assessment for environmental exposure for wide dispersive uses has therefore not been presented in section 3.

2.3.2. Worker exposure: PROC4

Route of exposure and type of effects	Exposure estimate	Assessment conditions	RCR
Dermal - Long-term - systemic effects	0.69 mg/kg bodyweight/day	Indoor use, With LEV, No gloves worn	0.101
	0.69 mg/kg bodyweight/day	Outdoor use, Indoor use, Without LEV, Gloves worn (90% Reduction)	0.101
Inhalation - Long-term - systemic effects	2.48 mg/m³	Outdoor use, With RPE95%	0.052
	7.08 mg/m³	Indoor use, With LEV, No RPE	0.149
Dermal - Acute - systemic effects	0.69 mg/kg bodyweight/day	Indoor use, With LEV, No gloves worn	0.101
	0.69 mg/kg bodyweight/day	Outdoor use, Indoor use, Without LEV, Gloves worn (90% Reduction)	0.101
Inhalation - Acute - systemic effects	2.48 mg/m³	Outdoor use, With RPE95%	0.052
	7.08 mg/m³	Indoor use, With LEV, No RPE	0.149
Acute - Local - Inhalation	2.48 mg/m³	Outdoor use, With RPE95%	0.069
	7.08 mg/m³	Indoor use, With LEV, No RPE	0.197
Long term - Local - Inhalation	2.48 mg/m³	Outdoor use, With RPE95%	0.177
	7.08 mg/m³	Indoor use, With LEV, No RPE	0.506

2.3.3. Worker exposure: PROC8a

Route of exposure and type of effects	Exposure estimate	Assessment conditions	RCR
Dermal - Long-term - systemic effects	0.14 mg/kg bodyweight/day	Indoor use, With LEV, No gloves worn	0.021
	1.37 mg/kg bodyweight/day	Outdoor use, Indoor use, Without LEV, Gloves worn (90% Reduction)	0.201
Inhalation - Long-term - systemic effects	6.2 mg/m³	Outdoor use, With RPE95%	0.13
	0.89 mg/m³	Indoor use, With LEV, No RPE	0.019
Dermal - Acute - systemic effects	0.14 mg/kg bodyweight/day	Indoor use, With LEV, No gloves worn	0.021
	1.37 mg/kg bodyweight/day	Outdoor use, Indoor use, Without LEV, Gloves worn (90% Reduction)	0.201
Inhalation - Acute - systemic effects	6.2 mg/m³	Outdoor use, With RPE95%	0.13
	0.89 mg/m³	Indoor use, With LEV, No RPE	0.019

Acute - Local - Inhalation	6.2 mg/m³	Outdoor use, With RPE95%	0.172
	0.89 mg/m³	Indoor use, With LEV, No RPE	0.025
Long term - Local - Inhalation	6.2 mg/m³	Outdoor use, With RPE95%	0.443
	0.89 mg/m³	Indoor use, With LEV, No RPE	0.064

2.4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the ES

2.4.1. Environment

Guidance - Environment	Check that RMMs and OCs are as described above or of equivalent efficiency

2.4.2. Health

Guidance - Health	Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. For scaling see : http://www.ecetoc.org/tra

End of document