SAFETY DATA SHEET
Ammonia, anhydrous

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

1.1 Product identifier

Product name: Ammonia, anhydrous

Trade name: Ammonia 3.0, Ammonia 3.6 Detector, Ammonia 3.8, Ammonia 4.5, Ammonia 5.0, Ammonia 6.0, R717

Additional identification

Chemical name:	Ammonia, anhydrous
Chemical formula:	NH3
INDEX No.	007-001-00-5
CAS-No.	7664-41-7
EC No.	231-635-3
REACH Registration No.	01-2119488876-14

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

Identified uses: Industrial and professional. Perform risk assessment prior to use. Casting operations Explosives manufacture & use Freezing, chilling, and packaging of foodstuffs. Manufacturing of fertilisers and nitric acid. Production of plastics. Refrigerant. Use for electronic component manufacture. Use of gas to manufacture pharmaceutical products. Using gas alone or in mixtures for the calibration of analysis equipment. Using gas as feedstock in chemical processes. Using gas for metal treatment. Washing of textiles or metal parts Water treatment. Use in laboratories Formulation of mixtures with gas in pressure receptacles.

Uses advised against Consumer use.

1.3 Details of the supplier of the safety data sheet

Supplier

Linde Gas A/S
Lautruphøj 2-6
2750 Ballerup

Telephone: +4532836600

E-mail: sds.ren@linde.com

1.4 Emergency telephone number: Poison control hotline: tel. +45 82 12 12 12

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008 as amended.

Physical Hazards		
Flammable gas	Category 2	H221: Flammable gas.
Gases under pressure	Liquefied gas	H280: Contains gas under pressure; may explode if heated.
Health Hazards		
Acute toxicity (Inhalation - gas)	Category 3	H331: Toxic if inhaled.
Skin corrosion	Category 1B	H314: Causes severe skin burns and eye damage.
Serious eye damage	Category 1	H318: Causes serious eye damage.
Environmental Hazards		
Acute hazards to the aquatic environment	Category 1	H400: Very toxic to aquatic life.
Chronic hazards to the aquatic environment	Category 2	H411: Toxic to aquatic life with long lasting effects.

2.2 Label Elements

Contains: Ammonia, anhydrous

Signal Word: Danger

Hazard Statement(s):
H221: Flammable gas.
H280: Contains gas under pressure; may explode if heated.
H331: Toxic if inhaled.
H314: Causes severe skin burns and eye damage.
H410: Very toxic to aquatic life with long lasting effects.

Precautionary Statements

General None.

Prevention: P210: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

	P260: Do not breathe gas/vapors. P273: Avoid release to the environment. P280: Wear protective gloves/protective clothing/eye protection/face protection.
Response:	P303+P361+P353+P315: IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower. Get immediate medical advice/attention. P304+P340+P315: IF INHALED: Remove person to fresh air and keep comfortable for breathing. Get immediate medical advice/attention. P305+P351+P338+P315: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get immediate medical advice/attention. P377: Leaking gas fire: Do not extinguish, unless leak can be stopped safely. P381: In case of leakage, eliminate all ignition sources.
Storage:	P403: Store in a well-ventilated place. P405: Store locked up.
Disposal	None.
Supplemental information	EUH071: Corrosive to the respiratory tract.

2.3 Other hazards Contact with evaporating liquid may cause frostbite or freezing of skin.

SECTION 3: Composition/information on ingredients

3.1 Substances

Chemical name Ammonia, anhydrous
INDEX No.: 007-001-00-5
CAS-No.: 7664-41-7
EC No.: 231-635-3
REACH Registration No.: 01-2119488876-14
Purity: 100%
The purity of the substance in this section is used for classification only, and does not represent the actual purity of the substance as supplied, for which other documentation should be consulted.
Trade name: Ammonia 3.0, Ammonia 3.6 Detector, Ammonia 3.8, Ammonia 4.5, Ammonia 5.0, Ammonia 6.0, R717

Chemical name	Chemical formula	Concentration	CAS-No.	REACH Registration No.	M-Factor:	Notes
Ammonia, anhydrous	NH3	100%	7664-41-7	01-2119488876-14	Aquatic Toxicity (Acute): 1	#

The concentrations of the components in the SDS header, product name on page one and in section 3.2 are in mol due to regulatory requirements. All concentrations are nominal.
This substance has workplace exposure limit(s).
PBT: persistent, bioaccumulative and toxic substance.
vPvB: very persistent and very bioaccumulative substance.

SECTION 4: First aid measures

General: Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.

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.

Eye contact: Rinse the eye with water immediately. Remove contact lenses, if present and easy to do. Continue rinsing. Flush thoroughly with water for at least 15 minutes. Get immediate medical assistance. If medical assistance is not immediately available, flush an additional 15 minutes.

Skin Contact:	Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Contact with evaporating liquid may cause frostbite or freezing of skin.
Ingestion:	Ingestion is not considered a potential route of exposure.
4.2 Most important symptoms and effects, both acute and delayed:	Causes severe skin burns and eye damage. Contact with liquefied gas can cause damage (frostbite) due to rapid evaporative cooling. May be fatal if inhaled.

4.3 Indication of any immediate medical attention and special treatment needed

Hazards:	Causes severe skin burns and eye damage. Contact with liquefied gas can cause damage (frostbite) due to rapid evaporative cooling. May be fatal if inhaled.
Treatment:	Thaw frosted parts with lukewarm water. Do not rub affected area. Get immediate medical advice/attention. Treat with a corticosteroid spray as soon as possible after inhalation.

SECTION 5: Firefighting measures

General Fire Hazards:	Heat may cause the containers to explode.

5.1 Extinguishing media

Suitable extinguishing media:	Use water spray to reduce vapors or divert vapor cloud drift. Water Spray or Fog. Dry powder. Foam.
Unsuitable extinguishing media:	Carbon Dioxide. Do not use water jet, as this may cause corrosive liquid to splash.
5.2 Special hazards arising from the substance or mixture:	Fire or excessive heat may produce hazardous decomposition products.
Hazardous Combustion Products:	If involved in a fire the following toxic and/or corrosive fumes may be produced by thermal decomposition: Nitrogen monoxide ; Nitrogen dioxide

5.3 Advice for firefighters

Special fire fighting procedures:	In case of fire: Stop leak if safe to do so. Use of water may result in the formation of very toxic aqueous solutions. Keep run-off water out of sewers and water sources. Dike for water control. Continue water spray from protected position until container stays cool. Use extinguishants to contain the fire. Isolate the source of the fire or let it burn out.

Special protective equipment for fire-fighters:	Gas tight chemically protective clothing (Type 1) in combination with self contained breathing apparatus. Guideline: EN 943-2 Protective clothing against liquid and gaseous chemicals, aerosols and solid particles. Performance requirements for gas-tight (Type 1) chemical protective suits for emergency teams (ET)

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures:	Evacuate area. Provide adequate ventilation. Consider the risk of potentially explosive atmospheres . In case of leakage, eliminate all ignition sources. Monitor the concentration of the released product. Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe. EN 137 Respiratory protective devices - Self-contained open-circuit compressed air breathing apparatus with full face mask - Requirements, testing, marking.
6.2 Environmental Precautions:	Prevent further leakage or spillage if safe to do so. Reduce vapour with fog or fine water spray. Keep run-off water out of sewers and water sources. Dike for water control.
6.3 Methods and material for containment and cleaning up:	Provide adequate ventilation. Eliminate sources of ignition. Wash contaminated equipment or sites of leaks with copious quantities of water.
6.4 Reference to other sections:	Refer to sections 8 and 13.

SECTION 7: Handling and storage:

7.1 Precautions for safe handling:

Only experienced and properly instructed persons should handle gases under pressure. Avoid exposure - obtain special instructions before use. Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Purge system with dry inert gas (e.g. helium or nitrogen) before gas is introduced and when system is placed out of service. Purge air from system before introducing gas. Containers, which contain or have contained flammable or explosive substances, must not be inerted with liquid carbon dioxide. Assess the risk of a potentially explosive atmosphere and the need for suitable equipment i.e. explosion-proof. Take precautionary measures against static discharges. Keep away from ignition sources (including static discharges). Provide electrical earthing of equipment and electrical equipment usable in explosive atmospheres. Use non-sparking tools. Installation of a cross purge assembly between the container and the regulator is recommended. Excess pressure must be vented through an appropriate scrubber system. Refer to supplier's handling instructions. The substance must be handled in accordance with good industrial hygiene and safety procedures. Ensure the complete system has been (or is regularly) checked for leaks before use. Protect containers from physical damage; do not drag, roll, slide or drop. Do not remove or deface labels provided by the supplier for the identification of the container contents. When moving containers, even for short distances, use appropriate equipment eg. trolley, hand truck, fork truck etc. Secure cylinders in an upright position at all times, close all valves when not in use. Provide adequate ventilation. Suck back of water into the container must be prevented. Do not allow backfeed into the container. Avoid suckback of water, acid and alkalis. Keep container below 50°C in a well ventilated place. Observe all regulations and local requirements regarding storage of containers. When using do not eat, drink or smoke. Store in accordance with local/regional/national/international regulations. Never use direct flame or electrical heating devices to raise the pressure of a container. 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. Damaged valves should be reported immediately to the supplier Close container valve after each use and when empty, even if still connected to equipment. Never attempt to repair or modify container valves or safety relief devices. Replace valve outlet caps or plugs and container caps where supplied as soon as container is disconnected from equipment. Keep container valve outlets clean and free from contaminates particularly oil and water. If user experiences any difficulty operating container valve discontinue use and contact supplier. Never attempt to transfer gases from one container to another. Container valve guards or caps should be in place.

7.2 Conditions for safe storage, including any incompatibilities: All electrical equipment in the storage areas should be compatible with the risk of a potentially explosive atmosphere. Segregate from oxidant gases and other oxidants being stored. Containers should not be stored in conditions likely to encourage corrosion. Stored containers should be periodically checked for general conditions and leakage. Keep away from food, drink and animal feeding stuffs. Container valve guards or caps should be in place. Store containers in location free from fire risk and away from sources of heat and ignition. Keep away from combustible material.

7.3 Specific end use(s): None.

SECTION 8: Exposure controls/personal protection

8.1 Control Parameters

Occupational Exposure Limits

Chemical name	Type	Exposure Limit Values	Source
Ammonia, anhydrous	TWA	20 ppm 14 mg/m3	EU. Indicative Occupational Exposure Limit Values in Directives 91/322/EEC, 2000/39/EC, 2006/15/EC, 2009/161/EU (12 2009)
	STEL	50 ppm 36 mg/m3	EU. Indicative Occupational Exposure Limit Values in Directives 91/322/EEC, 2000/39/EC, 2006/15/EC, 2009/161/EU (12 2009)
	GV	20 ppm 14 mg/m3	Denmark. Work Environment Authority. Exposure Limits for Substances & Materials, An. 2 & 3 (12 2011)

DNEL-Values

Critical component	Type	Value	Remarks
Ammonia, anhydrous	Workers - Inhalation, Local, short-term	36 mg/m3	respiratory tract irritation
	Workers - Inhalation, Local, long-term	14 mg/m3	respiratory tract irritation
	Workers - Inhalation, Systemic, short-term	47,6 mg/m3	Repeated dose toxicity
	Workers - Inhalation, Systemic, long-term	47,6 mg/m3	Repeated dose toxicity
	Workers - Dermal, Systemic, long-term	6,8 mg/kg bw/day	Repeated dose toxicity
	Workers - Eyes, Local effect		High hazard (no threshold derived)
	Workers - Dermal, Systemic, short-term	6,8 mg/kg bw/day	Repeated dose toxicity

PNEC-Values

Critical component	Type	Value	Remarks
Ammonia, anhydrous	Aquatic (freshwater)	0,001 mg/l	-
Ammonia, anhydrous	Aquatic (marine water)	0,001 mg/l	-

8.2 Exposure controls

Appropriate engineering controls:

Consider a work permit system e.g. for maintenance activities. Ensure adequate air ventilation. Provide adequate general and local exhaust ventilation. Keep concentrations well below occupational exposure limits. Gas detectors should be used when toxic quantities may be released. Gas detectors should be used when quantities of flammable gases or vapours may be released. Systems under pressure should be regularly checked for leakages. Product to be handled in a closed system and under strictly controlled conditions. Only use permanent leak tight installations (e.g. welded pipes). Take precautionary measures against static discharges. Do not eat, drink or smoke when using the product.

Individual protection measures, such as personal protective equipment

General information:

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. Keep self contained breathing apparatus readily available for emergency use. Personal protective equipment for the body should be selected based on the task being performed and the risks involved. Protect eyes, face and skin from contact with product. Refer to local regulations for restriction of emissions to the atmosphere. See section 13 for specific methods for waste gas treatment.

Eye/face protection:

Safety eyewear, goggles or face-shield to EN166 should be used to avoid exposure to liquid splashes. Wear eye protection to EN 166 when using gases.
Guideline: EN 166 Personal Eye Protection.

Skin protection

Hand Protection:

Guideline: EN 388 Protective gloves against mechanical risks.
Additional Information: Wear working gloves while handling containers
Material: Chloroprene rubber.
Break-through time: 30 min
Glove thickness: 0,5 mm
Guideline: EN 374-1/2/3 Protective gloves against chemicals and micro-organisms.
Additional Information: Chemically resistant gloves complying with EN 374 should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
Material: Butyl rubber.
Break-through time: 480 min
Glove thickness: 0,7 mm
Guideline: EN 374-1/2/3 Protective gloves against chemicals and micro-organisms.
Additional Information: Chemically resistant gloves complying with EN 374 should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

Body protection:

Wear fire resistant or flame retardant clothing. Keep suitable chemically resistant protective clothing readily available for emergency use.
Guideline: ISO/TR 2801:2007 Clothing for protection against heat and flame -- General recommendations for selection, care and use of protective clothing.Guideline: EN 943 Protective clothing against liquid and gaseous chemicals, including liquid aerosols and solid particles.

Other:

Wear safety shoes while handling containers
Guideline: ISO 20345 Personal protective equipment - Safety footwear.

Respiratory Protection:	Reference should be made to European Standard EN 689 for methods for the assessment of exposure by inhalation to chemical agents and national guidance documents for methods for the determination of hazardous substances. When allowed by a risk assessment Respiratory Protective Equipment (RPE) may be used The selection of the Respiratory Protective Device (RPD) must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected RPD. Self-contained breathing apparatus (SCBA) or positive pressure airline with mask are to be used in oxygen-deficient atmospheres Guideline: EN 137 Respiratory protective devices - Self-contained open-circuit compressed air breathing apparatus with full face mask - Requirements, testing, marking.Material: Filter K Guideline: EN 14387 Respiratory protective devices. Gas filter(s) and combined filter(s). Requirements, testing, marking. Guideline: EN 136 Respiratory protective devices. Full face masks. Requirements, testing, marking.
Thermal hazards:	No precautionary measures are necessary.
Hygiene measures:	Obtain special instructions before use. Specific risk management measures are not required beyond good industrial hygiene and safety procedures. Do not eat, drink or smoke when using the product.
Environmental exposure controls:	For waste disposal, see section 13 of the SDS.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance	
Physical state:	Gas
Form:	Liquefied gas
Color:	Colorless
Odor:	Pungent suffocating odor
Odor Threshold:	Odor threshold is subjective and is inadequate to warn of over exposure.
pH:	If dissolved in water pH-value will be affected.
Melting Point:	-77,7 °C Experimental result, Key study
Boiling Point:	-33 °C
Sublimation Point:	Not applicable.
Critical Temp. (°C):	132,0 °C
Flash Point:	Not applicable to gases and gas mixtures.

Evaporation Rate:	Not applicable to gases and gas mixtures.
Flammability (solid, gas):	Flammable Gas
Flammability Limit - Upper (%):	33,6 %(V) Experimental result, Key study
Flammability Limit - Lower (%):	15,4 %(V)
Vapor pressure:	8,5737 bar (20 °C) Experimental result, Key study
Vapor density (air=1):	0,59 AIR=1
Relative density:	0,8
Solubility(ies)	
Solubility in Water:	531 g/l (20 °C)
Partition coefficient (n-octanol/water):	< 1
Autoignition Temperature:	651 °C Experimental result, Key study
Decomposition Temperature:	> 450 °C
Viscosity	
Kinematic viscosity:	No data available.
Dynamic viscosity:	0,7 mPa.s (48,9 °C)
Explosive properties:	Not applicable.
Oxidizing properties:	Not applicable.

9.2 Other information: None.

Molecular weight: 17,03 g/mol (NH3)

SECTION 10: Stability and reactivity

10.1 Reactivity: No reactivity hazard other than the effects described in sub-section below.

10.2 Chemical Stability: Stable under normal conditions.

10.3 Possibility of hazardous reactions: Can form a potentially explosive atmosphere in air. May react violently with oxidants.

10.4 Conditions to avoid: Avoid moisture in the installation. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

10.5 Incompatible Materials: Air and oxidizers. Moisture. For material compatibility see latest version of ISO-11114. Reacts with water to form corrosive alkalis. May react violently with acids.

10.6 Hazardous Decomposition Products: Under normal conditions of storage and use, hazardous decomposition products should not be produced. If involved in a fire the following toxic and/or corrosive fumes may be produced by thermal decomposition: The following decomposition products may be produced: Nitrogen monoxide
; Nitrogen dioxide

SECTION 11: Toxicological information

General information: Inhalation of large amounts leads to bronchospasm, laryngeal oedema and pseudomembrane formation.

11.1 Information on toxicological effects

Acute toxicity - Oral

Product	Based on available data, the classification criteria are not met.
Ammonia, anhydrous	LD 50 (Rat): 350 mg/kg Remarks: Experimental result, Key study

Acute toxicity - Dermal

Product	Based on available data, the classification criteria are not met.

Acute toxicity - Inhalation

Product	Toxic if inhaled.
Ammonia, anhydrous	LC 50 (Rat, 4 h): 2000 ppm

Repeated dose toxicity

Ammonia, anhydrous	NOAEL (Rat(Female, Male), Oral, 28 - 53 d): 250 mg/kg Oral Read-across from supporting substance (structural analogue or surrogate), Key study LOAEL (Rat, Inhalation, 35 - 75 d): 175 mg/m3 Inhalation Experimental result, Weight of Evidence study

Skin Corrosion/Irritation

Product	Causes severe burns.

Serious Eye Damage/Eye Irritation

Product	Causes serious eye damage.

Respiratory or Skin Sensitization
Product: Based on available data, the classification criteria are not met.

Germ Cell Mutagenicity
Product: Based on available data, the classification criteria are not met.

Carcinogenicity
Product: Based on available data, the classification criteria are not met.

Reproductive toxicity
Product: Based on available data, the classification criteria are not met.

Specific Target Organ Toxicity - Single Exposure
Product: Based on available data, the classification criteria are not met.

Specific Target Organ Toxicity - Repeated Exposure
Product: Based on available data, the classification criteria are not met.

Aspiration Hazard
Product: Not applicable to gases and gas mixtures..

SECTION 12: Ecological information

General information: Avoid release to the environment. Product is not allowed to be discharged into ground water or the aquatic environment.

12.1 Toxicity

Acute toxicity
Product: Very toxic to aquatic life with long lasting effects.

Acute toxicity - Fish
Ammonia, anhydrous: LC 50 (Pimephales promelas, 96 h): 0,75 - 3,4 mg/l (flow-through) Remarks: Read-across from supporting substance (structural analogue or surrogate), Key study

Acute toxicity - Aquatic Invertebrates
Ammonia, anhydrous: LC 50 (48 h): 101 mg/l Remarks: Experimental result, Key study

Toxicity to microorganisms
Ammonia, anhydrous: Depending on local conditions and existing concentrations, disturbances in the biodegradation process of activated sludge are possible.

Toxicity to terrestrial organisms

Ammonia, anhydrous	Study not necessary due to exposure considerations.

Chronic Toxicity - Fish

Ammonia, anhydrous	LOEC (Fish, 73 Days): 0,022 mg/l

Chronic Toxicity - Aquatic Invertebrates

Ammonia, anhydrous	LC 50 (Daphnia magna, 96 h): 4,07 mg/l (flow-through) Read-across from supporting substance (structural analogue or surrogate), Key study

Toxicity to Aquatic Plants

Ammonia, anhydrous	LC 50 (Algae, algal mat (Algae), 18 Days): 2.700 mg/l

12.2 Persistence and Degradability

Product	Not applicable to gases and gas mixtures..

Biodegradation

Inorganic The product is not readily biodegradable.

12.3 Bioaccumulative potential

Product	The substance has no potential for bioaccumulation.

12.4 Mobility in soil

Product	The substance has low mobility in soil.

12.5 Results of PBT and vPvB assessment

Product	Not classified as PBT or vPvB.

12.6 Other adverse effects:

Other Ecological Information

May cause pH changes in aqueous ecological systems. Depending on local conditions and existing concentrations, disturbances in the biodegradation process of activated sludge are possible.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

General information: Must not be discharged to atmosphere. Consult supplier for specific recommendations.

Disposal methods: 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. Dispose of container via supplier only. Discharge, treatment, or disposal may be subject to national, state, or local laws. Toxic and corrosive gases formed during combustion should be scrubbed before discharge to atmosphere. Gas may be scrubbed in water. Gas may be scrubbed in sulphuric acid solution.

European Waste Codes

Container: 16 05 04*: Gases in pressure containers (including halons) containing dangerous substances.

SECTION 14: Transport information

ADR

14.1 UN Number:	UN 1005
14.2 UN Proper Shipping Name:	AMMONIA, ANHYDROUS
14.3 Transport Hazard Class(es)	
Class:	2
Label(s):	2.3, 8
Hazard No. (ADR):	268
Tunnel restriction code:	(C/D)
14.4 Packing Group:	–
14.5 Environmental hazards:	Environmentally Hazardous
14.6 Special precautions for user:	–

RID

14.1 UN Number:	UN 1005
14.2 UN Proper Shipping Name	AMMONIA, ANHYDROUS
14.3 Transport Hazard Class(es)	
Class:	2
Label(s):	2.3, 8
14.4 Packing Group:	–
14.5 Environmental hazards:	Environmentally Hazardous
14.6 Special precautions for user:	–

IMDG

14.1 UN Number:	UN 1005
14.2 UN Proper Shipping Name:	AMMONIA, ANHYDROUS
14.3 Transport Hazard Class(es)	
Class:	2.3
Label(s):	2.3, 8
EmS No.:	F-C, S-U
14.4 Packing Group:	–
14.5 Environmental hazards:	Marine Pollutant
14.6 Special precautions for user:	–

IATA

14.1 UN Number:	UN 1005
14.2 Proper Shipping Name:	Ammonia, anhydrous
14.3 Transport Hazard Class(es):	
Class:	2.3
Label(s):	–
14.4 Packing Group:	–
14.5 Environmental hazards:	Environmentally Hazardous
14.6 Special precautions for user:	–
Other information	
Passenger and cargo aircraft:	Forbidden.
Cargo aircraft only:	Forbidden.

14.7 Transport in bulk according to Annex II of MARPOL and the IBC Code: Not applicable

Additional identification: 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 that they are firmly secured. Ensure that the container valve is closed and not leaking. Container valve guards or caps should be in place. Ensure adequate air ventilation.

SECTION 15: Regulatory information

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

EU Regulations

EU. Directive 2012/18/EU (SEVESO III) on major accident hazards involving dangerous substances, as amended.:

Chemical	CAS-No.	Lower-tier Requirements	Upper-tier Requirements
Ammonia, anhydrous	7664-41-7	50 t	200 t

Directive 98/24/EC on the protection of workers from the risks related to chemical agents at work:

Chemical name	CAS-No.	Concentration
Ammonia, anhydrous	7664-41-7	100%

National Regulations

Council Directive 89/391/EEC on the introduction of measures to encourage improvements in the safety and health of workers at work Directive 89/686/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: Chemical Safety Assessment has been carried out.

SECTION 16: Other information

Revision Information: Not relevant.

Key literature references and sources for data: Various sources of data have been used in the compilation of this SDS, they include but are not exclusive to:
Agency for Toxic Substances and Diseases Registry (ATSDR) (http://www.atsdr.cdc.gov/).
European Chemical Agency: Guidance on the Compilation of Safety Data Sheets.
European Chemical Agency: Information on Registered Substances http://apps.echa.europa.eu/registered/registered-sub.aspx#search
European Industrial Gases Association (EIGA) Doc. 169 "Classification and Labelling guide", as amended.
International Programme on Chemical Safety (http://www.inchem.org/)
ISO 10156:2010 Gases and gas mixtures - Determination of fire potential and oxidizing ability for the selection of cylinder valve outlets.
Matheson Gas Data Book, 7th Edition.
National Institute for Standards and Technology (NIST) Standard Reference Database Number 69.
The ESIS (European chemical Substances 5 Information System) platform of the former European Chemicals Bureau (ECB) ESIS (http://ecb.jrc.ec.europa.eu/esis/).
The European Chemical Industry Council (CEFIC) ERICards.
United States of America's National Library of Medicine's toxicology data network TOXNET (http://toxnet.nlm.nih.gov/index.html)
Threshold Limit Values (TLV) from the American Conference of Governmental Industrial Hygienists (ACGIH).
Substance specific information from suppliers.
Details given in this document are believed to be correct at the time of publication.

Wording of the H-statements in section 2 and 3

H221	Flammable gas.
H280	Contains gas under pressure; may explode if heated.
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
H331	Toxic if inhaled.
H400	Very toxic to aquatic life.
H411	Toxic to aquatic life with long lasting effects.

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

SAFETY DATA SHEET

Ammonia, anhydrous

Issue Date:	16.01.2013	Version: 2.1	SDS No.: 000010021772
Last revised date:	10.12.2020		20/125

Classification according to Regulation (EC) No 1272/2008 as amended.

Flam. Gas 2, H221
Press. Gas Liq. Gas, H280
Acute Tox. 3, H331
Skin Corr. 1B, H314
Eye Dam. 1, H318
Aquatic Acute 1, H400
Aquatic Chronic 2, H411

Other information: Before using this product in any new process or experiment, a thorough material compatibility and safety study should be carried out. Ensure adequate air ventilation. Ensure all national/local regulations are observed. 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.

Last revised date: 10.12.2020

Disclaimer: This information is provided without warranty. The information is believed to be correct. This information should be used to make an independent determination of the methods to safeguard workers and the environment.

Annex to the extended Safety Data Sheet (eSDS)

Content

Exposure Scenario 1.

Exposure Scenario worker

1.Industrial use, Formulation & (re)packing of substances and mixtures

List of use descriptors	
Sector(s) of use	
Product categories [PC]:	

Name of contributing environmental scenario and corresponding ERC	Formulation of mixtures with gas in pressure receptacles, Transfilling gas or liquid.: ERC2: Formulation into mixture

Contributing Scenarios	Formulation of mixtures with gas in pressure receptacles, Transfilling gas or liquid.: PROC1: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions PROC8b: Transfer of substance or mixture (charging and discharging) at dedicated facilities

2.1.Contributing exposure scenario controlling environmental exposure for: Formulation of mixtures with gas in pressure receptacles, Transfilling gas or liquid.

Product characteristics

Concentration of the substance in a mixture:	Covers percentage substance in the product up to 100 %.

Physical form of the product	See section 9 of the SDS.

Viscosity:	
Kinematic viscosity:	No data available.
Dynamic viscosity:	0,7 mPa.s (48,9 °C)

Amounts used

Daily amount per site	3030 tonnes
Regional use tonnage:	11515 tonnes/day

Frequency and duration of use

Batch process:	330 Emission days
Continuous process:	not relevant

Environment factors not influenced by risk management

Flow rate of receiving surface water (m^3/d):	Local freshwater dilution factor	Local marine water dilution factor	Other factors:	Remarks:
18.000 m3/d	10	10	not relevant	

Other given operational conditions affecting environmental exposure

Other relevant operational conditions	not relevant

Risk management measures (RMM)

Technical conditions and measures at process level (source) to prevent release

See section 8 of the safety data sheet (Environmental exposure controls).

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil

Air	Closed systems are used in order to prevent unintended emissions
Soil	Soil emission controls are not applicable as there is no direct release to soil.
Water	Closed systems are used in order to prevent unintended emissions
Sediment:	not relevant
Remarks:	not relevant

Organisational measures to prevent/limit release from site:

none

Conditions and measures related to sewage treatment plant

type:	Municipal Sewage Treatment Plant
Discharge rate:	not relevant
Treatment effectiveness:	not relevant
Sludge treatment technique:	not relevant
Measures to limit air emissions:	not relevant
Remarks:	Direct emissions to the municipal STP should not be made.

Conditions and measures related to external treatment of waste for disposal

Fraction of used amount transferred to external waste treatment:

Suitable waste treatment	Treatment effectiveness	Remarks
See section 13 of the SDS		External treatment and disposal of waste should comply with applicable local and/or national regulations.

Conditions and measures related to external recovery of waste

Fraction of used amount transferred to external waste treatment:

Suitable recovery operations:	Treatment effectiveness	Remarks
See section 13 of the SDS		External recovery and recycling of waste should comply with applicable local and/or national regulations.

Additional good practice advice beyond the REACH Chemical Safety Report

Use appropriate abatement systems to ensure that the emission levels defined by local regulations are not exceeded. Ensure operatives are trained to minimise releases

2.2. Contributing exposure scenario controlling worker exposure for: Formulation of mixtures with gas in pressure receptacles, Transfilling gas or liquid.

Process Categories:	PROC1: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions PROC8b: Transfer of substance or mixture (charging and discharging) at dedicated facilities

Product characteristics

Concentration of the substance in a mixture:	Covers percentage substance in the product up to 100 %.

Physical form of the product:	See section 9 of the SDS.
Vapour pressure:	8574 hPa
Process temperature:	>= 20 °C
Remarks	not relevant

Amounts used

Daily amount per site	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 (industrial vs. professional) and level of containment/automation (as reflected in the PROCs and technical conditions) is the main determinant of the process-intrinsic emission potential.

Frequency and duration of use

	Use duration:	Frequency of use:	Remarks
Hours per shift	<= 8 h	5 days per week	PROC1, PROC8b

Human factors not influenced by risk management

This information is not available.

Other given operational conditions affecting workers exposure

Area of use	Room size:	Temperature:	Ventilation rate	Remarks
Indoor/Outdoor use.				Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions, Transfer of substance or mixture (charging and discharging) at dedicated facilities

Other relevant operational conditions:	. See section 8 of the SDS.

Risk management measures (RMM)

Technical conditions and measures at process level (source) to prevent release

See section 8 of the safety data sheet

Technical conditions and measures to control dispersion from source towards the worker

inhalation exposure	dermal exposure	eye exposure	oral exposure	Remarks
Handle product within a closed system				Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions
Apply a good standard of general or controlled ventilation when maintenance activities are carried out.				Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions
Handle product				Transfer of substance or

within a closed system				mixture (charging and discharging) at dedicated facilities
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.				Transfer of substance or mixture (charging and discharging) at dedicated facilities

Organisational measures to prevent/limit releases, dispersion and exposure

inhalation exposure	dermal exposure	eye exposure	oral exposure	Remarks
				See section 7 of the SDS.
				Ensure operatives are trained to minimise exposures.
				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

inhalation exposure	dermal exposure	eye exposure	oral exposure	Remarks
				See section 8 of the safety data sheet (Personal protection equipment)
If technical exhaust or ventilation measures are not possible or insufficient, respiratory				Transfer of substance or mixture (charging and discharging) at dedicated facilities

protection must be worn.: 95 %				
	Wear suitable gloves tested to EN374: 90 %			Transfer of substance or mixture (charging and discharging) at dedicated facilities
	Wear suitable face shield.			Transfer of substance or mixture (charging and discharging) at dedicated facilities
	Wear suitable coveralls to prevent exposure to the skin.			Transfer of substance or mixture (charging and discharging) at dedicated facilities
		Use suitable eye protection.		Transfer of substance or mixture (charging and discharging) at dedicated facilities

Additional good practice advice beyond the REACH Chemical Safety Report

See section 7 of the SDS. Handle product within a closed system 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.

3. Exposure estimation

Environment:
Formulation of mixtures with gas in pressure receptacles, Transfilling gas or liquid.:
ERC2:

Compartment	PEC	RCR	Method	Remarks
freshwater	0,0000497 mg/l	0,045	EUSES	none

ERC2:

Compartment	PEC	RCR	Method	Remarks
marine water	0,000012 mg/l	0,011	EUSES	none

Health:
Formulation of mixtures with gas in pressure receptacles, Transfilling gas or liquid.:

PROC1:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, local, (acute)	Indoor/Outdoor use., without local exhaust ventilation	0 mg/m³	< 0,01	ECETOC TRA worker v2.0	none

PROC1:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, local	Indoor/Outdoor use., without local exhaust ventilation	0 mg/m³	< 0,01	ECETOC TRA worker v2.0	none

PROC1:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, systemic, (acute)	Indoor/Outdoor use., with local exhaust ventilation	0 mg/m³	< 0,01	ECETOC TRA worker v2.0	none

PROC1:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, systemic	Indoor/Outdoor use., with local exhaust ventilation	0 mg/m³	< 0,01	ECETOC TRA worker v2.0	none

PROC1:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, short-term, systemic, (acute)	Indoor/Outdoor use., without local exhaust	0,34 mg/kg bw/day	0,05	ECETOC TRA worker v2.0	none

	ventilation, No gloves worn				

PROC1:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, long-term, systemic	Indoor/Outdoor use., without local exhaust ventilation, No gloves worn	0,34 mg/kg bw/day	0,05	ECETOC TRA worker v2.0	none

PROC8b:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, local, (acute)	Outdoor use, Respiratory Protection	3,72 mg/m³	0,103	ECETOC TRA worker v2.0	none

PROC8b:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, local, (acute)	Indoor use, with local exhaust ventilation, No RPE	3,19 mg/m³	0,089	ECETOC TRA worker v2.0	none

PROC8b:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, local	Outdoor use, Respiratory Protection	3,72 mg/m³	0,266	ECETOC TRA worker v2.0	none

PROC8b:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks

inhalative, long-term, local	Indoor use, with local exhaust ventilation, No RPE	3,19 mg/m³	0,228	ECETOC TRA worker v2.0	none

PROC8b:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, systemic, (acute)	Outdoor use, Respiratory Protection	3,72 mg/m³	0,078	ECETOC TRA worker v2.0	none

PROC8b:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, systemic, (acute)	Indoor use, with local exhaust ventilation, No RPE	3,19 mg/m³	0,067	ECETOC TRA worker v2.0	none

PROC8b:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, systemic	Outdoor use, Respiratory Protection	3,72 mg/m³	0,078	ECETOC TRA worker v2.0	none

PROC8b:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, systemic	Indoor use, with local exhaust ventilation, No RPE	3,19 mg/m³	0,067	ECETOC TRA worker v2.0	none

PROC8b:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks

dermal, short-term, systemic, (acute)	Indoor/Outdoor use., without local exhaust ventilation, Gloves worn	0,69 mg/kg bw/day	0,101	ECETOC TRA worker v2.0	none

PROC8b:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, short-term, systemic, (acute)	Indoor use, with local exhaust ventilation, No gloves worn	0,69 mg/kg bw/day	0,101	ECETOC TRA worker v2.0	none

PROC8b:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, long-term, systemic	Indoor/Outdoor use., without local exhaust ventilation, Gloves worn	0,69 mg/kg bw/day	0,101	ECETOC TRA worker v2.0	none

PROC8b:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, long-term, systemic	Indoor use, with local exhaust ventilation, No gloves worn	0,69 mg/kg bw/day	0,101	ECETOC TRA worker v2.0	none

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

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

Exposure Scenario 2.

Exposure Scenario worker

1.Industrial use, Manufacture of fine chemicals

List of use descriptors	
Sector(s) of use	SU9: Manufacture of fine chemicals
Product categories [PC]:	PC21: Laboratory chemicals

Name of contributing environmental scenario and corresponding ERC	Using gas as feedstock in chemical processes.: ERC6a: Use of intermediate

Contributing Scenarios	Using gas as feedstock in chemical processes.: 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

2.1.Contributing exposure scenario controlling environmental exposure for: Using gas as feedstock in chemical processes., Precursor for fertiliser/explosive manufacture, Use of gas to manufacture pharmaceutical products.

Product characteristics

Concentration of the substance in a mixture:	Covers percentage substance in the product up to 100 %.

Physical form of the product	See section 9 of the SDS.

Viscosity:	
Kinematic viscosity:	No data available.

Dynamic viscosity:	0,7 mPa.s (48,9 °C)

Amounts used

Daily amount per site	2424 tonnes
Regional use tonnage:	11515 tonnes/day

Frequency and duration of use

Batch process:	330 Emission days
Continuous process:	not relevant

Environment factors not influenced by risk management

Flow rate of receiving surface water (m^3/d):	Local freshwater dilution factor	Local marine water dilution factor	Other factors:	Remarks:
18.000 m3/d	10	10	not relevant	

Other given operational conditions affecting environmental exposure

Other relevant operational conditions	not relevant

Risk management measures (RMM)

Technical conditions and measures at process level (source) to prevent release

See section 8 of the safety data sheet (Environmental exposure controls).

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil

Air	Closed systems are used in order to prevent unintended emissions
Soil	Soil emission controls are not applicable as there is no direct release to soil.
Water	Closed systems are used in order to prevent unintended emissions
Sediment:	not relevant

Remarks:	not relevant

Organisational measures to prevent/limit release from site:

none

Conditions and measures related to sewage treatment plant

type:	Municipal Sewage Treatment Plant
Discharge rate:	not relevant
Treatment effectiveness:	not relevant
Sludge treatment technique:	not relevant
Measures to limit air emissions:	not relevant
Remarks:	Direct emissions to the municipal STP should not be made.

Conditions and measures related to external treatment of waste for disposal

Fraction of used amount transferred to external waste treatment:

Suitable waste treatment	Treatment effectiveness	Remarks
See section 13 of the SDS		External treatment and disposal of waste should comply with applicable local and/or national regulations.

Conditions and measures related to external recovery of waste

Fraction of used amount transferred to external waste treatment:

Suitable recovery operations:	Treatment effectiveness	Remarks
See section 13 of the SDS		External recovery and recycling of waste should comply with applicable local and/or national regulations.

Additional good practice advice beyond the REACH Chemical Safety Report

Use appropriate abatement systems to ensure that the emission levels defined by local regulations are not exceeded.
Ensure operatives are trained to minimise releases

2.2. Contributing exposure scenario controlling worker exposure for: Using gas as feedstock in chemical processes., Precursor for fertiliser/explosive manufacture, Use of gas to manufacture pharmaceutical products.

Process Categories:	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

Product characteristics

Concentration of the substance in a mixture:	Covers percentage substance in the product up to 100 %.

Physical form of the product:	See section 9 of the SDS.
Vapour pressure:	8574 hPa
Process temperature:	>= 20 °C
Remarks	not relevant

Amounts used

Daily amount per site	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 (industrial vs. professional) and level of containment/automation (as reflected in the PROCs and technical conditions) is the main determinant of the process-intrinsic emission potential.

Frequency and duration of use

	Use duration:	Frequency of use:	Remarks
Hours per shift	<= 8 h	5 days per week	PROC1, PROC2, PROC3

Human factors not influenced by risk management

This information is not available.

Other given operational conditions affecting workers exposure

Area of use	Room size:	Temperature:	Ventilation rate	Remarks
Indoor/Outdoor use.				Chemical production or refinery in closed process without likelihood of exposure or

				processes with equivalent containment conditions, Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions, Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition

Other relevant operational conditions:	. See section 8 of the SDS.

Risk management measures (RMM)

Technical conditions and measures at process level (source) to prevent release

See section 8 of the safety data sheet

Technical conditions and measures to control dispersion from source towards the worker

inhalation exposure	dermal exposure	eye exposure	oral exposure	Remarks
Handle product within a closed system				Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions
Apply a good standard of general or controlled ventilation when maintenance activities are carried out.				Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions
Handle product within a closed system				Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions

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.				Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions
Handle product within a closed system				Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition
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.				Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition

Organisational measures to prevent/limit releases, dispersion and exposure

inhalation exposure	dermal exposure	eye exposure	oral exposure	Remarks
				See section 7 of the SDS.
				Ensure operatives are trained to minimise exposures.
				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

inhalation exposure	dermal exposure	eye exposure	oral exposure	Remarks
				See section 8 of the safety data sheet (Personal protection equipment)
If technical exhaust or ventilation measures are not possible or insufficient, respiratory protection must be worn.: 95 %				Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition
	Wear suitable gloves tested to EN374: 90 %			Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition
	Wear suitable face shield.			Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled

				exposure or processes with equivalent containment condition
	Wear suitable coveralls to prevent exposure to the skin.			Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition
		Use suitable eye protection.		Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition

Additional good practice advice beyond the REACH Chemical Safety Report

See section 7 of the SDS. Handle product within a closed system 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.

3. Exposure estimation

Environment:
Using gas as feedstock in chemical processes., Precursor for fertiliser/explosive manufacture, Use of gas to manufacture pharmaceutical products.:
ERC6a:

Compartment	PEC	RCR	Method	Remarks

freshwater	0,000083 7 mg/l	0,076	EUSES	none

ERC6a:

Compartment	PEC	RCR	Method	Remarks
marine water	0,000020 5 mg/l	0,019	EUSES	none

Health:
Using gas as feedstock in chemical processes., Precursor for fertiliser/explosive manufacture, Use of gas to manufacture pharmaceutical products.:
PROC1:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, local, (acute)	Indoor/Outdoor use., without local exhaust ventilation	0 mg/m³	< 0,01	ECETOC TRA worker v2.0	none

PROC1:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, local	Indoor/Outdoor use., without local exhaust ventilation	0 mg/m³	< 0,01	ECETOC TRA worker v2.0	none

PROC1:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, systemic, (acute)	Indoor/Outdoor use., with local exhaust ventilation	0 mg/m³	< 0,01	ECETOC TRA worker v2.0	none

PROC1:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks

inhalative, long-term, systemic	Indoor/Outdoor use., with local exhaust ventilation	0 mg/m³	< 0,01	ECETOC TRA worker v2.0	none

PROC1:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, short-term, systemic, (acute)	Indoor/Outdoor use., without local exhaust ventilation, No gloves worn	0,34 mg/kg bw/day	0,05	ECETOC TRA worker v2.0	none

PROC1:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, long-term, systemic	Indoor/Outdoor use., without local exhaust ventilation, No gloves worn	0,34 mg/kg bw/day	0,05	ECETOC TRA worker v2.0	none

PROC2:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, local, (acute)	Outdoor use, Respiratory Protection	1,24 mg/m³	0,034	ECETOC TRA worker v2.0	none

PROC2:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, local, (acute)	Indoor use, with local exhaust ventilation, No RPE	3,54 mg/m³	0,098	ECETOC TRA worker v2.0	none

PROC2:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, local	Outdoor use, Respiratory Protection	1,24 mg/m³	0,089	ECETOC TRA worker v2.0	none

PROC2:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, local	Indoor use, with local exhaust ventilation, No RPE	3,54 mg/m³	0,253	ECETOC TRA worker v2.0	none

PROC2:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, systemic, (acute)	Outdoor use, Respiratory Protection	1,24 mg/m³	0,026	ECETOC TRA worker v2.0	none

PROC2:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, systemic, (acute)	Indoor use, with local exhaust ventilation, No RPE	3,54 mg/m³	0,074	ECETOC TRA worker v2.0	none

PROC2:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, systemic	Outdoor use, Respiratory Protection	1,24 mg/m³	0,026	ECETOC TRA worker v2.0	none

PROC2:

Route of Exposure	Specific	Exposure	RCR	Method	Remarks

	condition	level			
inhalative, long-term, systemic	Indoor use, with local exhaust ventilation, No RPE	3,54 mg/m³	0,074	ECETOC TRA worker v2.0	none

PROC2:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, short-term, systemic, (acute)	Indoor/Outdoor use., without local exhaust ventilation, No gloves worn	1,37 mg/kg bw/day	0,201	ECETOC TRA worker v2.0	none

PROC2:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, short-term, systemic, (acute)	Indoor use, with local exhaust ventilation, No gloves worn	0,14 mg/kg bw/day	0,021	ECETOC TRA worker v2.0	none

PROC2:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, long-term, systemic	Indoor/Outdoor use., without local exhaust ventilation, No gloves worn	1,37 mg/kg bw/day	0,201	ECETOC TRA worker v2.0	none

PROC2:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks

dermal, long-term, systemic	Indoor use, with local exhaust ventilation, No gloves worn	0,14 mg/kg bw/day	0,021	ECETOC TRA worker v2.0	none

PROC3:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, local, (acute)	Outdoor use, Respiratory Protection	2,48 mg/m³	0,069	ECETOC TRA worker v2.0	none

PROC3:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, local, (acute)	Indoor use, with local exhaust ventilation, No RPE	7,08 mg/m³	0,197	ECETOC TRA worker v2.0	none

PROC3:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, local	Outdoor use, Respiratory Protection	2,48 mg/m³	0,177	ECETOC TRA worker v2.0	none

PROC3:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, local	Indoor use, with local exhaust ventilation, No RPE	7,08 mg/m³	0,506	ECETOC TRA worker v2.0	none

PROC3:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks

inhalative, short-term, systemic, (acute)	Outdoor use, Respiratory Protection	2,48 mg/m³	0,052	ECETOC TRA worker v2.0	none

PROC3:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, systemic, (acute)	Indoor use, with local exhaust ventilation, No RPE	7,08 mg/m³	0,149	ECETOC TRA worker v2.0	none

PROC3:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, systemic	Outdoor use, Respiratory Protection	0,34 mg/m³	0,05	ECETOC TRA worker v2.0	none

PROC3:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, systemic	Indoor use, with local exhaust ventilation, No RPE	0,03 mg/m³	0,004	ECETOC TRA worker v2.0	none

PROC3:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, short-term, systemic, (acute)	Indoor/Outdoor use., without local exhaust ventilation, No gloves worn	0,34 mg/kg bw/day	0,05	ECETOC TRA worker v2.0	none

PROC3:

Route of Exposure	Specific	Exposure	RCR	Method	Remarks

	condition	level			
dermal, short-term, systemic, (acute)	Indoor use, with local exhaust ventilation, No gloves worn	0,03 mg/kg bw/day	0,004	ECETOC TRA worker v2.0	none

PROC3:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, long-term, systemic	Indoor/Outdoor use., without local exhaust ventilation, No gloves worn	0,69 mg/kg bw/day	0,101	ECETOC TRA worker v2.0	none

PROC3:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, long-term, systemic	Indoor use, with local exhaust ventilation, No gloves worn	0,69 mg/kg bw/day	0,101	ECETOC TRA worker v2.0	none

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

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

Exposure Scenario 3.

Exposure Scenario worker

1.Industrial use, Metal surface treatment products

List of use descriptors

Sector(s) of use	SU14: Manufacture of basic metals, including alloys SU15: Manufacture of fabricated metal products, except machinery and equipment
Product categories [PC]:	PC14: Metal surface treatment products

Name of contributing environmental scenario and corresponding ERC	Using gas for metal treatment.: ERC6b: Use of reactive processing aid at industrial site (no inclusion into or onto article)

Contributing Scenarios	Using gas for metal treatment.: PROC22: Manufacturing and processing of minerals and/or metals at substantially elevated temperature

2.1.Contributing exposure scenario controlling environmental exposure for: Using gas for metal treatment., Aluminium casting

Product characteristics

Concentration of the substance in a mixture:	Covers percentage substance in the product up to 100 %.

Physical form of the product	See section 9 of the SDS.

Viscosity:	
Kinematic viscosity:	No data available.
Dynamic viscosity:	0,7 mPa.s (48,9 °C)

Amounts used

Daily amount per site	76 tonnes
Regional use tonnage:	1073 tonnes/day

Frequency and duration of use

Batch process:	330 Emission days
Continuous process:	not relevant

Environment factors not influenced by risk management				
Flow rate of receiving surface water (m^3/d):	Local freshwater dilution factor	Local marine water dilution factor	Other factors:	Remarks:
18.000 m3/d	10	10	not relevant	

Other given operational conditions affecting environmental exposure	
Other relevant operational conditions	not relevant

Risk management measures (RMM)

Technical conditions and measures at process level (source) to prevent release

See section 8 of the safety data sheet (Environmental exposure controls).

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil

Air	Closed systems are used in order to prevent unintended emissions
Soil	Soil emission controls are not applicable as there is no direct release to soil.
Water	Closed systems are used in order to prevent unintended emissions
Sediment:	not relevant
Remarks:	not relevant

Organisational measures to prevent/limit release from site:

none

Conditions and measures related to sewage treatment plant

type:	Municipal Sewage Treatment Plant
Discharge rate:	not relevant
Treatment effectiveness:	not relevant
Sludge treatment technique:	not relevant

Measures to limit air emissions:	not relevant
Remarks:	Direct emissions to the municipal STP should not be made.

Conditions and measures related to external treatment of waste for disposal

Fraction of used amount transferred to external waste treatment:

Suitable waste treatment	Treatment effectiveness	Remarks
See section 13 of the SDS		External treatment and disposal of waste should comply with applicable local and/or national regulations.

Conditions and measures related to external recovery of waste

Fraction of used amount transferred to external waste treatment:

Suitable recovery operations:	Treatment effectiveness	Remarks
See section 13 of the SDS		External recovery and recycling of waste should comply with applicable local and/or national regulations.

Additional good practice advice beyond the REACH Chemical Safety Report

Use appropriate abatement systems to ensure that the emission levels defined by local regulations are not exceeded. Ensure operatives are trained to minimise releases

2.2. Contributing exposure scenario controlling worker exposure for: Using gas for metal treatment., Aluminium casting

Process Categories:	PROC22: Manufacturing and processing of minerals and/or metals at substantially elevated temperature

Product characteristics

Concentration of the substance in a mixture:	Covers percentage substance in the product up to 100 %.

Physical form of the product:	See section 9 of the SDS.
Vapour pressure:	8574 hPa
Process temperature:	>= 20 °C
Remarks	not relevant

Amounts used

Daily amount per site	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 (industrial vs. professional) and level of containment/automation (as reflected in the PROCs and technical conditions) is the main determinant of the process-intrinsic emission potential.

Frequency and duration of use

	Use duration:	Frequency of use:	Remarks
Hours per shift	<= 8 h	5 days per week	PROC22

Human factors not influenced by risk management

This information is not available.

Other given operational conditions affecting workers exposure

Area of use	Room size:	Temperature:	Ventilation rate	Remarks
Indoor/Outdoor use.				Manufacturing and processing of minerals and/or metals at substantially elevated temperature

Other relevant operational conditions:	. See section 8 of the SDS.

Risk management measures (RMM)

Technical conditions and measures at process level (source) to prevent release

See section 8 of the safety data sheet

Technical conditions and measures to control dispersion from source towards the worker

inhalation exposure	dermal exposure	eye exposure	oral exposure	Remarks
Handle product within a closed system				Manufacturing and processing of minerals and/or metals at substantially elevated temperature

Apply a good standard of general or controlled ventilation when maintenance activities are carried out.				Manufacturing and processing of minerals and/or metals at substantially elevated temperature

Organisational measures to prevent/limit releases, dispersion and exposure

inhalation exposure	dermal exposure	eye exposure	oral exposure	Remarks
				See section 7 of the SDS.
				Ensure operatives are trained to minimise exposures.
				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

inhalation exposure	dermal exposure	eye exposure	oral exposure	Remarks
				See section 8 of the safety data sheet (Personal protection equipment)
If technical exhaust or ventilation measures are not possible or insufficient, respiratory protection must be worn.: 95 %				Manufacturing and processing of minerals and/or metals at substantially elevated temperature
	Wear suitable gloves tested to EN374: 90 %			Manufacturing and processing of minerals and/or metals at substantially elevated temperature

	Wear suitable face shield.			Manufacturing and processing of minerals and/or metals at substantially elevated temperature
	Wear suitable coveralls to prevent exposure to the skin.			Manufacturing and processing of minerals and/or metals at substantially elevated temperature
		Use suitable eye protection.		Manufacturing and processing of minerals and/or metals at substantially elevated temperature

Additional good practice advice beyond the REACH Chemical Safety Report

See section 7 of the SDS. Handle product within a closed system 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.

3. Exposure estimation

Environment:
Using gas for metal treatment., Aluminium casting:
ERC6b:

Compartment	PEC	RCR	Method	Remarks
freshwater	0,0000017 mg/l	0,002	EUSES	none

ERC6b:

Compartment	PEC	RCR	Method	Remarks
marine water	0,0000002 mg/l	0,00018	EUSES	none

Health:
Using gas for metal treatment., Aluminium casting:
PROC22:

Route of Exposure	Specific	Exposure	RCR	Method	Remarks

	condition	level			
inhalative, short-term, local, (acute)	Outdoor use, Respiratory Protection	mg/m³			No data available.

PROC22:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, local, (acute)	Indoor use, with local exhaust ventilation, No RPE	mg/m³			No data available.

PROC22:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, local	Outdoor use, Respiratory Protection	mg/m³			No data available.

PROC22:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, local	Indoor use, with local exhaust ventilation, No RPE	mg/m³			No data available.

PROC22:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, systemic, (acute)	Outdoor use, Respiratory Protection	mg/m³			No data available.

PROC22:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term,	Indoor use,	mg/m³			No data available.

systemic, (acute)	with local exhaust ventilation, No RPE				

PROC22:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, systemic	Outdoor use, Respiratory Protection	mg/m³			No data available.

PROC22:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, systemic	Indoor use, with local exhaust ventilation, No RPE	mg/m³			No data available.

PROC22:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, short-term, systemic, (acute)	Indoor/Outdoor use., without local exhaust ventilation, Gloves worn	mg/kg bw/day			No data available.

PROC22:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, short-term, systemic, (acute)	Indoor use, with local exhaust ventilation, No gloves worn	mg/kg bw/day			No data available.

PROC22:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, long-term, systemic	Indoor/Outdoor use., without local exhaust ventilation, Gloves worn	mg/kg bw/day			No data available.

PROC22:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, long-term, systemic	Indoor use, with local exhaust ventilation, No gloves worn	mg/kg bw/day			No data available.

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

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

Exposure Scenario 4.

Exposure Scenario worker

1.Industrial use, Manufacture of computer, electronic and optical products, electrical equipment

List of use descriptors	
Sector(s) of use	SU16: Manufacture of computer, electronic and optical products, electrical equipment
Product categories [PC]:	PC33: Semiconductors

Name of contributing environmental scenario and corresponding ERC	Use for electronic component manufacture.: ERC6a: Use of intermediate

Contributing Scenarios	Use for electronic component manufacture.:

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

2.1.Contributing exposure scenario controlling environmental exposure for: Use for electronic component manufacture.

Product characteristics

Concentration of the substance in a mixture:	Covers percentage substance in the product up to 100 %.

Physical form of the product	See section 9 of the SDS.

Viscosity:	
Kinematic viscosity:	No data available.
Dynamic viscosity:	0,7 mPa.s (48,9 °C)

Amounts used

Daily amount per site	2424 tonnes
Regional use tonnage:	11515 tonnes/day

Frequency and duration of use

Batch process:	330 Emission days
Continuous process:	not relevant

Environment factors not influenced by risk management

Flow rate of receiving surface water (m^3/d):	Local freshwater dilution factor	Local marine water dilution factor	Other factors:	Remarks:
18.000 m3/d	10	10	not relevant	

Other given operational conditions affecting environmental exposure

Other relevant operational conditions	not relevant

Risk management measures (RMM)

Technical conditions and measures at process level (source) to prevent release

See section 8 of the safety data sheet (Environmental exposure controls).

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil

Air	Closed systems are used in order to prevent unintended emissions
Soil	Soil emission controls are not applicable as there is no direct release to soil.
Water	Closed systems are used in order to prevent unintended emissions
Sediment:	not relevant
Remarks:	not relevant

Organisational measures to prevent/limit release from site:

none

Conditions and measures related to sewage treatment plant

type:	Municipal Sewage Treatment Plant
Discharge rate:	not relevant
Treatment effectiveness:	not relevant
Sludge treatment technique:	not relevant
Measures to limit air emissions:	not relevant
Remarks:	Direct emissions to the municipal STP should not be made.

Conditions and measures related to external treatment of waste for disposal

Fraction of used amount transferred to external waste treatment:

Suitable waste treatment	Treatment effectiveness	Remarks
See section 13 of the SDS		External treatment and disposal of waste should comply with applicable local and/or national regulations.

Conditions and measures related to external recovery of waste

Fraction of used amount transferred to external waste treatment:

Suitable recovery operations:	Treatment effectiveness	Remarks
See section 13 of the SDS		External recovery and recycling of waste should comply with applicable local and/or national regulations.

Additional good practice advice beyond the REACH Chemical Safety Report

Use appropriate abatement systems to ensure that the emission levels defined by local regulations are not exceeded. Ensure operatives are trained to minimise releases

2.2. Contributing exposure scenario controlling worker exposure for: Use for electronic component manufacture.

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

Product characteristics

Concentration of the substance in a mixture:	Covers percentage substance in the product up to 100 %.

Physical form of the product:	See section 9 of the SDS.
Vapour pressure:	8574 hPa
Process temperature:	>= 20 °C
Remarks	not relevant

Amounts used

Daily amount per site	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 (industrial vs. professional) and level of containment/automation (as reflected in the PROCs and technical conditions) is the main determinant of the process-intrinsic emission potential.

Frequency and duration of use

	Use duration:	Frequency of use:	Remarks
Hours per shift	<= 8 h	5 days per week	PROC1

Human factors not influenced by risk management
This information is not available.

Other given operational conditions affecting workers exposure				
Area of use	Room size:	Temperature:	Ventilation rate	Remarks
Indoor/Outdoor use.				Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions

Other relevant operational conditions:	. See section 8 of the SDS.

Risk management measures (RMM)

Technical conditions and measures at process level (source) to prevent release
See section 8 of the safety data sheet

Technical conditions and measures to control dispersion from source towards the worker				
inhalation exposure	dermal exposure	eye exposure	oral exposure	Remarks
Handle product within a closed system				Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions
Apply a good standard of general or controlled ventilation when maintenance activities are carried out.				Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions

Organisational measures to prevent/limit releases, dispersion and exposure				
inhalation	dermal exposure	eye exposure	oral exposure	Remarks

exposure				
				See section 7 of the SDS.
				Ensure operatives are trained to minimise exposures.
				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

inhalation exposure	dermal exposure	eye exposure	oral exposure	Remarks
				See section 8 of the safety data sheet (Personal protection equipment)

Additional good practice advice beyond the REACH Chemical Safety Report

See section 7 of the SDS. Handle product within a closed system 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.

3. Exposure estimation

Environment:
Use for electronic component manufacture.:
ERC6a:

Compartment	PEC	RCR	Method	Remarks
freshwater	0,000083 7 mg/l	0,076	EUSES	none

ERC6a:

Compartment	PEC	RCR	Method	Remarks
marine water	0,000020 5 mg/l	0,019	EUSES	none

Health:
Use for electronic component manufacture.:

PROC1:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, local, (acute)	Indoor/Outdoor use., without local exhaust ventilation	0 mg/m³	< 0,01	ECETOC TRA worker v2.0	none

PROC1:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, local	Indoor/Outdoor use., without local exhaust ventilation	0 mg/m³	< 0,01	ECETOC TRA worker v2.0	none

PROC1:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, systemic, (acute)	Indoor/Outdoor use., with local exhaust ventilation	0 mg/m³	< 0,01	ECETOC TRA worker v2.0	none

PROC1:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, systemic	Indoor/Outdoor use., with local exhaust ventilation	0 mg/m³	< 0,01	ECETOC TRA worker v2.0	none

PROC1:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, short-term, systemic, (acute)	Indoor/Outdoor use., without local exhaust	0,34 mg/kg bw/day	0,05	ECETOC TRA worker v2.0	none

	ventilation, No gloves worn				

PROC1:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, long-term, systemic	Indoor/Outdoor use., without local exhaust ventilation, No gloves worn	0,34 mg/kg bw/day	0,05	ECETOC TRA worker v2.0	none

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

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

Exposure Scenario 5.

Exposure Scenario worker

1.Industrial use, Exhaust gas DeNOx applications

List of use descriptors	
Sector(s) of use	SU23: Electricity, steam, gas water supply and sewage treatment
Product categories [PC]:	PC20: Processing aids such as pH-regulators, flocculants, precipitants, neutralization agents

Name of contributing environmental scenario and corresponding ERC	Exhaust gas DeNOx applications: ERC6a: Use of intermediate

Contributing Scenarios	Exhaust gas DeNOx applications: PROC23: Open processing and transfer operations at substantially elevated temperature

2.1.Contributing exposure scenario controlling environmental exposure for: Exhaust gas DeNOx applications

Product characteristics

Concentration of the substance in a mixture:	Covers percentage substance in the product up to 100 %.

Physical form of the product	See section 9 of the SDS.

Viscosity:	
Kinematic viscosity:	No data available.
Dynamic viscosity:	0,7 mPa.s (48,9 °C)

Amounts used

Daily amount per site	2424 tonnes
Regional use tonnage:	11515 tonnes/day

Frequency and duration of use

Batch process:	330 Emission days
Continuous process:	not relevant

Environment factors not influenced by risk management

Flow rate of receiving surface water (m^3/d):	Local freshwater dilution factor	Local marine water dilution factor	Other factors:	Remarks:
18.000 m3/d	10	10	not relevant	

Other given operational conditions affecting environmental exposure

Other relevant operational conditions	not relevant

Risk management measures (RMM)

Technical conditions and measures at process level (source) to prevent release

See section 8 of the safety data sheet (Environmental exposure controls).

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Air	Closed systems are used in order to prevent unintended emissions
Soil	Soil emission controls are not applicable as there is no direct release to soil.
Water	Closed systems are used in order to prevent unintended emissions
Sediment:	not relevant
Remarks:	not relevant

Organisational measures to prevent/limit release from site:
none

Conditions and measures related to sewage treatment plant	
type:	Municipal Sewage Treatment Plant
Discharge rate:	not relevant
Treatment effectiveness:	not relevant
Sludge treatment technique:	not relevant
Measures to limit air emissions:	not relevant
Remarks:	Direct emissions to the municipal STP should not be made.

Conditions and measures related to external treatment of waste for disposal

Fraction of used amount transferred to external waste treatment:

Suitable waste treatment	Treatment effectiveness	Remarks
See section 13 of the SDS		External treatment and disposal of waste should comply with applicable local and/or national regulations.

Conditions and measures related to external recovery of waste

Fraction of used amount transferred to external waste treatment:

Suitable recovery operations:	Treatment effectiveness	Remarks

See section 13 of the SDS		External recovery and recycling of waste should comply with applicable local and/or national regulations.

Additional good practice advice beyond the REACH Chemical Safety Report

Use appropriate abatement systems to ensure that the emission levels defined by local regulations are not exceeded. Ensure operatives are trained to minimise releases

2.2. Contributing exposure scenario controlling worker exposure for: Exhaust gas DeNOx applications

Process Categories:	PROC23: Open processing and transfer operations at substantially elevated temperature

Product characteristics

Concentration of the substance in a mixture:	Covers percentage substance in the product up to 100 %.

Physical form of the product:	See section 9 of the SDS.
Vapour pressure:	8574 hPa
Process temperature:	>= 20 °C
Remarks	not relevant

Amounts used

Daily amount per site	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 (industrial vs. professional) and level of containment/automation (as reflected in the PROCs and technical conditions) is the main determinant of the process-intrinsic emission potential.

Frequency and duration of use

	Use duration:	Frequency of use:	Remarks
Hours per shift	<= 8 h	5 days per week	PROC23

Human factors not influenced by risk management

This information is not available.

Other given operational conditions affecting workers exposure

Area of use	Room size:	Temperature:	Ventilation rate	Remarks
Indoor/Outdoor use.				Open processing and transfer operations at substantially elevated temperature

Other relevant operational conditions:	. See section 8 of the SDS.

Risk management measures (RMM)

Technical conditions and measures at process level (source) to prevent release

See section 8 of the safety data sheet

Technical conditions and measures to control dispersion from source towards the worker

inhalation exposure	dermal exposure	eye exposure	oral exposure	Remarks
Handle product within a closed system				Open processing and transfer operations at substantially elevated temperature
Apply a good standard of general or controlled ventilation when maintenance activities are carried out.				Open processing and transfer operations at substantially elevated temperature

Organisational measures to prevent/limit releases, dispersion and exposure

inhalation exposure	dermal exposure	eye exposure	oral exposure	Remarks
				See section 7 of the SDS.
				Ensure operatives are trained to minimise exposures.
				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

inhalation exposure	dermal exposure	eye exposure	oral exposure	Remarks
				See section 8 of the safety data sheet (Personal protection equipment)
If technical exhaust or ventilation measures are not possible or insufficient, respiratory protection must be worn.: 95 %				Open processing and transfer operations at substantially elevated temperature
	Wear suitable gloves tested to EN374: 90 %			Open processing and transfer operations at substantially elevated temperature
	Wear suitable face shield.			Open processing and transfer operations at substantially elevated temperature
	Wear suitable coveralls to prevent exposure to the skin.			Open processing and transfer operations at substantially elevated temperature
		Use suitable eye protection.		Open processing and transfer operations at substantially elevated temperature

Additional good practice advice beyond the REACH Chemical Safety Report

See section 7 of the SDS. Handle product within a closed system 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.

3. Exposure estimation

Environment:
Exhaust gas DeNOx applications:
ERC6a:

Compartment	PEC	RCR	Method	Remarks
freshwater	0,000083 7 mg/l	0,076	EUSES	none

ERC6a:

Compartment	PEC	RCR	Method	Remarks
marine water	0,000020 5 mg/l	0,019	EUSES	none

Health:
Exhaust gas DeNOx applications:
PROC23:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, local, (acute)	Outdoor use, Respiratory Protection	mg/m³			No data available.

PROC23:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, local, (acute)	Indoor use, with local exhaust ventilation, No RPE	mg/m³			No data available.

PROC23:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, local	Outdoor use, Respiratory Protection	mg/m³			No data available.

PROC23:

Route of Exposure	Specific	Exposure	RCR	Method	Remarks

	condition	level			
inhalative, long-term, local	Indoor use, with local exhaust ventilation, No RPE	mg/m³			No data available.

PROC23:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, systemic, (acute)	Outdoor use, Respiratory Protection	mg/m³			No data available.

PROC23:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, systemic, (acute)	Indoor use, with local exhaust ventilation, No RPE	mg/m³			No data available.

PROC23:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, systemic	Outdoor use, Respiratory Protection	mg/m³			No data available.

PROC23:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, systemic	Indoor use, with local exhaust ventilation, No RPE	mg/m³			No data available.

PROC23:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks

dermal, short-term, systemic, (acute)	Indoor/Outdoor use., without local exhaust ventilation, Gloves worn	mg/kg bw/day			No data available.

PROC23:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, short-term, systemic, (acute)	Indoor use, with local exhaust ventilation, No gloves worn	mg/kg bw/day			No data available.

PROC23:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, long-term, systemic	Indoor/Outdoor use., without local exhaust ventilation, Gloves worn	mg/kg bw/day			No data available.

PROC23:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, long-term, systemic	Indoor use, with local exhaust ventilation, No gloves worn	mg/kg bw/day			No data available.

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

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

Exposure Scenario 6.

Exposure Scenario worker

1.Industrial use, Non-metal-surface treatment products, Treatment of plastics

List of use descriptors	
Sector(s) of use	SU12: Manufacture of plastics products, including compounding and conversion
Product categories [PC]:	PC15: Non-metal surface treatment products

Name of contributing environmental scenario and corresponding ERC	Treatment of plastics: ERC6b: Use of reactive processing aid at industrial site (no inclusion into or onto article)

Contributing Scenarios	Treatment of plastics: PROC1: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions PROC8b: Transfer of substance or mixture (charging and discharging) at dedicated facilities

2.1.Contributing exposure scenario controlling environmental exposure for: Treatment of plastics

Product characteristics

Concentration of the substance in a mixture:	Covers percentage substance in the product up to 100 %.

Physical form of the product	See section 9 of the SDS.

Viscosity:	
Kinematic viscosity:	No data available.
Dynamic viscosity:	0,7 mPa.s (48,9 °C)

Amounts used

Daily amount per site	76 tonnes
Regional use tonnage:	1073 tonnes/day

Frequency and duration of use

Batch process:	330 Emission days
Continuous process:	not relevant

Environment factors not influenced by risk management

Flow rate of receiving surface water (m^3/d):	Local freshwater dilution factor	Local marine water dilution factor	Other factors:	Remarks:
18.000 m3/d	10	10	not relevant	

Other given operational conditions affecting environmental exposure

Other relevant operational conditions	not relevant

Risk management measures (RMM)

Technical conditions and measures at process level (source) to prevent release

See section 8 of the safety data sheet (Environmental exposure controls).

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil

Air	Closed systems are used in order to prevent unintended emissions
Soil	Soil emission controls are not applicable as there is no direct release to soil.
Water	Closed systems are used in order to prevent unintended emissions
Sediment:	not relevant
Remarks:	not relevant

Organisational measures to prevent/limit release from site:

none

Conditions and measures related to sewage treatment plant

type:	Municipal Sewage Treatment Plant
Discharge rate:	not relevant
Treatment effectiveness:	not relevant
Sludge treatment technique:	not relevant
Measures to limit air emissions:	not relevant
Remarks:	Direct emissions to the municipal STP should not be made.

Conditions and measures related to external treatment of waste for disposal

Fraction of used amount transferred to external waste treatment:

Suitable waste treatment	Treatment effectiveness	Remarks
See section 13 of the SDS		External treatment and disposal of waste should comply with applicable local and/or national regulations.

Conditions and measures related to external recovery of waste

Fraction of used amount transferred to external waste treatment:

Suitable recovery operations:	Treatment effectiveness	Remarks
See section 13 of the SDS		External recovery and recycling of waste should comply with applicable local and/or national regulations.

Additional good practice advice beyond the REACH Chemical Safety Report

Use appropriate abatement systems to ensure that the emission levels defined by local regulations are not exceeded. Ensure operatives are trained to minimise releases

2.2. Contributing exposure scenario controlling worker exposure for: Treatment of plastics

Process Categories:	PROC1: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions PROC8b: Transfer of substance or mixture (charging and discharging) at dedicated facilities

Product characteristics

Concentration of the substance in a mixture:	Covers percentage substance in the product up to 100 %.

Physical form of the product:	See section 9 of the SDS.
Vapour pressure:	8574 hPa
Process temperature:	>= 20 °C
Remarks	not relevant

Amounts used

Daily amount per site	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 (industrial vs. professional) and level of containment/automation (as reflected in the PROCs and technical conditions) is the main determinant of the process-intrinsic emission potential.

Frequency and duration of use

	Use duration:	Frequency of use:	Remarks
Hours per shift	<= 8 h	5 days per week	PROC1, PROC8b

Human factors not influenced by risk management

This information is not available.

Other given operational conditions affecting workers exposure

Area of use	Room size:	Temperature:	Ventilation rate	Remarks
Indoor/Outdoor use.				Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions, Transfer of substance or mixture (charging and discharging) at dedicated facilities

Other relevant operational conditions:	. See section 8 of the SDS.

Risk management measures (RMM)

Technical conditions and measures at process level (source) to prevent release

See section 8 of the safety data sheet

Technical conditions and measures to control dispersion from source towards the worker

inhalation exposure	dermal exposure	eye exposure	oral exposure	Remarks
Handle product within a closed system				Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions
Apply a good standard of general or controlled ventilation when maintenance activities are carried out.				Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions
Handle product within a closed system				Transfer of substance or mixture (charging and discharging) at dedicated facilities
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.				Transfer of substance or mixture (charging and discharging) at dedicated facilities

Organisational measures to prevent/limit releases, dispersion and exposure

inhalation exposure	dermal exposure	eye exposure	oral exposure	Remarks
				See section 7 of the SDS.

				Ensure operatives are trained to minimise exposures.
				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

inhalation exposure	dermal exposure	eye exposure	oral exposure	Remarks
				See section 8 of the safety data sheet (Personal protection equipment)
If technical exhaust or ventilation measures are not possible or insufficient, respiratory protection must be worn.: 95 %				Transfer of substance or mixture (charging and discharging) at dedicated facilities
	Wear suitable gloves tested to EN374: 90 %			Transfer of substance or mixture (charging and discharging) at dedicated facilities
	Wear suitable face shield.			Transfer of substance or mixture (charging and discharging) at dedicated facilities
	Wear suitable coveralls to prevent exposure to the skin.			Transfer of substance or mixture (charging and discharging) at dedicated facilities
		Use suitable eye protection.		Transfer of substance or mixture (charging and discharging) at dedicated facilities

Additional good practice advice beyond the REACH Chemical Safety Report

See section 7 of the SDS. Handle product within a closed system 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.

3. Exposure estimation

Environment:
Treatment of plastics:
ERC6b:

Compartment	PEC	RCR	Method	Remarks
freshwater	0,0000017 mg/l	0,002	EUSES	none

ERC6b:

Compartment	PEC	RCR	Method	Remarks
marine water	0,0000002 mg/l	0,00018	EUSES	none

Health:
Treatment of plastics:
PROC1:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, local, (acute)	Indoor/Outdoor use., without local exhaust ventilation	0 mg/m³	< 0,01	ECETOC TRA worker v2.0	none

PROC1:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, local	Indoor/Outdoor use., without local exhaust ventilation	0 mg/m³	< 0,01	ECETOC TRA worker v2.0	none

PROC1:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, systemic, (acute)	Indoor/Outdoor use., with local exhaust ventilation	0 mg/m³	< 0,01	ECETOC TRA worker v2.0	none

PROC1:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, systemic	Indoor/Outdoor use., with local exhaust ventilation	0 mg/m³	< 0,01	ECETOC TRA worker v2.0	none

PROC1:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, short-term, systemic, (acute)	Indoor/Outdoor use., without local exhaust ventilation, No gloves worn	0,34 mg/kg bw/day	0,05	ECETOC TRA worker v2.0	none

PROC1:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, long-term, systemic	Indoor/Outdoor use., without local exhaust ventilation, No gloves worn	0,34 mg/kg bw/day	0,05	ECETOC TRA worker v2.0	none

PROC8b:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, local, (acute)	Outdoor use, Respiratory	3,72 mg/m³	0,103	ECETOC TRA worker v2.0	none

	Protection				

PROC8b:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, local, (acute)	Indoor use, with local exhaust ventilation, No RPE	3,19 mg/m³	0,089	ECETOC TRA worker v2.0	none

PROC8b:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, local	Outdoor use, Respiratory Protection	3,72 mg/m³	0,266	ECETOC TRA worker v2.0	none

PROC8b:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, local	Indoor use, with local exhaust ventilation, No RPE	3,19 mg/m³	0,228	ECETOC TRA worker v2.0	none

PROC8b:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, systemic, (acute)	Outdoor use, Respiratory Protection	3,72 mg/m³	0,078	ECETOC TRA worker v2.0	none

PROC8b:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, systemic, (acute)	Indoor use, with local exhaust ventilation,	3,19 mg/m³	0,067	ECETOC TRA worker v2.0	none

	No RPE				

PROC8b:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, systemic	Outdoor use, Respiratory Protection	3,72 mg/m³	0,078	ECETOC TRA worker v2.0	none

PROC8b:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, systemic	Indoor use, with local exhaust ventilation, No RPE	3,19 mg/m³	0,067	ECETOC TRA worker v2.0	none

PROC8b:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, short-term, systemic, (acute)	Indoor/Outdoor use., without local exhaust ventilation, Gloves worn	0,69 mg/kg bw/day	0,101	ECETOC TRA worker v2.0	none

PROC8b:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, short-term, systemic, (acute)	Indoor use, with local exhaust ventilation, No gloves worn	0,69 mg/kg bw/day	0,101	ECETOC TRA worker v2.0	none

PROC8b:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks

dermal, long-term, systemic	Indoor/Outdoor use., without local exhaust ventilation, Gloves worn	0,69 mg/kg bw/day	0,101	ECETOC TRA worker v2.0	none

PROC8b:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, long-term, systemic	Indoor use, with local exhaust ventilation, No gloves worn	0,69 mg/kg bw/day	0,101	ECETOC TRA worker v2.0	none

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

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

Exposure Scenario 7.

Exposure Scenario worker

1.Industrial use, Non-metal-surface treatment products, Treatment of textiles

List of use descriptors	
Sector(s) of use	SU5: Manufacture of textiles, leather, fur
Product categories [PC]:	PC34: Textile dyes and impregnating products

Name of contributing environmental scenario and corresponding ERC	Treatment of textiles: ERC6b: Use of reactive processing aid at industrial site (no inclusion into or onto article)

Contributing Scenarios	Treatment of textiles: PROC4: Chemical production where opportunity for exposure arises

	PROC6: Calendering operations

2.1.Contributing exposure scenario controlling environmental exposure for: Treatment of textiles

Product characteristics

Concentration of the substance in a mixture:	Covers percentage substance in the product up to 100 %.

Physical form of the product	See section 9 of the SDS.

Viscosity:	
Kinematic viscosity:	No data available.
Dynamic viscosity:	0,7 mPa.s (48,9 °C)

Amounts used

Daily amount per site	76 tonnes
Regional use tonnage:	1073 tonnes/day

Frequency and duration of use

Batch process:	330 Emission days
Continuous process:	not relevant

Environment factors not influenced by risk management

Flow rate of receiving surface water (m^3/d):	Local freshwater dilution factor	Local marine water dilution factor	Other factors:	Remarks:
18.000 m3/d	10	10	not relevant	

Other given operational conditions affecting environmental exposure

Other relevant operational conditions	not relevant

Risk management measures (RMM)

Technical conditions and measures at process level (source) to prevent release

See section 8 of the safety data sheet (Environmental exposure controls).

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil

Air	Closed systems are used in order to prevent unintended emissions
Soil	Soil emission controls are not applicable as there is no direct release to soil.
Water	Closed systems are used in order to prevent unintended emissions
Sediment:	not relevant
Remarks:	not relevant

Organisational measures to prevent/limit release from site:

none

Conditions and measures related to sewage treatment plant

type:	Municipal Sewage Treatment Plant
Discharge rate:	not relevant
Treatment effectiveness:	not relevant
Sludge treatment technique:	not relevant
Measures to limit air emissions:	not relevant
Remarks:	Direct emissions to the municipal STP should not be made.

Conditions and measures related to external treatment of waste for disposal

Fraction of used amount transferred to external waste treatment:

Suitable waste treatment	Treatment effectiveness	Remarks
See section 13 of the SDS		External treatment and disposal of waste should comply with applicable local and/or national regulations.

Conditions and measures related to external recovery of waste

Fraction of used amount transferred to external waste treatment:

Suitable recovery operations:	Treatment effectiveness	Remarks
See section 13 of the SDS		External recovery and recycling of waste should comply with applicable local and/or national regulations.

Additional good practice advice beyond the REACH Chemical Safety Report

Use appropriate abatement systems to ensure that the emission levels defined by local regulations are not exceeded.
Ensure operatives are trained to minimise releases

2.2. Contributing exposure scenario controlling worker exposure for: Treatment of textiles

Process Categories:	PROC4: Chemical production where opportunity for exposure arises PROC6: Calendering operations

Product characteristics

Concentration of the substance in a mixture:	Covers percentage substance in the product up to 100 %.

Physical form of the product:	See section 9 of the SDS.
Vapour pressure:	8574 hPa
Process temperature:	>= 20 °C
Remarks	not relevant

Amounts used

Daily amount per site	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 (industrial vs. professional) and level of containment/automation (as reflected in the PROCs and technical conditions) is the main determinant of the process-intrinsic emission potential.

Frequency and duration of use

	Use duration:	Frequency of use:	Remarks
Hours per shift	<= 8 h	5 days per week	PROC4
No data available.			PROC6

Human factors not influenced by risk management

This information is not available.

Other given operational conditions affecting workers exposure

Area of use	Room size:	Temperature:	Ventilation rate	Remarks
Indoor/Outdoor use.				Chemical production where opportunity for exposure arises
No data available.				Calendering operations

Other relevant operational conditions:	. See section 8 of the SDS.

Risk management measures (RMM)

Technical conditions and measures at process level (source) to prevent release

See section 8 of the safety data sheet

Technical conditions and measures to control dispersion from source towards the worker

inhalation exposure	dermal exposure	eye exposure	oral exposure	Remarks
Handle product within a closed system				Chemical production where opportunity for exposure arises
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.				Chemical production where opportunity for exposure arises
No data available.				Calendering operations

Organisational measures to prevent/limit releases, dispersion and exposure

inhalation exposure	dermal exposure	eye exposure	oral exposure	Remarks
				See section 7 of the SDS.
				Ensure operatives are trained to minimise exposures.
				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

inhalation exposure	dermal exposure	eye exposure	oral exposure	Remarks
				See section 8 of the safety data sheet (Personal protection equipment)
If technical exhaust or ventilation measures are not possible or insufficient, respiratory protection must be worn.: 95 %				Chemical production where opportunity for exposure arises
	Wear suitable gloves tested to EN374: 90 %			Chemical production where opportunity for exposure arises
	Wear suitable face shield.			Chemical production where opportunity for exposure arises
	Wear suitable coveralls to prevent exposure to the skin.			Chemical production where opportunity for exposure arises
		Use suitable eye protection.		Chemical production where opportunity for exposure arises
No data available.	No data available.	No data available.		Calendering operations

Additional good practice advice beyond the REACH Chemical Safety Report

See section 7 of the SDS. Handle product within a closed system 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.

3. Exposure estimation

Environment:
Treatment of textiles:
ERC6b:

Compartment	PEC	RCR	Method	Remarks
freshwater	0,0000017 mg/l	0,002	EUSES	none

ERC6b:

Compartment	PEC	RCR	Method	Remarks
marine water	0,0000002 mg/l	0,00018	EUSES	none

Health:
Treatment of textiles:
PROC4:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, local, (acute)	Outdoor use, Respiratory Protection	2,48 mg/m³	0,069	ECETOC TRA worker v2.0	none

PROC4:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, local, (acute)	Indoor use, with local exhaust ventilation, No RPE	7,08 mg/m³	0,197	ECETOC TRA worker v2.0	none

PROC4:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks

inhalative, long-term, local	Outdoor use, Respiratory Protection	2,48 mg/m³	0,177	ECETOC TRA worker v2.0	none

PROC4:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, local	Indoor use, with local exhaust ventilation, No RPE	7,08 mg/m³	0,506	ECETOC TRA worker v2.0	none

PROC4:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, systemic, (acute)	Outdoor use, Respiratory Protection	2,48 mg/m³	0,052	ECETOC TRA worker v2.0	none

PROC4:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, systemic, (acute)	Indoor use, with local exhaust ventilation, No RPE	2,48 mg/m³	0,149	ECETOC TRA worker v2.0	none

PROC4:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, systemic	Outdoor use, Respiratory Protection	2,48 mg/m³	0,052	ECETOC TRA worker v2.0	none

PROC4:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, systemic	Indoor use, with local	7,08 mg/m³	0,149	ECETOC TRA worker v2.0	none

	exhaust ventilation, No RPE				

PROC4:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, short-term, systemic, (acute)	Indoor/Outdoor use., without local exhaust ventilation, No gloves worn	0,69 mg/kg bw/day	0,101	ECETOC TRA worker v2.0	none

PROC4:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, short-term, systemic, (acute)	Indoor use, with local exhaust ventilation, No gloves worn	0,69 mg/kg bw/day	0,101	ECETOC TRA worker v2.0	none

PROC4:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, long-term, systemic	Indoor/Outdoor use., without local exhaust ventilation, No gloves worn	0,69 mg/kg bw/day	0,101	ECETOC TRA worker v2.0	none

PROC4:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, long-term, systemic	Indoor use, with local exhaust	0,69 mg/kg bw/day	0,101	ECETOC TRA worker v2.0	none

	ventilation, No gloves worn				

PROC6:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, local, (acute)	Outdoor use, Respiratory Protection	mg/m³			No data available.

PROC6:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, local, (acute)	Indoor use, with local exhaust ventilation, No RPE	mg/m³			No data available.

PROC6:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, local	Outdoor use, Respiratory Protection	mg/m³			No data available.

PROC6:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, local	Indoor use, with local exhaust ventilation, No RPE	mg/m³			No data available.

PROC6:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, systemic, (acute)	Outdoor use, Respiratory	mg/m³			No data available.

	Protection				

PROC6:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, systemic, (acute)	Indoor use, with local exhaust ventilation, No RPE	mg/m³			No data available.

PROC6:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, systemic	Outdoor use, Respiratory Protection	mg/m³			No data available.

PROC6:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, systemic	Indoor use, with local exhaust ventilation, No RPE	mg/m³			No data available.

PROC6:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, short-term, systemic, (acute)	Indoor/Outdoor use., without local exhaust ventilation, No gloves worn	mg/kg bw/day			No data available.

PROC6:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks

dermal, short-term, systemic, (acute)	Indoor use, with local exhaust ventilation, No gloves worn	mg/kg bw/day			No data available.

PROC6:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, long-term, systemic	Indoor/Outdoor use., without local exhaust ventilation, No gloves worn	mg/kg bw/day			No data available.

PROC6:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, long-term, systemic	Indoor use, with local exhaust ventilation, No gloves worn	mg/kg bw/day			No data available.

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

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

Exposure Scenario 8.

Exposure Scenario worker

1.Professional use, Laboratory activities

List of use descriptors	
Sector(s) of use	SU24: Scientific research and development

Product categories [PC]:	PC21: Laboratory chemicals

Name of contributing environmental scenario and corresponding ERC	Using gas alone or in mixtures for the calibration of analysis equipment.: ERC8b: Widespread use of reactive processing aid (no inclusion into or onto article, indoor)

Contributing Scenarios	Using gas alone or in mixtures for the calibration of analysis equipment.: PROC15: Use as laboratory reagent

2.1.Contributing exposure scenario controlling environmental exposure for: Using gas alone or in mixtures for the calibration of analysis equipment.

Product characteristics

Concentration of the substance in a mixture:	Covers percentage substance in the product up to 100 %.

Physical form of the product	See section 9 of the SDS.

Viscosity:	
Kinematic viscosity:	No data available.
Dynamic viscosity:	0,7 mPa.s (48,9 °C)

Amounts used

Annual amount per site	No data available.
Regional use tonnage (tons/year):	No data available.

Frequency and duration of use

Batch process:	not relevant
Continuous process:	not relevant

Environment factors not influenced by risk management

Flow rate of receiving	Local freshwater	Local marine water	Other factors:	Remarks:

surface water (m^3/d):	dilution factor	dilution factor		
18.000 m3/d	10	10	not relevant	

Other given operational conditions affecting environmental exposure

Other relevant operational conditions	not relevant

Risk management measures (RMM)

Technical conditions and measures at process level (source) to prevent release

See section 8 of the safety data sheet (Environmental exposure controls).

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil

Air	Closed systems are used in order to prevent unintended emissions
Soil	Soil emission controls are not applicable as there is no direct release to soil.
Water	Closed systems are used in order to prevent unintended emissions
Sediment:	not relevant
Remarks:	not relevant

Organisational measures to prevent/limit release from site:

none

Conditions and measures related to sewage treatment plant

type:	Municipal Sewage Treatment Plant
Discharge rate:	not relevant
Treatment effectiveness:	not relevant
Sludge treatment technique:	not relevant
Measures to limit air emissions:	not relevant
Remarks:	Direct emissions to the municipal STP should not be made.

Conditions and measures related to external treatment of waste for disposal

Fraction of used amount transferred to external waste treatment:

Suitable waste treatment	Treatment effectiveness	Remarks
See section 13 of the SDS		External treatment and disposal of waste should comply with applicable local and/or national regulations.

Conditions and measures related to external recovery of waste

Fraction of used amount transferred to external waste treatment:

Suitable recovery operations:	Treatment effectiveness	Remarks
See section 13 of the SDS		External recovery and recycling of waste should comply with applicable local and/or national regulations.

Additional good practice advice beyond the REACH Chemical Safety Report

Use appropriate abatement systems to ensure that the emission levels defined by local regulations are not exceeded. Ensure operatives are trained to minimise releases

2.2. Contributing exposure scenario controlling worker exposure for: Using gas alone or in mixtures for the calibration of analysis equipment.

Process Categories:	PROC15: Use as laboratory reagent

Product characteristics

Concentration of the substance in a mixture:	Covers percentage substance in the product up to 100 %.

Physical form of the product:	See section 9 of the SDS.
Vapour pressure:	8574 hPa
Process temperature:	>= 20 °C
Remarks	not relevant

Amounts used

Daily amount per site	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 (industrial vs. professional) and level of containment/automation (as reflected in the PROCs and technical conditions) is the main determinant of the process-intrinsic emission potential.

Frequency and duration of use

	Use duration:	Frequency of use:	Remarks
Hours per shift	< 8 h	5 days per week	PROC15

Human factors not influenced by risk management

This information is not available.

Other given operational conditions affecting workers exposure

Area of use	Room size:	Temperature:	Ventilation rate	Remarks
Indoor use				Use as laboratory reagent

Other relevant operational conditions:	. See section 8 of the SDS.

Risk management measures (RMM)

Technical conditions and measures at process level (source) to prevent release

See section 8 of the safety data sheet

Technical conditions and measures to control dispersion from source towards the worker

inhalation exposure	dermal exposure	eye exposure	oral exposure	Remarks
Handle product within a closed system				Use as laboratory reagent
Provide a good standard of controlled ventilation (10 to 15 air changes per hour).				Use as laboratory reagent
Local exhaust				Use as laboratory reagent

ventilation				

Organisational measures to prevent/limit releases, dispersion and exposure

inhalation exposure	dermal exposure	eye exposure	oral exposure	Remarks
				See section 7 of the SDS.
				Ensure operatives are trained to minimise exposures.
				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

inhalation exposure	dermal exposure	eye exposure	oral exposure	Remarks
				See section 8 of the safety data sheet (Personal protection equipment)
If technical exhaust or ventilation measures are not possible or insufficient, respiratory protection must be worn.: 95 %				Use as laboratory reagent
	Wear suitable gloves tested to EN374: 90 %			Use as laboratory reagent
	Wear suitable face shield.			Use as laboratory reagent
	Wear suitable coveralls to prevent exposure to the skin.			Use as laboratory reagent
		Use suitable eye protection.		Use as laboratory reagent

Additional good practice advice beyond the REACH Chemical Safety Report

See section 7 of the SDS. Handle product within a closed system 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.

3. Exposure estimation

Environment:
Using gas alone or in mixtures for the calibration of analysis equipment.:
ERC8b:

Compartment	PEC	RCR	Method	Remarks
freshwater	mg/l	< 1		No data available.

ERC8b:

Compartment	PEC	RCR	Method	Remarks
marine water	mg/l	< 1		No data available.

Health:
Using gas alone or in mixtures for the calibration of analysis equipment.:
PROC15:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, local, (acute)	Indoor use, without local exhaust ventilation, No RPE	35,42 mg/m³	0,98	ECETOC TRA worker v2.0	none

PROC15:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, local, (acute)	Indoor use, with local exhaust ventilation, No RPE	3,54 mg/m³	0,10	ECETOC TRA worker v2.0	none

PROC15:

Route of Exposure	Specific	Exposure	RCR	Method	Remarks

	condition	level			
inhalative, long-term, local	Indoor use, without local exhaust ventilation, No RPE	35,42 mg/m³	2,53	ECETOC TRA worker v2.0	none

PROC15:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, local	Indoor use, with local exhaust ventilation, No RPE	3,54 mg/m³	0,25	ECETOC TRA worker v2.0	none

PROC15:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, systemic, (acute)	Indoor use, without local exhaust ventilation, No RPE	35,42 mg/m³	0,74	ECETOC TRA worker v2.0	none

PROC15:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, systemic, (acute)	Indoor use, with local exhaust ventilation, No RPE	3,54 mg/m³	0,07	ECETOC TRA worker v2.0	none

PROC15:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, systemic	Indoor use, without local exhaust ventilation, No RPE	35,42 mg/m³	0,74	ECETOC TRA worker v2.0	none

PROC15:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, systemic	Indoor use, with local exhaust ventilation, No RPE	3,54 mg/m³	0,07	ECETOC TRA worker v2.0	none

PROC15:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, local, (acute)	Indoor use, without local exhaust ventilation, Respiratory Protection	1,77 mg/m³	0,05	ECETOC TRA worker v2.0	none

PROC15:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, local, (acute)	Indoor use, with local exhaust ventilation, Respiratory Protection	0,18 mg/m³	0,01	ECETOC TRA worker v2.0	none

PROC15:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, local	Indoor use, without local exhaust ventilation, Respiratory Protection	1,77 mg/m³	0,13	ECETOC TRA worker v2.0	none

PROC15:

Route of Exposure	Specific	Exposure	RCR	Method	Remarks

	condition	level			
inhalative, long-term, local	Indoor use, with local exhaust ventilation, Respiratory Protection	0,18 mg/m³	0,01	ECETOC TRA worker v2.0	none

PROC15:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, systemic, (acute)	Indoor use, without local exhaust ventilation, Respiratory Protection	1,77 mg/m³	0,04	ECETOC TRA worker v2.0	none

PROC15:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, systemic, (acute)	Indoor use, with local exhaust ventilation, Respiratory Protection	0,18 mg/m³	0	ECETOC TRA worker v2.0	none

PROC15:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, systemic	Indoor use, without local exhaust ventilation, Respiratory Protection	1,77 mg/m³	0,04	ECETOC TRA worker v2.0	none

PROC15:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term,	Indoor use,	0,18	0	ECETOC TRA	none

systemic	with local exhaust ventilation, Respiratory Protection	mg/m³		worker v2.0	

PROC15:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, local, (acute)	Indoor use, without local exhaust ventilation, No RPE	21,25 mg/m³	0,59	ECETOC TRA worker v2.0	4 hours

PROC15:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, local, (acute)	Indoor use, with local exhaust ventilation, No RPE	2,13 mg/m³	0,06	ECETOC TRA worker v2.0	4 hours

PROC15:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, local	Indoor use, without local exhaust ventilation, No RPE	21,25 mg/m³	1,52	ECETOC TRA worker v2.0	4 hours

PROC15:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, local	Indoor use, with local exhaust ventilation, No RPE	2,13 mg/m³	0,15	ECETOC TRA worker v2.0	4 hours

PROC15:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, systemic, (acute)	Indoor use, without local exhaust ventilation, No RPE	21,25 mg/m³	0,45	ECETOC TRA worker v2.0	4 hours

PROC15:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, systemic, (acute)	Indoor use, with local exhaust ventilation, No RPE	2,13 mg/m³	0,04	ECETOC TRA worker v2.0	4 hours

PROC15:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, systemic	Indoor use, without local exhaust ventilation, No RPE	21,25 mg/m³	0,45	ECETOC TRA worker v2.0	4 hours

PROC15:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, systemic	Indoor use, with local exhaust ventilation, No RPE	2,13 mg/m³	0,04	ECETOC TRA worker v2.0	4 hours

PROC15:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, local, (acute)	Indoor use, without local exhaust	1,06 mg/m³	0,03	ECETOC TRA worker v2.0	4 hours

	ventilation, Respiratory Protection				

PROC15:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, local, (acute)	Indoor use, with local exhaust ventilation, Respiratory Protection	0,11 mg/m³	0,01	ECETOC TRA worker v2.0	4 hours

PROC15:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, local	Indoor use, without local exhaust ventilation, Respiratory Protection	1,06 mg/m³	0,08	ECETOC TRA worker v2.0	4 hours

PROC15:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, local	Indoor use, with local exhaust ventilation, Respiratory Protection	0,11 mg/m³	0,01	ECETOC TRA worker v2.0	4 hours

PROC15:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, systemic, (acute)	Indoor use, without local exhaust ventilation, Respiratory	1,06 mg/m³	0,02	ECETOC TRA worker v2.0	4 hours

	Protection				

PROC15:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, systemic, (acute)	Indoor use, with local exhaust ventilation, Respiratory Protection	0,11 mg/m³	0	ECETOC TRA worker v2.0	4 hours

PROC15:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, systemic	Indoor use, without local exhaust ventilation, Respiratory Protection	1,06 mg/m³	0,02	ECETOC TRA worker v2.0	4 hours

PROC15:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, systemic	Indoor use, with local exhaust ventilation, Respiratory Protection	0,11 mg/m³	0	ECETOC TRA worker v2.0	4 hours

PROC15:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, short-term, systemic, (acute)	Indoor/Outdoor use., without local exhaust ventilation, No gloves worn	0,34 mg/kg bw/day	0,05	ECETOC TRA worker v2.0	none

PROC15:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, short-term, systemic, (acute)	Indoor use, with local exhaust ventilation, No gloves worn	0,03 mg/kg bw/day	0,01	ECETOC TRA worker v2.0	none

PROC15:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, short-term, systemic, (acute)	Indoor/Outdoor use., without local exhaust ventilation, Gloves worn	0,03 mg/kg bw/day	0,01	ECETOC TRA worker v2.0	none

PROC15:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, short-term, systemic, (acute)	Indoor use, with local exhaust ventilation, Gloves worn	0,01 mg/kg bw/day	0,01	ECETOC TRA worker v2.0	none

PROC15:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, long-term, systemic	Indoor/Outdoor use., without local exhaust ventilation, No gloves worn	0,34 mg/kg bw/day	0,05	ECETOC TRA worker v2.0	none

PROC15:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, long-term, systemic	Indoor use, with local exhaust ventilation, No gloves worn	0,03 mg/kg bw/day	0,01	ECETOC TRA worker v2.0	none

PROC15:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, long-term, systemic	Indoor/Outdoor use., without local exhaust ventilation, Gloves worn	0,03 mg/kg bw/day	0,01	ECETOC TRA worker v2.0	none

PROC15:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, long-term, systemic	Indoor use, with local exhaust ventilation, Gloves worn	0,01 mg/kg bw/day	0,01	ECETOC TRA worker v2.0	none

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

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

Exposure Scenario 9.

Exposure Scenario worker

1.Professional use, Refilling of refrigeration equipment

List of use descriptors	
Sector(s) of use	

Product categories [PC]:	PC16: Heat transfer fluids

Name of contributing environmental scenario and corresponding ERC	Refilling of refrigeration equipment: ERC9a: Widespread use of functional fluid (indoor) ERC9b: Widespread use of functional fluid (outdoor)

Contributing Scenarios	Refilling of refrigeration equipment: PROC8a: Transfer of substance or mixture (charging and discharging) at non-dedicated facilities

2.1.Contributing exposure scenario controlling environmental exposure for: Refilling of refrigeration equipment

Product characteristics

Concentration of the substance in a mixture:	Covers percentage substance in the product up to 100 %.

Physical form of the product	See section 9 of the SDS.

Viscosity:	
Kinematic viscosity:	No data available.
Dynamic viscosity:	0,7 mPa.s (48,9 °C)

Amounts used

Annual amount per site	No data available.
Regional use tonnage (tons/year):	No data available.

Frequency and duration of use

Batch process:	not relevant
Continuous process:	not relevant

Environment factors not influenced by risk management

Flow rate of receiving surface water	Local freshwater dilution factor	Local marine water dilution factor	Other factors:	Remarks:

(m^3/d):				
18.000 m3/d	10	10	not relevant	

Other given operational conditions affecting environmental exposure

Other relevant operational conditions	not relevant

Risk management measures (RMM)

Technical conditions and measures at process level (source) to prevent release

See section 8 of the safety data sheet (Environmental exposure controls).

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil

Air	Closed systems are used in order to prevent unintended emissions
Soil	Soil emission controls are not applicable as there is no direct release to soil.
Water	Closed systems are used in order to prevent unintended emissions
Sediment:	not relevant
Remarks:	not relevant

Organisational measures to prevent/limit release from site:

none

Conditions and measures related to sewage treatment plant

type:	Municipal Sewage Treatment Plant
Discharge rate:	not relevant
Treatment effectiveness:	not relevant
Sludge treatment technique:	not relevant
Measures to limit air emissions:	not relevant
Remarks:	Direct emissions to the municipal STP should not be made.

Conditions and measures related to external treatment of waste for disposal

Fraction of used amount transferred to external waste treatment:

Suitable waste treatment	Treatment effectiveness	Remarks
See section 13 of the SDS		External treatment and disposal of waste should comply with applicable local and/or national regulations.

Conditions and measures related to external recovery of waste

Fraction of used amount transferred to external waste treatment:

Suitable recovery operations:	Treatment effectiveness	Remarks
See section 13 of the SDS		External recovery and recycling of waste should comply with applicable local and/or national regulations.

Additional good practice advice beyond the REACH Chemical Safety Report

Use appropriate abatement systems to ensure that the emission levels defined by local regulations are not exceeded. Ensure operatives are trained to minimise releases

2.2. Contributing exposure scenario controlling worker exposure for: Refilling of refrigeration equipment

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

Product characteristics

Concentration of the substance in a mixture:	Covers percentage substance in the product up to 100 %.

Physical form of the product:	See section 9 of the SDS.
Vapour pressure:	8574 hPa
Process temperature:	>= 20 °C
Remarks	not relevant

Amounts used

Daily amount per site	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 (industrial vs. professional) and level of

	containment/automation (as reflected in the PROCs and technical conditions) is the main determinant of the process-intrinsic emission potential.

Frequency and duration of use

	Use duration:	Frequency of use:	Remarks
Hours per shift	<= 8 h	5 days per week	PROC22

Human factors not influenced by risk management

This information is not available.

Other given operational conditions affecting workers exposure

Area of use	Room size:	Temperature:	Ventilation rate	Remarks
Indoor/Outdoor use.				Transfer of substance or mixture (charging and discharging) at non-dedicated facilities

Other relevant operational conditions:	. See section 8 of the SDS.

Risk management measures (RMM)

Technical conditions and measures at process level (source) to prevent release

See section 8 of the safety data sheet

Technical conditions and measures to control dispersion from source towards the worker

inhalation exposure	dermal exposure	eye exposure	oral exposure	Remarks
Handle product within a closed system				Transfer of substance or mixture (charging and discharging) at non-dedicated facilities
Apply a good standard of general or controlled ventilation when maintenance activities are carried				Transfer of substance or mixture (charging and discharging) at non-dedicated facilities

out.				

Organisational measures to prevent/limit releases, dispersion and exposure

inhalation exposure	dermal exposure	eye exposure	oral exposure	Remarks
				See section 7 of the SDS.
				Ensure operatives are trained to minimise exposures.
				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

inhalation exposure	dermal exposure	eye exposure	oral exposure	Remarks
				See section 8 of the safety data sheet (Personal protection equipment)
If technical exhaust or ventilation measures are not possible or insufficient, respiratory protection must be worn.: 95 %				Transfer of substance or mixture (charging and discharging) at non-dedicated facilities
	Wear suitable gloves tested to EN374: 90 %			Transfer of substance or mixture (charging and discharging) at non-dedicated facilities
	Wear suitable face shield.			Transfer of substance or mixture (charging and discharging) at non-dedicated facilities
	Wear suitable coveralls to prevent exposure to the skin.			Transfer of substance or mixture (charging and discharging) at non-

				dedicated facilities
		Use suitable eye protection.		Transfer of substance or mixture (charging and discharging) at non-dedicated facilities

Additional good practice advice beyond the REACH Chemical Safety Report

See section 7 of the SDS. Handle product within a closed system 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.

3. Exposure estimation

Environment:
Refilling of refrigeration equipment:
ERC9a, ERC9b:

Compartment	PEC	RCR	Method	Remarks
freshwater	mg/l	< 1		No data available.

ERC9a, ERC9b:

Compartment	PEC	RCR	Method	Remarks
marine water	mg/l	< 1		No data available.

Health:
Refilling of refrigeration equipment:
PROC8a:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, local, (acute)	Outdoor use, Respiratory Protection	mg/m³			No data available.

PROC8a:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, local, (acute)	Indoor use, with local exhaust	mg/m³			No data available.

	ventilation, No RPE				

PROC8a:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, local	Outdoor use, Respiratory Protection	mg/m³			No data available.

PROC8a:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, local	Indoor use, with local exhaust ventilation, No RPE	mg/m³			No data available.

PROC8a:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, systemic, (acute)	Outdoor use, Respiratory Protection	mg/m³			No data available.

PROC8a:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, systemic, (acute)	Indoor use, with local exhaust ventilation, No RPE	mg/m³			No data available.

PROC8a:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, systemic	Outdoor use, Respiratory Protection	mg/m³			No data available.

PROC8a:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, systemic	Indoor use, with local exhaust ventilation, No RPE	mg/m³			No data available.

PROC8a:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, short-term, systemic, (acute)	Indoor/Outdoor use., without local exhaust ventilation, Gloves worn	mg/kg bw/day			No data available.

PROC8a:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, short-term, systemic, (acute)	Indoor use, with local exhaust ventilation, No gloves worn	mg/kg bw/day			No data available.

PROC8a:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, long-term, systemic	Indoor/Outdoor use., without local exhaust ventilation, Gloves worn	mg/kg bw/day			No data available.

PROC8a:

Route of Exposure	Specific	Exposure	RCR	Method	Remarks

	condition	level			
dermal, long-term, systemic	Indoor use, with local exhaust ventilation, No gloves worn	mg/kg bw/day			No data available.

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

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

Exposure Scenario 10.

Exposure Scenario worker

1.Professional use, Water treatment chemicals

List of use descriptors	
Sector(s) of use	SU23: Electricity, steam, gas water supply and sewage treatment
Product categories [PC]:	PC37: Water treatment chemicals

Name of contributing environmental scenario and corresponding ERC	Water treatment.: ERC8b: Widespread use of reactive processing aid (no inclusion into or onto article, indoor)

Contributing Scenarios	Water treatment.: PROC8b: Transfer of substance or mixture (charging and discharging) at dedicated facilities

2.1.Contributing exposure scenario controlling environmental exposure for: Water treatment.

Product characteristics

Concentration of the substance in a mixture:	Covers percentage substance in the product up to 100 %.

Physical form of the product	See section 9 of the SDS.

Viscosity:	
Kinematic viscosity:	No data available.
Dynamic viscosity:	0,7 mPa.s (48,9 °C)

Amounts used

Annual amount per site	No data available.
Regional use tonnage (tons/year):	No data available.

Frequency and duration of use

Batch process:	not relevant
Continuous process:	not relevant

Environment factors not influenced by risk management

Flow rate of receiving surface water (m^3/d):	Local freshwater dilution factor	Local marine water dilution factor	Other factors:	Remarks:
18.000 m3/d	10	10	not relevant	

Other given operational conditions affecting environmental exposure

Other relevant operational conditions	not relevant

Risk management measures (RMM)

Technical conditions and measures at process level (source) to prevent release

See section 8 of the safety data sheet (Environmental exposure controls).

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil

Air	Closed systems are used in order to prevent unintended emissions
Soil	Soil emission controls are not applicable as there is no direct release to soil.
Water	

	Closed systems are used in order to prevent unintended emissions
Sediment:	not relevant
Remarks:	not relevant

Organisational measures to prevent/limit release from site:

none

Conditions and measures related to sewage treatment plant

type:	Municipal Sewage Treatment Plant
Discharge rate:	not relevant
Treatment effectiveness:	not relevant
Sludge treatment technique:	not relevant
Measures to limit air emissions:	not relevant
Remarks:	Direct emissions to the municipal STP should not be made.

Conditions and measures related to external treatment of waste for disposal

Fraction of used amount transferred to external waste treatment:

Suitable waste treatment	Treatment effectiveness	Remarks
See section 13 of the SDS		External treatment and disposal of waste should comply with applicable local and/or national regulations.

Conditions and measures related to external recovery of waste

Fraction of used amount transferred to external waste treatment:

Suitable recovery operations:	Treatment effectiveness	Remarks
See section 13 of the SDS		External recovery and recycling of waste should comply with applicable local and/or national regulations.

Additional good practice advice beyond the REACH Chemical Safety Report

Use appropriate abatement systems to ensure that the emission levels defined by local regulations are not exceeded.

Ensure operatives are trained to minimise releases

2.2. Contributing exposure scenario controlling worker exposure for: Water treatment.

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

Product characteristics

Concentration of the substance in a mixture:	Covers percentage substance in the product up to 100 %.

Physical form of the product:	See section 9 of the SDS.
Vapour pressure:	8574 hPa
Process temperature:	>= 20 °C
Remarks	not relevant

Amounts used

Daily amount per site	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 (industrial vs. professional) and level of containment/automation (as reflected in the PROCs and technical conditions) is the main determinant of the process-intrinsic emission potential.

Frequency and duration of use

	Use duration:	Frequency of use:	Remarks
Hours per shift	<= 8 h	5 days per week	PROC8b

Human factors not influenced by risk management

This information is not available.

Other given operational conditions affecting workers exposure

Area of use	Room size:	Temperature:	Ventilation rate	Remarks
Indoor/Outdoor use.				Transfer of substance or mixture (charging and discharging) at dedicated facilities

Other relevant operational conditions:	. See section 8 of the SDS.

Risk management measures (RMM)

Technical conditions and measures at process level (source) to prevent release

See section 8 of the safety data sheet

Technical conditions and measures to control dispersion from source towards the worker

inhalation exposure	dermal exposure	eye exposure	oral exposure	Remarks
Handle product within a closed system				Transfer of substance or mixture (charging and discharging) at dedicated facilities
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.				Transfer of substance or mixture (charging and discharging) at dedicated facilities

Organisational measures to prevent/limit releases, dispersion and exposure

inhalation exposure	dermal exposure	eye exposure	oral exposure	Remarks
				See section 7 of the SDS.
				Ensure operatives are trained to minimise exposures.
				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

inhalation exposure	dermal exposure	eye exposure	oral exposure	Remarks
				See section 8 of the safety data sheet (Personal protection equipment)
If technical exhaust or ventilation measures are not possible or insufficient, respiratory protection must be worn.: 95 %				Transfer of substance or mixture (charging and discharging) at dedicated facilities
	Wear suitable gloves tested to EN374: 90 %			Transfer of substance or mixture (charging and discharging) at dedicated facilities
	Wear suitable face shield.			Transfer of substance or mixture (charging and discharging) at dedicated facilities
	Wear suitable coveralls to prevent exposure to the skin.			Transfer of substance or mixture (charging and discharging) at dedicated facilities
		Use suitable eye protection.		Transfer of substance or mixture (charging and discharging) at dedicated facilities

Additional good practice advice beyond the REACH Chemical Safety Report

See section 7 of the SDS. Handle product within a closed system 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.

3. Exposure estimation

Environment:
Water treatment.:
ERC8b:

Compartment	PEC	RCR	Method	Remarks
freshwater	mg/l	< 1		No data available.

ERC8b:

Compartment	PEC	RCR	Method	Remarks
marine water	mg/l	< 1		No data available.

Health:
Water treatment.:
PROC8b:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, local, (acute)	Outdoor use, Respiratory Protection	3,72 mg/m³	0,103	ECETOC TRA worker v2.0	none

PROC8b:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, local, (acute)	Indoor use, with local exhaust ventilation, No RPE	3,19 mg/m³	0,089	ECETOC TRA worker v2.0	none

PROC8b:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, local	Outdoor use, Respiratory Protection	3,72 mg/m³	0,266	ECETOC TRA worker v2.0	none

PROC8b:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, local	Indoor use, with local exhaust ventilation,	3,19 mg/m³	0,228	ECETOC TRA worker v2.0	none

	No RPE				

PROC8b:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, systemic, (acute)	Outdoor use, Respiratory Protection	3,72 mg/m³	0,078	ECETOC TRA worker v2.0	none

PROC8b:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, short-term, systemic, (acute)	Indoor use, with local exhaust ventilation, No RPE	3,19 mg/m³	0,067	ECETOC TRA worker v2.0	none

PROC8b:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, systemic	Outdoor use, Respiratory Protection	3,72 mg/m³	0,078	ECETOC TRA worker v2.0	none

PROC8b:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
inhalative, long-term, systemic	Indoor use, with local exhaust ventilation, No RPE	3,19 mg/m³	0,067	ECETOC TRA worker v2.0	none

PROC8b:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, short-term, systemic, (acute)	Indoor/Outdoor use., without local exhaust	0,69 mg/kg bw/day	0,101	ECETOC TRA worker v2.0	none

	ventilation, Gloves worn				

PROC8b:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, short-term, systemic, (acute)	Indoor use, with local exhaust ventilation, No gloves worn	0,69 mg/kg bw/day	0,101	ECETOC TRA worker v2.0	none

PROC8b:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, long-term, systemic	Indoor/Outdoor use., without local exhaust ventilation, Gloves worn	0,69 mg/kg bw/day	0,101	ECETOC TRA worker v2.0	none

PROC8b:

Route of Exposure	Specific condition	Exposure level	RCR	Method	Remarks
dermal, long-term, systemic	Indoor use, with local exhaust ventilation, No gloves worn	0,69 mg/kg bw/day	0,101	ECETOC TRA worker v2.0	none

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

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

SAFETY DATA SHEET

Ammonia, anhydrous

Issue Date:	16.01.2013	Version: 2.1	SDS No.: 000010021772
Last revised date:	10.12.2020		125/125