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		Country : DK / Language : EN

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

1.1. Product identifier

Trade name : Ammonia, anhydrous, Ammonia, Ammonia N38, Ammonia HG, Ammonia LGC
SDS no : NOAL_0002
Chemical description : Ammonia, anhydrous
CAS-No. : 7664-41-7
EC-No. : 231-635-3
EC Index-No. : 007-001-00-5
Registration-No. : 01-2119488876-14
Chemical formula : NH₃

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

Relevant identified uses : Industrial and professional uses. Perform risk assessment prior to use.
See the list of identified uses and exposure scenarios in the annex of the safety data sheet.
Contact supplier for more information on uses.
Uses advised against : Consumer use.

1.3. Details of the supplier of the safety data sheet

Company identification

AIR LIQUIDE Denmark A/S
Høje Taastrupvej 42
2630 Taastrup - DENMARK
T +45 76 25 25 25
eunordic-sds@airliquide.com

E-Mail address (competent person) : eunordic-sds@airliquide.com

1.4. Emergency telephone number

Emergency telephone number : 112
Availability
(24 / 7)

SECTION 2: Hazards identification


2.1. Classification of the substance or mixture

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

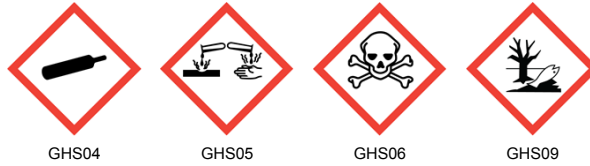
Physical hazards	Flammable gases, Category 2	H221
	Gases under pressure : Liquefied gas	H280
Health hazards	Acute toxicity (inhalation:gas) Category 3	H331
	Skin corrosion/irritation, Category 1B	H314
	Serious eye damage/eye irritation, Category 1	H318
Environmental hazards	Hazardous to the aquatic environment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

2.2. Label elements

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

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Hazard pictograms (CLP) :



Signal word (CLP) :

Danger

Hazard statements (CLP) :

H280 - Contains gas under pressure; may explode if heated.
 H331 - Toxic if inhaled..
 H410 - Very toxic to aquatic life with long lasting effects.
 H221 - Flammable gas..
 H314 - Causes severe skin burns and eye damage.
 EUH071 - Corrosive to the respiratory tract..

Precautionary statements (CLP)

- Prevention : P260 - Do not breathe gas, vapours.
P273 - Avoid release to the environment.
P280 - Wear protective gloves, protective clothing, eye protection, face protection.
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
- Response : P377 - Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381 - In case of leakage, eliminate all ignition sources.
P303+P361+P353+P315 - IF ON SKIN : (or hair) Take off immediately all contaminated clothing. Rinse skin with water or shower. Get immediate medical advice..
P304+P340+P315 - IF INHALED : Remove person to fresh air and keep comfortable for breathing. Get immediate medical advice..
P305+P351+P338+P315 - IF IN EYES : Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get immediate medical advice..
- Storage : P403 - Store in a well-ventilated place.
P405 - Store locked up.

2.3. Other hazards

: None.

SECTION 3: Composition/information on ingredients

3.1. Substances

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

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

3.2. Mixtures


: Not established.

SECTION 4: First aid measures

4.1. Description of first aid measures

- Inhalation

: Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Perform cardiopulmonary resuscitation if breathing stopped.

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- Skin contact : Remove contaminated clothing. Drench affected area with water for at least 15 minutes. In case of frostbite spray with water for at least 15 minutes. Apply a sterile dressing. Obtain medical assistance.
- Eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes.
- Ingestion : Ingestion is not considered a potential route of exposure.

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

- : May cause severe chemical burns to skin and cornea. Suitable first-aid treatment should be immediately available. Seek medical advice before using product.
- Prolonged exposure to small concentrations may result in pulmonary oedema.
- Material is destructive to tissue of the mucuous membranes and upper respiratory tract. Cough, shortness of breath, headache, nausea.
- Refer to section 11.

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

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

SECTION 5: Firefighting measures

5.1. Extinguishing media

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

5.2. Special hazards arising from the substance or mixture


- Specific hazards : Exposure to fire may cause containers to rupture/explode.
- Hazardous combustion products : Nitric oxide/nitrogen dioxide.

5.3. Advice for firefighters

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

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

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

6.2. Environmental precautions

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

6.3. Methods and material for containment and cleaning up

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

6.4. Reference to other sections

- : See also sections 8 and 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Safe use of the product

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

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Safe handling of the gas receptacle : Refer to supplier's container handling instructions.

Do not allow backfeed into the container.

Protect cylinders from physical damage; do not drag, roll, slide or drop.

When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders.

Leave valve protection caps in place until the container has been secured against either a wall or bench or placed in a container stand and is ready for use.

If user experiences any difficulty operating valve discontinue use and contact supplier.

Never attempt to repair or modify container valves or safety relief devices.

Damaged valves should be reported immediately to the supplier.

Keep container valve outlets clean and free from contaminants particularly oil and water.

Replace valve outlet caps or plugs and container caps where supplied as soon as container is disconnected from equipment.

Close container valve after each use and when empty, even if still connected to equipment.

Never attempt to transfer gases from one cylinder/container to another.

Never use direct flame or electrical heating devices to raise the pressure of a container.

Do not remove or deface labels provided by the supplier for the identification of the content of the container.

Suck back of water into the container must be prevented.

Open valve slowly to avoid pressure shock.

7.2. Conditions for safe storage, including any incompatibilities

: Observe all regulations and local requirements regarding storage of containers.

Containers should not be stored in conditions likely to encourage corrosion.

Container valve guards or caps should be in place.

Containers should be stored in the vertical position and properly secured to prevent them from falling over.

Stored containers should be periodically checked for general condition and leakage.

Keep container below 50°C in a well ventilated place.

Store containers in location free from fire risk and away from sources of heat and ignition.

Keep away from combustible materials.

Segregate from oxidant gases and other oxidants in store.

All electrical equipment in the storage areas should be compatible with the risk of a potentially explosive atmosphere.

7.3. Specific end use(s)

: None.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Ammonia, anhydrous (7664-41-7)		
OEL : Occupational Exposure Limits		
EU	TWA IOELV (EU) 8 h [mg/m ³]	14 mg/m ³
	TWA IOELV (EU) 8 h [ppm]	20 ppm
	STEL IOELV (EU) 15 min [mg/m ³]	36 mg/m ³
	STEL IOELV (EU) 15 min [ppm]	50 ppm
Denmark	TWA (DK) OEL 8h [mg/m ³]	14 mg/m ³
	TWA (DK) OEL 8h [ppm]	20 ppm
	Anmærkninger (DK)	(2002); E (betyder, at stoffet har en EF-grænseværdi)

Ammonia, anhydrous (7664-41-7)		
OEL : Occupational Exposure Limits		
EU	TWA IOELV (EU) 8 h [mg/m ³]	14 mg/m ³
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	TWA (DK) OEL 8h [ppm]	20 ppm
	Anmærkninger (DK)	(2002); E (betyder, at stoffet har en EF-grænseværdi)

Ammonia, anhydrous

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Ammonia, anhydrous (7664-41-7)

DNEL: Derived no effect level (Workers)

Acute - local effects, inhalation	36 mg/m ³
Acute - systemic effects, inhalation	47.6 mg/m ³
Long-term - local effects, inhalation	14 mg/m ³
Long-term - systemic effects, inhalation	47.6 mg/m ³
Acute - systemic effects, dermal	6.8 mg/kg bw/day
Long-term - systemic effects, dermal	6.8 mg/kg bw/day

Ammonia, anhydrous (7664-41-7)

DNEL: Derived no effect level (Workers)

Acute - local effects, inhalation	36 mg/m ³
Acute - systemic effects, inhalation	47.6 mg/m ³
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Acute - systemic effects, dermal	6.8 mg/kg bw/day
Long-term - systemic effects, dermal	6.8 mg/kg bw/day

Ammonia, anhydrous (7664-41-7)

PNEC: Predicted no effect concentration

Aqua (freshwater)	0.0011 mg/l
Aqua (marine water)	0.0011 mg/l

Ammonia, anhydrous (7664-41-7)

PNEC: Predicted no effect concentration

Aqua (freshwater)	0.0011 mg/l
Aqua (marine water)	0.0011 mg/l


8.2. Exposure controls

8.2.1. Appropriate engineering controls

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

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

- : A risk assessment should be conducted and documented in each work area to assess the risks related to the use of the product and to select the PPE that matches the relevant risk. The following recommendations should be considered:
PPE compliant to the recommended EN/ISO standards should be selected.
- Eye/face protection
 - : Wear goggles and a face shield when transfilling or breaking transfer connections.
 - Standard EN 166 - Personal eye-protection - specifications.
 - Provide readily accessible eye wash stations and safety showers.
- Skin protection
 - Hand protection
 - : Wear working gloves when handling gas containers.
 - Standard EN 388 - Protective gloves against mechanical risk.
 - Wear cold insulating gloves when transfilling or breaking transfer connections.
 - Standard EN 511 - Cold insulating gloves.
 - Wear chemically resistant protective gloves.
 - Standard EN 374 - Protective gloves against chemicals.
 - Permeation time: minimum >30min short term exposure: material / thickness Chloroprene rubber (Neoprene®) (CR) / 0.5 [mm].
 - Permeation time: minimum >480min long term exposure : material / thickness Butyl rubber (IIR) / 0.7 [mm].
 - Consult glove manufacturer's product information on material suitability and material thickness.
 - The breakthrough time of the selected gloves must be greater than the intended use period.
 - Other
 - : Keep suitable chemically resistant protective clothing readily available for emergency use.
 - Standard EN943-1 - Full protective suits against liquid, solid and gaseous chemicals.
 - Wear safety shoes while handling containers.
 - Standard EN ISO 20345 - Personal protective equipment - Safety footwear.

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• Respiratory protection : Gas filters may be used if all surrounding conditions e.g. type and concentration of the contaminant(s) and duration of use are known.
Use gas filters with full face mask, where exposure limits may be exceeded for a short-term period, e.g. connecting or disconnecting containers.
Recommended: Filter K (green).
Gas filters do not protect against oxygen deficiency.
Standard EN 14387 - Gas filter(s), combined filter(s) and standard EN136, full face masks .
Keep self contained breathing apparatus readily available for emergency use.
Self contained breathing apparatus is recommended, where unknown exposure may be expected, e.g. during maintenance activities on installation systems.
Standard EN 137 - Self-contained open-circuit compressed air breathing apparatus with full face mask.

• Thermal hazards : None in addition to the above sections.

8.2.3. Environmental exposure controls

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

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Appearance

- Physical state at 20°C / 101.3kPa : Gas.
- Colour : Colourless.

Odour : Ammoniacal.

Odour threshold : Odour threshold is subjective and inadequate to warn of overexposure.

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

Molar mass : 17 g/mol

Melting point : -77.7 °C

Boiling point : -33 °C

Flash point : Not applicable for gases and gas mixtures.

Critical temperature [°C] : 132 °C

Evaporation rate (ether=1) : Not applicable for gases and gas mixtures.

Flammability range : 15.4 - 33.6 vol %

Vapour pressure [20°C] : 8.6 bar(a)

Vapour pressure [50°C] : 20 bar(a)

Relative density, gas (air=1) : 0.6

Relative density, liquid (water=1) : 0.7

Solubility in water : 517 g/l

Partition coefficient n-octanol/water [log Kow] : Not applicable for inorganic products.

Auto-ignition temperature : 630 °C

Decomposition point [°C] : Not applicable.

Viscosity [20°C] : No reliable data available.

Explosive Properties : Not applicable.

Oxidising Properties : Not applicable.

9.2. Other information

Other data : No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

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

10.2. Chemical stability

: Stable under normal conditions.

Ammonia, anhydrous

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10.3. Possibility of hazardous reactions

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

10.4. Conditions to avoid

: Keep away from heat/sparks/open flames/hot surfaces. – No smoking.
 Avoid moisture in installation systems.

10.5. Incompatible materials

: Air, Oxidisers.
 Reacts with water to form corrosive alkalis.
 May react violently with acids.
 For additional information on compatibility refer to ISO 11114.

10.6. Hazardous decomposition products

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

SECTION 11: Toxicological information

11.1. Information on toxicological effects

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

LC50 inhalation rat (ppm)	2000 ppm/4h
Ammonia, anhydrous (7664-41-7)	
LC50 inhalation rat (ppm)	2000 ppm/4h

Skin corrosion/irritation : Causes severe skin burns and eye damage.
Serious eye damage/irritation : Causes serious eye damage.
Respiratory or skin sensitisation : No known effects from this product.
Germ cell mutagenicity : No known effects from this product.
Carcinogenicity : No known effects from this product.
Reproductive toxicity : No known effects from this product.
 No known effects from this product.
STOT-single exposure : Severe corrosion to the respiratory tract at high concentrations.
 May cause inflammation of the respiratory system.
Target organ(s) : Respiratory tract.
STOT-repeated exposure : No known effects from this product.
Aspiration hazard : Not applicable for gases and gas mixtures.

SECTION 12: Ecological information

12.1. Toxicity

Assessment : Very toxic to aquatic life.
 Toxic to aquatic life with long lasting effects.


EC50 48h - Daphnia magna [mg/l] : 101 mg/l
 EC50 72h - Algae [mg/l] : No data available.
 LC50 96 h - Fish [mg/l] : 0.89 mg/l

12.2. Persistence and degradability

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

12.3. Bioaccumulative potential

Assessment : No data available.

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12.4. Mobility in soil

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

12.5. Results of PBT and vPvB assessment

Assessment : Not classified as PBT or vPvB.

12.6. Other adverse effects

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

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Contact supplier if guidance is required.
Must not be discharged to atmosphere.
Toxic and corrosive gases formed during combustion should be scrubbed before discharge to atmosphere.
Gas may be scrubbed in sulphuric acid solution.
Gas may be scrubbed in water.
Ensure that the emission levels from local regulations or operating permits are not exceeded.
Refer to the EIGA code of practice Doc.30 "Disposal of Gases", downloadable at <http://www.eiga.org> for more guidance on suitable disposal methods.
Return unused product in original container to supplier.

List of hazardous waste codes (from Commission Decision 2000/532/EC as amended)

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

13.2. Additional information

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

SECTION 14: Transport information

14.1. UN number

UN-No. : 3318

14.2. UN proper shipping name

Transport by road/rail (ADR/RID) : AMMONIA SOLUTION
Transport by air (ICAO-TI / IATA-DGR) : Ammonia solution
Transport by sea (IMDG) : AMMONIA SOLUTION

14.3. Transport hazard class(es)


Labelling :



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

Transport by road/rail (ADR/RID)

Class : 2.
Classification code : 4TC.
Hazard identification number : 268.

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Tunnel Restriction : C/D - Tank carriage : Passage forbidden through tunnels of category C, D and E. Other carriage : Passage forbidden through tunnels of category D and E.

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

Class / Div. (Sub. risk(s)) : 2.3 (8)

Transport by sea (IMDG)

Class / Div. (Sub. risk(s)) : 2.3 (8)

Emergency Schedule (EmS) - Fire : F-C.

Emergency Schedule (EmS) - Spillage : S-U.

14.4. Packing group

Transport by road/rail (ADR/RID) : Not established.

Transport by air (ICAO-TI / IATA-DGR) : Not established.

Transport by sea (IMDG) : Not established.

14.5. Environmental hazards

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

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

Transport by sea (IMDG) : Marine pollutant

14.6. Special precautions for user

Packing Instruction(s)

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

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

Passenger and Cargo Aircraft : Forbidden.

Cargo Aircraft only : Forbidden.

Transport by sea (IMDG) : P200.

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

14.7. Transport in bulk according to Annex II of Marpol and the IBC Code

: Not applicable.

SECTION 15: Regulatory information

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

EU-Regulations


Restrictions on use : None.

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

National regulations

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

Denmark

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Recommendations Danish Regulation : Young people below the age of 18 years are not allowed to use the product
Pregnant/breastfeeding women working with the product must not be in direct contact with the product

15.2. Chemical safety assessment

A CSA has been carried out.

SECTION 16: Other information

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

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


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

Full text of H- and EUH-statements

Acute Tox. 3 (Inhalation:gas)	Acute toxicity (inhalation:gas) Category 3
Aquatic Acute 1	Hazardous to the aquatic environment — Acute Hazard, Category 1
Aquatic Chronic 2	Hazardous to the aquatic environment — Chronic Hazard, Category 2
Eye Dam. 1	Serious eye damage/eye irritation, Category 1
Flam. Gas 2	Flammable gases, Category 2
Press. Gas (Liq.)	Gases under pressure : Liquefied gas
Skin Corr. 1B	Skin corrosion/irritation, Category 1B
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.
EUH071	Corrosive to the respiratory tract.

DISCLAIMER OF LIABILITY

: Before using this product in any new process or experiment, a thorough material compatibility and safety study should be carried out.
Details given in this document are believed to be correct at the time of going to press.
Whilst proper care has been taken in the preparation of this document, no liability for injury or damage resulting from its use can be accepted.

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1. Exposure scenario EIGA002-1

Industrial uses, closed contained conditions

ES Ref.: EIGA002-1 ES Type: Worker - EIGA Revision date: 01/07/2016

Use descriptors	SU3 PROC1, PROC2, PROC3, PROC4, PROC8b, PROC9 ERC1, ERC2, ERC4, ERC6a, ERC6b, ERC7
Processes, tasks, activities covered	Industrial uses, including product transfers and associated laboratory activities within different closed or contained systems
Assessment method	ECETOC TRA 2.0 EUSES

2. Operational conditions and risk management measures

1.2.1 Contributing scenario controlling environmental exposure (ERC1)

Manufacture of substances	
ERC1	Manufacture of substances
Assessment method	EUSES

Product characteristics

Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	<= 100 %

Operational conditions

Amounts used	Annual site tonnage:	950000 t/yr
	Regional use tonnage:	6500000 t/yr
Frequency and duration of use	Emission Days (days/year)	330
Environmental factors not influenced by risk management	Flow rate of receiving water at least:	18000 m³/d
	Dilution of STP emissions at least:	10
Other given operational conditions affecting environmental exposure	Closed systems are used in order to prevent unintended emissions	

Risk Management Measures

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	Use appropriate abatement systems to ensure that the emission levels defined by local regulations are not exceeded. Soil emission controls are not applicable as there is no direct release to soil	
Organisation measures to prevent/limit release from site	Ensure operatives are trained to minimise releases	
Conditions and measures related to sewage treatment plant	Direct emissions to the municipal STP should not be made.	
Conditions and measures related to external treatment of waste for disposal	See section 13 of the SDS	

1.2.2 Contributing scenario controlling environmental exposure (ERC2)


Formulation of preparations	
ERC2	Formulation of preparations
Assessment method	EUSES

Product characteristics

Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	<= 100 %

Operational conditions

Amounts used	Annual site tonnage:	1000000 t/yr
	Regional use tonnage:	3800000 t/yr
Frequency and duration of use	Emission Days (days/year)	330
Environmental factors not influenced by risk management	Flow rate of receiving water at least:	18000 m³/d
	Dilution of STP emissions at least:	10
Other given operational conditions affecting environmental exposure	Closed systems are used in order to prevent unintended emissions	

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Risk Management Measures

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	Use appropriate abatement systems to ensure that the emission levels defined by local regulations are not exceeded.	
	Soil emission controls are not applicable as there is no direct release to soil	
Organisation measures to prevent/limit release from site	Ensure operatives are trained to minimise releases	
Conditions and measures related to sewage treatment plant	Direct emissions to the municipal STP should not be made.	
Conditions and measures related to external treatment of waste for disposal	See section 13 of the SDS	

1.2.3 Contributing scenario controlling environmental exposure (ERC4)

Industrial use of processing aids in processes and products, not becoming part of articles	
ERC4	Industrial use of processing aids in processes and products, not becoming part of articles

Product characteristics

Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	<= 100 %

Operational conditions

Amounts used	Annual site tonnage:	25000 t/yr
	Regional use tonnage:	354000 t/yr
Frequency and duration of use	Emission Days (days/year)	330
Environmental factors not influenced by risk management	Flow rate of receiving water at least:	18000 m³/d
	Dilution of STP emissions at least:	10
Other given operational conditions affecting environmental exposure	Closed systems are used in order to prevent unintended emissions	

Risk Management Measures

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	Use appropriate abatement systems to ensure that the emission levels defined by local regulations are not exceeded.	
	Soil emission controls are not applicable as there is no direct release to soil	
Organisation measures to prevent/limit release from site	Ensure operatives are trained to minimise releases	
Conditions and measures related to sewage treatment plant	Direct emissions to the municipal STP should not be made.	
Conditions and measures related to external treatment of waste for disposal	See section 13 of the SDS	

1.2.4 Contributing scenario controlling environmental exposure (ERC6a)

Industrial use resulting in manufacture of another substance (use of intermediates)	
ERC6a	Industrial use resulting in manufacture of another substance (use of intermediates)
Assessment method	EUSES

Product characteristics

Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	<= 100 %

Operational conditions

Amounts used	Annual site tonnage:	800000 t/yr
	Regional use tonnage:	3800000 t/yr
Frequency and duration of use	Emission Days (days/year)	330
Environmental factors not influenced by risk management	Flow rate of receiving water at least:	18000 m³/d
	Dilution of STP emissions at least:	10
Other given operational conditions affecting environmental exposure	Closed systems are used in order to prevent unintended emissions	

Risk Management Measures

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	Use appropriate abatement systems to ensure that the emission levels defined by local regulations are not exceeded.	
	Soil emission controls are not applicable as there is no direct release to soil	

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Organisation measures to prevent/limit release from site	Ensure operatives are trained to minimise releases	
Conditions and measures related to sewage treatment plant	Direct emissions to the municipal STP should not be made.	
Conditions and measures related to external treatment of waste for disposal	See section 13 of the SDS	

1.2.5 Contributing scenario controlling environmental exposure (ERC6b)

Industrial use of reactive processing aids	
ERC6b	Industrial use of reactive processing aids

Product characteristics

Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	<= 100 %

Operational conditions

Amounts used	Annual site tonnage:	25000 t/yr
	Regional use tonnage:	354000 t/yr
Frequency and duration of use	Emission Days (days/year)	330
Environmental factors not influenced by risk management	Flow rate of receiving water at least:	18000 m ³ /d
	Dilution of STP emissions at least:	10
Other given operational conditions affecting environmental exposure	Closed systems are used in order to prevent unintended emissions	

Risk Management Measures

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	Use appropriate abatement systems to ensure that the emission levels defined by local regulations are not exceeded.	
	Soil emission controls are not applicable as there is no direct release to soil	
Organisation measures to prevent/limit release from site	Ensure operatives are trained to minimise releases	
Conditions and measures related to sewage treatment plant	Direct emissions to the municipal STP should not be made.	
Conditions and measures related to external treatment of waste for disposal	See section 13 of the SDS	

1.2.6 Contributing scenario controlling environmental exposure (ERC7)

Industrial use of substances in closed systems	
ERC7	Industrial use of substances in closed systems

Product characteristics

Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	<= 100 %

Operational conditions

Amounts used	Annual site tonnage:	25000 t/yr
	Regional use tonnage:	354000 t/yr
Frequency and duration of use	Emission Days (days/year)	330
Environmental factors not influenced by risk management	Flow rate of receiving water at least:	18000 m ³ /d
	Dilution of STP emissions at least:	10
Other given operational conditions affecting environmental exposure	Closed systems are used in order to prevent unintended emissions	

Risk Management Measures

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	Use appropriate abatement systems to ensure that the emission levels defined by local regulations are not exceeded.	
	Soil emission controls are not applicable as there is no direct release to soil	
Organisation measures to prevent/limit release from site	Ensure operatives are trained to minimise releases	
Conditions and measures related to sewage treatment plant	Direct emissions to the municipal STP should not be made.	
Conditions and measures related to external treatment of waste for disposal	See section 13 of the SDS	

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1.2.7 Contributing scenario controlling worker exposure (PROC1)

Use in closed process, no likelihood of exposure

PROC1	Use in closed process, no likelihood of exposure
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Product characteristics

Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	<= 100 %

Operational conditions

Amounts used	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	Exposure duration	<= 8 h/day
	Covers frequency up to:	5 days/week
Other given operational conditions affecting workers exposure	Indoor or outdoor use	

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Handle product within a closed system	
	Apply a good standard of general or controlled ventilation when maintenance activities are carried out.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposure	
	Ensure supervision is in place to check that the RMMs are in place and are being used correctly and that the OCs are being followed	
Conditions and measures related to personal protection, hygiene and health evaluation	See section 8 of the SDS.	

1.2.8 Contributing scenario controlling worker exposure (PROC2)

Use in closed, continuous process with occasional controlled exposure

PROC2	Use in closed, continuous process with occasional controlled exposure
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Product characteristics


Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	<= 100 %

Operational conditions

Amounts used	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	Exposure duration	<= 8 h/day
	Covers frequency up to:	5 days/week
Other given operational conditions affecting workers exposure	Indoor or outdoor use	

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Handle product within a closed system	
	During indoor processes or in cases where natural ventilation is not sufficient, LEV should be in place at points where emissions could occur. Outdoor, LEV is not generally required.	
	Ensure samples are obtained under containment or extract ventilation.	
	Drain down and flush system prior to equipment break-in or maintenance.	
	Apply a good standard of general or controlled ventilation when maintenance activities are carried out.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposure	
	Ensure supervision is in place to check that the	

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

1.2.9 Contributing scenario controlling worker exposure (PROC3)

Use in closed batch process (synthesis or formulation)	
PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics

Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	<= 100 %

Operational conditions

Amounts used	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	Exposure duration	<= 8 h/day
	Covers frequency up to:	5 days/week
Other given operational conditions affecting workers exposure	Indoor or outdoor use	

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Handle product within a closed system	
	During indoor processes or in cases where natural ventilation is not sufficient, LEV should be in place at points where emissions could occur. Outdoor, LEV is not generally required.	
	Ensure samples are obtained under containment or extract ventilation.	
	Drain down and flush system prior to equipment break-in or maintenance.	
	Apply a good standard of general or controlled ventilation when maintenance activities are carried out.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposure	
	Ensure supervision is in place to check that the RMMs are in place and are being used correctly and that the OCs are being followed	
Conditions and measures related to personal protection, hygiene and health evaluation	Use suitable eye protection. Wear suitable face shield. Wear suitable coveralls to prevent exposure to the skin	Personal protection measures have to be applied in case of potential exposure only.
	Wear gloves providing a minimum efficiency of (%):	90
	Wear a respirator providing a minimum efficiency of (%):	95 Mandatory if activities take place outdoors or indoors with no local exhaust ventilation
	See section 8 of the SDS.	

1.2.10 Contributing scenario controlling worker exposure (PROC4)


Use in batch and other process (synthesis) where opportunity for exposure arises	
PROC4	Use in batch and other process (synthesis) where opportunity for exposure arises

Product characteristics

Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	<= 100 %

Operational conditions

Amounts used	The actual tonnage handled per shift is not considered to influence the exposure as such for this	
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	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	Exposure duration	<= 8 h/day
	Covers frequency up to:	5 days/week
Other given operational conditions affecting workers exposure	Indoor or outdoor use	

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Handle product within a closed system	
	During indoor processes or in cases where natural ventilation is not sufficient, LEV should be in place at points where emissions could occur. Outdoor, LEV is not generally required.	
	Ensure samples are obtained under containment or extract ventilation.	
	Drain down and flush system prior to equipment break-in or maintenance.	
	Apply a good standard of general or controlled ventilation when maintenance activities are carried out.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposure	
	Ensure supervision is in place to check that the RMMs are in place and are being used correctly and that the OCs are being followed	
Conditions and measures related to personal protection, hygiene and health evaluation	Use suitable eye protection. Wear suitable face shield. Wear suitable coveralls to prevent exposure to the skin	Personal protection measures have to be applied in case of potential exposure only.
	Wear gloves providing a minimum efficiency of (%):	90
	Wear a respirator providing a minimum efficiency of (%):	95 Mandatory if activities take place outdoors or indoors with no local exhaust ventilation
	See section 8 of the SDS.	

1.2.11 Contributing scenario controlling worker exposure (PROC8b)

Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities	
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Product characteristics


Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	<= 100 %

Operational conditions

Amounts used	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	Exposure duration	<= 8 h/day
	Covers frequency up to:	5 days/week
Other given operational conditions affecting workers exposure	Indoor or outdoor use	

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Handle product within a closed system	
	During indoor processes or in cases where natural ventilation is not sufficient, LEV should be in place at points where emissions could occur. Outdoor, LEV is not generally required.	
	Fill containers at dedicated fill points supplied with local extract ventilation.	
	Drain down and flush system prior to equipment break-in or maintenance.	
	Apply a good standard of general or controlled ventilation when maintenance activities are carried	

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	out.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposure	
	Ensure supervision is in place to check that the RMMs are in place and are being used correctly and that the OCs are being followed	
Conditions and measures related to personal protection, hygiene and health evaluation	Use suitable eye protection. Wear suitable face shield. Wear suitable coveralls to prevent exposure to the skin	Personal protection measures have to be applied in case of potential exposure only.
	Wear gloves providing a minimum efficiency of (%):	90
	Wear a respirator providing a minimum efficiency of (%):	95 Mandatory if activities take place outdoors or indoors with no local exhaust ventilation
	See section 8 of the SDS.	

1.2.12 Contributing scenario controlling worker exposure (PROC9)

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

Product characteristics

Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	<= 100 %

Operational conditions

Amounts used	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	Exposure duration	<= 8 h/day
	Covers frequency up to:	5 days/week
Other given operational conditions affecting workers exposure	Indoor or outdoor use	

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Handle product within a closed system	
	During indoor processes or in cases where natural ventilation is not sufficient, LEV should be in place at points where emissions could occur. Outdoor, LEV is not generally required.	
	Fill containers at dedicated fill points supplied with local extract ventilation.	
	Drain down and flush system prior to equipment break-in or maintenance.	
	Apply a good standard of general or controlled ventilation when maintenance activities are carried out.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposure	
	Ensure supervision is in place to check that the RMMs are in place and are being used correctly and that the OCs are being followed	
Conditions and measures related to personal protection, hygiene and health evaluation	Use suitable eye protection. Wear suitable face shield. Wear suitable coveralls to prevent exposure to the skin	Personal protection measures have to be applied in case of potential exposure only.
	Wear gloves providing a minimum efficiency of (%):	90
	Wear a respirator providing a minimum efficiency of (%):	95 Mandatory if activities take place outdoors or indoors with no local exhaust ventilation
	See section 8 of the SDS.	

3. Exposure estimation and reference to its source

3.1. Health

3.2. Environment

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



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4.1. Health


Guidance - Health

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

4.2. Environment

Guidance - Environment

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

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1. Exposure scenario EIGA002-2

Professional uses

ES Ref.: EIGA002-2 ES Type: Worker - EIGA Revision date: 01/07/2016

Use descriptors	SU22 PROC4, PROC8a ERC9a, ERC9b
Processes, tasks, activities covered	Professional uses, including transfer of product in non-industrial settings
Assessment method	ECETOC TRA 2.0

2. Operational conditions and risk management measures

1.2.1 Contributing scenario controlling environmental exposure (ERC9a, ERC9b)

Wide dispersive indoor use of substances in closed systems, Wide dispersive outdoor use of substances in closed systems	
ERC9a	Wide dispersive indoor use of substances in closed systems
ERC9b	Wide dispersive outdoor use of substances in closed systems

Product characteristics

Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	<= 100 %

Operational conditions

Amounts used	No additional information
Other given operational conditions affecting environmental exposure	Closed systems are used in order to prevent unintended emissions

Risk Management Measures

Organisation measures to prevent/limit release from site	Ensure operatives are trained to minimise exposure
Conditions and measures related to sewage treatment plant	No additional information
Conditions and measures related to external treatment of waste for disposal	See section 13 of the SDS

1.2.2 Contributing scenario controlling worker exposure (PROC4)

Use in batch and other process (synthesis) where opportunity for exposure arises	
PROC4	Use in batch and other process (synthesis) where opportunity for exposure arises

Product characteristics


Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	<= 100 %

Operational conditions

Amounts used	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	Exposure duration	<= 8 h/day
	Covers frequency up to:	5 days/week
Other given operational conditions affecting workers exposure	Indoor or outdoor use	

Risk Management Measures

Technical conditions and measures at process level (source) to prevent release	Handle product within a closed system
	During indoor processes or in cases where natural ventilation is not sufficient, LEV should be in place at points where emissions could occur. Outdoor, LEV is not generally required.
	Drain down and flush system prior to equipment break-in or maintenance.
	Apply a good standard of general or controlled

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	ventilation when maintenance activities are carried out.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposure	
	Ensure supervision is in place to check that the RMMs are in place and are being used correctly and that the OCs are being followed	
Conditions and measures related to personal protection, hygiene and health evaluation	Use suitable eye protection. Wear suitable face shield. Wear suitable coveralls to prevent exposure to the skin	Personal protection measures have to be applied in case of potential exposure only.
	Wear gloves providing a minimum efficiency of (%):	90
	Wear a respirator providing a minimum efficiency of	95 Mandatory if activities take place outdoors or indoors with no local exhaust ventilation
	See section 8 of the SDS.	

1.2.3 Contributing scenario controlling worker exposure (PROC8a)

Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities	
PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities

Product characteristics

Physical form of product	See section 9 of the SDS, No additional information
Concentration of substance in product	<= 100 %

Operational conditions

Amounts used	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	Exposure duration	<= 8 h/day
	Covers frequency up to:	5 days/week
Other given operational conditions affecting workers exposure	Indoor or outdoor use	

Risk Management Measures


Technical conditions and measures at process level (source) to prevent release	Handle product within a closed system	
	During indoor processes or in cases where natural ventilation is not sufficient, LEV should be in place at points where emissions could occur. Outdoor, LEV is not generally required.	
	Drain down and flush system prior to equipment break-in or maintenance.	
	Apply a good standard of general or controlled ventilation when maintenance activities are carried out.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposure	
	Ensure supervision is in place to check that the RMMs are in place and are being used correctly and that the OCs are being followed	
Conditions and measures related to personal protection, hygiene and health evaluation	Use suitable eye protection. Wear suitable face shield. Wear suitable coveralls to prevent exposure to the skin	Personal protection measures have to be applied in case of potential exposure only.
	Wear gloves providing a minimum efficiency of (%):	90
	Wear a respirator providing a minimum efficiency of	95 Mandatory if activities take place outdoors or indoors with no local exhaust ventilation
	See section 8 of the SDS.	

3. Exposure estimation and reference to its source

3.1. Health

3.2. Environment

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

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4.1. Health

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

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