Anhydrous Ammonia

SAFETY DATA SHEET

ACCORDING TO EC-REGULATIONS 1907/2006 (REACH) & 1272/2008 (CLP)
Revision 6, Aug 2021 (replaces Revision 5, July 2019)

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

1.1. Product identifier

Trade name	:	Anhydrous Ammonia
EC index no	:	007-001-00-5
EC no	:	231-635-3;231-634-3
CAS No	:	7664-41-7
UK REACH Registration No.		UK-01-9638925497-8-0001
EU REACH registration No	:	01-2119488876-14-0024
Other means of identification:		
Unique Formula Identifier (UFI):		N/A
Formula	:	NH_3
Synonyms	:	Ammonia gas / Ammonia, anhydrous / Anhydrous ammonia / Ammonia anhydrous / Gaseous ammonia / Anhydrous, ammonia / Ammonium / Free ammonia / Ammonia (anhydrous) / AMMONIA

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

1.2.1. Relevant identified uses

Title	Use descriptors
Formulation & (re)packing of substances and mixtures (ES Ref.: 1)	PROC1, PROC2, PROC3, PROC5, PROC8a, PROC8b, PROC9, PROC15, ERC2
Use as an intermediate (ES Ref.: 1)	SU1, SU5, SU8, SU9, SU12, SU24, PC19, PROC1, PROC2, PROC3, PROC4, PROC5, PROC8b, PROC9, PROC15, ERC6a
Industrial use of processing aids. (ES Ref.: 1)	SU4, SU5, SU6a, SU6b, SU8, SU9, SU11, SU12, SU13, SU15, SU16, SU23, SU24, PC1, PC9a, PC14, PC16, PC20, PC26, PC29, PC30, PC34, PC35, PC37, PC39, PROC1, PROC2, PROC3, PROC4, PROC5, PROC8b, PROC9, PROC13, ERC4, ERC5, ERC6b, ERC7
Professional use (ES Ref.: 4)	SU1, SU4, SU5, SU6a, SU6b, SU9, SU10, SU11, SU12, SU13, SU15, SU16, SU17, SU23, SU24, PC9a, PC12, PC14, PC15, PC16, PC19, PC20, PC21, PC26, PC29, PC30, PC34, PC35, PC37, PC39, PC40, PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC13, PROC15, PROC20, ERC8b, ERC8e, ERC9a, ERC9b
Consumer use *(ES ref: 5)*	*PC9a, PC35, PC39*

Full text of use descriptors: see section 16

1.2.2. Uses advised against

No additional information available

1.3. Details of the supplier of the safety data sheet

CF Fertilisers UK Limited Ince, Chester
CH2 4LB
United Kingdom
Tel: +44 (0) 151 357 2777
Fax: +44 (0) 151 357 1755
General email: info@cffertilisers.co.uk

Only Representative for EU REACH:

ERM GmbH
Siemensstrasse 9
63263 Neu-Isenburg
Germany

E: REACH-OR.de@erm.com

Reassuringly British

1.4. Emergency telephone number

Emergency number : +44 (0)1642 542824 (24 hours) (Liquids.sds@cffertilisers.co.uk)

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

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

Flammable gases, Category 2	H221
Gases under pressure : Compressed gas	H280
Acute toxicity (inhalation:gas) Category 3	H331
Skin corrosion/irritation Category 1B	H314
Hazardous to the aquatic environment — Aquatic Acute, Category 1	H400
Hazardous to the aquatic environment – Aquatic Chronic, Category 2	H411

Full text of H statements : see section 16

Adverse physicochemical, human health and environmental effects

No additional information available

2.2. Label elements

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

Hazard pictograms (CLP) :

GHS05 GHS06 GHS09 GHS04

Signal word (CLP) : Danger

Hazard statements (CLP) :
H221 - Flammable gas
H280 - Contains gas under pressure; may explode if heated
H314 - Causes severe skin burns and eye damage
H331 - Toxic if inhaled
H400 - Very toxic to aquatic life
H411 – Toxic to aquatic life with long lasting effects.

Precautionary statements (CLP) :
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking
P260 - Do not breathe dust/fume/gas/mist/vapours/spray
P264 - Wash hands, forearms and face thoroughly after handling
P271 - Use only outdoors or in a well-ventilated area
P273 - Avoid release to the environment
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P301 + P330 + P331 - IF SWALLOWED: rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310 - Immediately call a POISON CENTER or doctor/physician
P363 - Wash contaminated clothing before reuse.
P377 - Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381 - Eliminate all ignition sources if safe to do so.
P391 - Collect spillage.
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed.
P405 - Store locked up.
P410 + P403 - Protect from sunlight. Store in a well-ventilated place.
P501 - Dispose of contents/container to a licensed waste contractor.

2.3. Other hazards

No additional information available

SECTION 3: Composition/information on ingredients

3.1. Substance

Name	Product identifier	%	Classification according to Regulation (EC) No. 1272/2008 [CLP]
Anhydrous Ammonia	(CAS No) 7664-41-7 (EC no) 231-635-3;231-634-3 (EC index no) 007-001-00-5 (REACH-no) 01-2119488876-14-0024	100	Flam. Gas 2, H221 Compressed gas, H280 Acute Tox. 3 (Inhalation:gas), H331 Skin Corr. 1B, H314 Aquatic Acute 1, H400 Aquatic Chronic 2, H411

Full text of H-statements: see section 16

3.2. Mixture

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures after inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. Get immediate medical advice/attention.

First-aid measures after skin contact : Rinse with plenty of water. Do not remove clothing (since it may stick to the skin). Immediately call a POISON CENTER or doctor/physician.

First-aid measures after eye contact : In case of contact with eyes flush immediately with plenty of flowing water for 10 to 15 minutes holding eyelids apart and consult an ophthalmologist. Remove contact lenses, if present and easy to do. Continue rinsing.

First-aid measures after ingestion : Rinse mouth immediately and drink plenty of water. Do NOT induce vomiting.

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

Symptoms/injuries after inhalation : Vapours are irritating to the respiratory system. Corrosive to the respiratory tract. Coughing. Wheezing. May cause allergy or asthma symptoms or breathing difficulties if inhaled. Symptoms may be delayed.

Symptoms/injuries after skin contact : Can cause frostbite. Skin contact with hot material may result in severe burns.

Symptoms/injuries after eye contact : Contact with the product may cause cold burns or frostbite. Redness of the eye tissue.

Symptoms/injuries after ingestion : Burns or irritation of the linings of the mouth, throat, and gastrointestinal tract. Contact with the product may cause cold burns or frostbite.

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

Treat symptomatically. Treat as thermal burns. Symptoms of poisoning may develop several hours following exposure. Victim should be under medical observation for at least 48 hours after exposure.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Use extinguishing media appropriate for surrounding fire. Cool closed containers exposed to fire with water spray.

Unsuitable extinguishing media : None known.

5.2. Special hazards arising from the substance or mixture

Fire hazard : Flammable gas. Contains gas under pressure; may explode if heated.

Explosion hazard : Contains gas under pressure; may explode if heated.

Hazardous decomposition products in case of fire : Toxic fumes may be released. Nitrogen oxides.

5.3. Advice for firefighters

Firefighting instructions : In case of fire: Evacuate area. Fight fire remotely due to the risk of explosion. Spray from a distance to keep far away from any possible explosion. Use a water spray to cool exposed surfaces and to protect fire-fighters. Move undamaged containers from immediate hazard area if it can be done safely. If impossible to extinguish fire, protect surroundings and allow fire to burn out.

Protective equipment for firefighters : Wear suitable protective clothing, gloves and eye/face protection. In case of fire: Wear self-contained breathing apparatus. Only approved supplied air or self-contained breathing apparatus operated in positive pressure mode are satisfactory, if exposure can exceed the exposure limit value.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Protective equipment : Wear suitable protective clothing, gloves and eye/face protection. Use appropriate respiratory protection.

Emergency procedures : Do not walk through spilled material. Evacuate area. Avoid contact with skin, eyes and clothing. Provide adequate ventilation.

6.1.2. For emergency responders

Protective equipment : Wear protective gloves/protective clothing/eye protection/face protection. In case of fire: Wear self-contained breathing apparatus.

Emergency procedures : Evacuate area. Isolate the spill and ventilate the spill area. Do not add water to product. In case of large spillages, alert occupants in downwind areas.

6.2. Environmental precautions

Avoid release to the environment. Notify authorities if liquid enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

For containment : Contain any spills with dykes or absorbents to prevent migration and entry into sewers or streams.

Methods for cleaning up : Collect spillage. Dispose of this material and its container to hazardous or special waste collection point.

6.4. Reference to other sections

No additional information available

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Additional hazards when processed : Flammable gas. Contains gas under pressure; may explode if heated.

Precautions for safe handling : Avoid breathing dust/fume/gas/mist/vapours/spray. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose containers to flames, sparks, heat, or other potential ignition sources. Use product in a well-ventilated area only. In case of insufficient ventilation, wear suitable respiratory equipment. Handle empty containers with care because residual vapours are flammable. Empty container retains product residue.

Hygiene measures : Handle in accordance with good industrial hygiene and safety practices. Take care for general good hygiene and housekeeping. Do not eat, drink or smoke when using this product. Wash contaminated clothing before reuse. Contaminated work clothing should not be allowed out of the workplace. Wash hands before breaks and after work.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures : Use only explosion-proof equipment.

Storage conditions : Store in a well-ventilated place. Keep cool. Protect from sunlight. Store locked up.

Incompatible products : Reacts violently with (some) halogens. Strong acids.

Incompatible materials : Copper alloys. Silver. Mercury. Zinc and its alloys.

Heat and ignition sources : Keep away from open flames, hot surfaces and sources of ignition. Do not smoke while handling product.

Storage area : Ensure adequate ventilation of the storage area.

7.3. Specific end use(s)

No additional information available

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Anhydrous Ammonia (7664-41-7)		
EU	Local name	Ammonia, anhydrous
EU	IOELV TWA (mg/m³)	14 mg/m³
EU	IOELV TWA (ppm)	20 ppm
EU	IOELV STEL (mg/m³)	36 mg/m³
EU	IOELV STEL (ppm)	50 ppm
United Kingdom	Local name	Ammonia, anhydrous
United Kingdom	WEL TWA (mg/m³)	18 mg/m³
United Kingdom	WEL TWA (ppm)	25 ppm
United Kingdom	WEL STEL (mg/m³)	25 mg/m³

Anhydrous Ammonia (7664-41-7)		
United Kingdom	WEL STEL (ppm)	35 ppm

Anhydrous Ammonia (7664-41-7)	
DNEL/DMEL (Workers)	
Acute - systemic effects, dermal	6.8 mg/kg bodyweight/day
Acute - systemic effects, inhalation	47.6 mg/m³
Acute - local effects, inhalation	36 mg/m³
Long-term - systemic effects, dermal	6.8 mg/kg bodyweight/day
Long-term - systemic effects, inhalation	47.6 mg/m³
Long-term - local effects, inhalation	14 mg/m³
PNEC (Water)	
PNEC aqua (freshwater)	0.001 mg/l
PNEC aqua (marine water)	0.001 mg/l
PNEC aqua (intermittent, freshwater)	0.089 mg/l
PNEC aqua (intermittent, marine water)	0.089 mg/l

8.2. Exposure controls

Appropriate engineering controls : Local exhaust ventilation is recommended to maintain vapor level below the threshold limit value (TLV).

Personal protective equipment : Protective goggles. Gloves. High gas/vapour concentration: gas mask with filter type K.

Materials for protective clothing : Wear protective clothing tested to EN 14605.

Hand protection : Wear suitable gloves tested to EN374. Breakthrough time : > 8 h. neoprene/butyl rubber. Viton. Polytetrafluoroethylene (PTFE)

Eye protection : Wear eye protection/face protection. EN 136

Respiratory protection : Type K - Ammonia and amines. Wear appropriate mask. In confined space use self-contained breathing apparatus. EN 141. EN 405

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state : Gas

Appearance : Colorless gas. Liquid under pressure.

Colour : Colourless.

Odour and Odour threshold : pungent. 5 ppm

:

pH : > 12 (conc 100% v/v)

Relative evaporation rate (butyl acetate=1) : No data available

Melting point : -78 °C @ 1013 hPa

Freezing point : No data available

Boiling point : -33 °C @ 1013 hPa
(Handbook of Compressed Gases and CRC Handbook, 2006)

Flash point : The endpoint is not applicable as the substance is an inorganic gas. Aqueous solutions of ammonia does not show any flash point.

Critical temperature : @ 1013hPa

Auto-ignition temperature : 651.1
(Fire Protection Guide).

Decomposition temperature : 450 °C

Flammability (solid, liquid, gas) : Flammable gas. Explosion limits: 16% to 25%
(Anhydrous ammonia is listed on Annex I of Directive 67/548/EEC with classification as (R10) 'Flammable'.)

Vapour pressure : 861 hPa @ 20 °C
(Handbook of Compressed Gases; Lange's Handbook of Chemistry)

Relative vapour density at 20 °C	:	0.6 (Air=1)
Relative density	:	The substance is a gas at room temperature: this endpoint is not relevant.
Density	:	0.682 g/cm³ (at -33 °C)
Solubility	:	Water: 510 - 531 g/l @ 20 °C (Merck Index)
Partition coefficient n-octanol/water (Log Pow)	:	0.23
Viscosity, kinematic	:	The substance is a gas at room temperature: this endpoint is not relevant.
Viscosity, dynamic	:	0.22 mPa.s
Explosive properties	:	Anhydrous ammonia is not predicted to be explosive based on a theoretical assessment of its chemical structure.
Oxidising properties	:	Not oxidising.
Explosive limits	:	Anhydrous ammonia is not predicted to be explosive based on a theoretical assessment of its chemical structure.
Particle characteristics		Not applicable

9.2. Other information

9.2.1	**Information with Regard to Physical Hazard Classes**	Nothing to report.
9.2.2	**Other Safety Characteristics.**	None to report.

SECTION 10: Stability and reactivity

10.1. Reactivity

Stable under normal conditions of use. Reacts violently with (some) halogens. Reacts with : acids.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

No dangerous reactions known under normal conditions of use. Product will not undergo polymerization.

10.4. Conditions to avoid

Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose containers to flames, sparks, heat, or other potential ignition sources.

10.5. Incompatible materials

May be corrosive to metals. Copper and its alloys. Zinc and its alloys. Silver. Mercury.

10.6. Hazardous decomposition products

Nitrogen oxides (NOx). Nitrogen. Hydrogen. When exposed to high temperatures may produce hazardous decomposition products.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Inhalation:gas: Toxic if inhaled.

Anhydrous Ammonia (7664-41-7)	
LC50 inhalation rat (mg/l)	7.939 mg/l 1h

Skin corrosion/irritation	:	Causes severe skin burns and eye damage. pH: > 12 (conc 100% v/v)
Serious eye damage/irritation	:	Serious eye damage, category 1, implicit pH: > 12 (conc 100% v/v)
Respiratory or skin sensitisation	:	Not classified
Germ cell mutagenicity	:	Not classified
Carcinogenicity	:	Not classified
Reproductive toxicity	:	Not classified
Specific target organ toxicity (single exposure)	:	Not classified
Specific target organ toxicity (repeated exposure)	:	Not classified

Anhydrous Ammonia (7664-41-7)	
NOAEL (subacute, oral, animal/male, 28 days)	408 mg/kg bodyweight OECD 422

Aspiration hazard : Not classified

Anhydrous Ammonia (7664-41-7)	
Viscosity, kinematic	0.32258065 mm²/s

11.1. Other information

11.2.1 Endocrine disrupting properties The product does not have endocrine disrupting properties

11.2.2 Information on other hazards None to report.

SECTION 12: Ecological information

12.1. Toxicity

Anhydrous Ammonia (7664-41-7)	
LC50 fish 1	0.89 mg/l (Exposure time: 96 h)
EC50 Daphnia 1	101 mg/l (Exposure time: 48 h)
NOEC chronic fish	< 0.048 mg/l (31 days)
NOEC chronic crustacea	0.79 mg/l (Daphian magha - 96h)

12.2. Persistence and degradability

Anhydrous Ammonia (7664-41-7)	
Persistence and degradability	not applicable.

12.3. Bioaccumulative potential

Anhydrous Ammonia (7664-41-7)	
Log Pow	0.23

12.4. Mobility in soil

No additional information available

12.5. Results of PBT and vPvB assessment

No additional information available

12.6. Endocrine disruption properties

The substance does not have endocrine disrupting properties

12.7. Other adverse effects

No additional information available

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Regional legislation (waste) : Disposal must be done according to official regulations. Dispose of at authorized waste collection point.

Waste disposal recommendations : Avoid release to the environment. Dispose of this material and its container at hazardous or special waste collection point. Content under pressure. Do not crush, puncture or incinerate.

SECTION 14: Transport information

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

14.1. UN number

UN-No. (All Modes) : 1005

14.2. UN proper shipping name

Proper Shipping Name (All modes) : AMMONIA ANHYDROUS

14.3. Transport hazard class(es)

All modes

Transport hazard class(es) : 2.3

Danger labels : 2.3

:

14.4. Packing group

Packing group : Not applicable

14.5. Environmental hazards

Dangerous for the environment : Yes

Marine pollutant : Yes

Other information : No supplementary information available

14.6. Special precautions for user

- Overland transport

Classification code (ADR) : 2TC

Special provisions (ADR) : 23

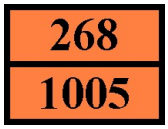
Limited quantities (ADR) : 0

Excepted quantities (ADR) : E0

Transport category (ADR) : 1

Hazard identification number (Kemler No.) : 268

Orange plates :



Tunnel restriction code (ADR) : C/D

EAC code : 2XE

- Transport by sea

Limited quantities (IMDG) : 0

Excepted quantities (IMDG) : E0

EmS-No. (Fire) : F-C

EmS-No. (Spillage) : S-U

Stowage category (IMDG) : D

- Air transport

PCA Excepted quantities (IATA) : E0

PCA Limited quantities (IATA) : Forbidden

PCA packing instructions (IATA) : Forbidden

CAO packing instructions (IATA) : Forbidden

Special provisions (IATA) : A2

- Inland waterway transport

Classification code (ADN) : 2TC

Special provisions (ADN) : 23

Limited quantities (ADN) : 0

Excepted quantities (ADN) : E0

- Rail transport

Classification code (RID) : 2TC

Special provision (RID) : 23

Limited quantities (RID) : 0

Excepted quantities (RID) : E0

14.7. Maritime transport in bulk according to IMO instruments

Not applicable

SECTION 15: Regulatory information

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

15.1.1. EU-Regulations

No REACH Annex XVII restrictions

Anhydrous Ammonia is not on the REACH Candidate List

15.1.2. National regulations

Listed on the AICS (Australian Inventory of Chemical Substances)
Listed on the Canadian DSL (Domestic Substances List)
Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China)
Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)
Listed on the Japanese ENCS (Existing & New Chemical Substances) inventory
Listed on the Korean ECL (Existing Chemicals List)
Listed on NZIoC (New Zealand Inventory of Chemicals)
Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances)
Listed on the United States TSCA (Toxic Substances Control Act) inventory
Japanese Poisonous and Deleterious Substances Control Law
Listed on the United States SARA Section 302
Subject to reporting requirements of United States SARA Section 313
Listed on the Canadian IDL (Ingredient Disclosure List)
Listed on INSQ (Mexican national Inventory of Chemical Substances)
Listed on CICR (Turkish Inventory and Control of Chemicals)

15.2. Chemical safety assessment

For this substance a chemical safety assessment has been carried out
see attached exposure scenario

SECTION 16: Other information

Additional Change Information: None.

Abbreviations and acronyms:

CAS	Chemical Abstracts Service
CLP	Classification, Labelling and Packaging
CSR	Chemical Safety Report
EC	European Community
PBT	Persistent, Bioaccumulative and Toxic substance
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals

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
Compressed gas	Gases under pressure : Compressed gas
Flam. Gas 2	Flammable gases, Category 2
Skin Corr. 1B	Skin corrosion/irritation Category 1B
H221	Flammable gas
H280	Contains gas under pressure; may explode if heated
H314	Causes severe skin burns and eye damage
H331	Toxic if inhaled
H400	Very toxic to aquatic life
H411	Toxic to aquatic life with longlasting effects
ERC2	Formulation of preparations
ERC4	Industrial use of processing aids in processes and products, not becoming part of articles
ERC5	Industrial use resulting in inclusion into or onto a matrix
ERC6a	Industrial use resulting in manufacture of another substance (use of intermediates)
ERC6b	Industrial use of reactive processing aids
ERC7	Industrial use of substances in closed systems
ERC8b	Wide dispersive indoor use of reactive substances in open systems
ERC8e	Wide dispersive outdoor use of reactive substances in open systems
ERC9a	Wide dispersive indoor use of substances in closed systems
ERC9b	Wide dispersive outdoor use of substances in closed systems
PC1	Adhesives, sealants
PC12	Fertilizers
PC14	Metal surface treatment products, including galvanic and electroplating products
PC15	Non-metal-surface treatment products
PC16	Heat Transfer Fluids

PC19	Intermediate
PC20	Products such as ph-regulators, flocculants, precipitants, neutralization agents
PC21	Laboratory chemicals
PC26	Paper and Board dye, finishing and impregnation products: including bleaches and other processing aids
PC29	Pharmaceuticals
PC30	Photochemicals
PC34	Textile dyes, finishing and impregnating products; including bleaches and other processing aids
PC35	Washing and cleaning products (including solvent based products)
PC37	Water treatment chemicals
PC39	Cosmetics, personal care products
PC40	Extraction agents
PC9a	Coatings and paints, thinners, paint removers
PROC1	Use in closed process, no likelihood of exposure
PROC13	Treatment of articles by dipping and pouring
PROC15	Use as laboratory reagent
PROC2	Use in closed, continuous process with occasional controlled exposure
PROC20	Heat and pressure transfer fluids in dispersive use but closed systems
PROC3	Use in closed batch process (synthesis or formulation)
PROC4	Use in batch and other process (synthesis) where opportunity for exposure arises
PROC5	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)
PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
PROC9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
SU1	Agriculture, forestry, fishery
SU10	Formulation [mixing] of preparations and/or re-packaging (excluding alloys)
SU11	Manufacture of rubber products
SU12	Manufacture of plastics products, including compounding and conversion
SU13	Manufacture of other non-metallic mineral products, e.g. plasters, cement
SU15	Manufacture of fabricated metal products, except machinery and equipment
SU16	Manufacture of computer, electronic and optical products, electrical equipment
SU17	General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment
SU23	Electricity, steam, gas water supply and sewage treatment
SU24	Scientific research and development
SU4	Manufacture of food products
SU5	Manufacture of textiles, leather, fur
SU6a	Manufacture of wood and wood products
SU6b	Manufacture of pulp, paper and paper products
SU8	Manufacture of bulk, large scale chemicals (including petroleum products)
SU9	Manufacture of fine chemicals

Annex to the Safety Data Sheet

Product exposure scenario(s)	
ES Type	**ES title**
Worker	Formulation & (re)packing of substances and mixtures
Worker	Use as an intermediate
Worker	Industrial use of reactive processing aids
Worker	Professional use

1. Exposure scenario 1

Formulation & (re)packing of substances and mixtures

ES Ref.: 1 ES Type: Worker	

Use descriptors	PROC1, PROC2, PROC3, PROC5, PROC8a, PROC8b, PROC9, PROC15 ERC2
Processes, tasks, activities covered	Formulation [mixing] of preparations and/or re-packaging Distribution of substance Industrial use

2. Operational conditions and risk management measures

2.2 Contributing scenario controlling environmental exposure (ERC2)

ERC2	Formulation of preparations

Product characteristics		
Concentration of substance in product	<= 100 %	
Operational conditions		
Amounts used	Annual site tonnage (tons/year):	1000000
Frequency and duration of use	Emission days (days/year):	330
Environmental factors not influenced by risk management	Local freshwater dilution factor:	10
Environmental factors not influenced by risk management	Local marine water dilution factor:	10
Environmental factors not influenced by risk management	Receiving surface water flow (m³/day):	20000 m³/d
Other given operational conditions affecting environmental exposure	Release fraction to air from process (initial release prior to RMM):	2.5 %
Other given operational conditions affecting environmental exposure	Release fraction to wastewater from process (initial release prior to RMM):	2 %
Risk management measures		
Conditions and measures related to municipal sewage treatment plant	Estimated substance removal from wastewater via on-site sewage treatment (%):	99.9 %

2.1.1 Contributing scenario controlling worker exposure (PROC1)

PROC1	Use in closed process, no likelihood of exposure

Product characteristics		
Concentration of substance in product	<= 100 %	
Operational conditions		
Amounts used	Maximum daily site tonnage (kg/day):	3000000 kg
Frequency and duration of use	Avoid carrying out operation for more than 4 hours,Covers daily exposures up to 8 hours (unless stated differently)	
Other given operational conditions affecting workers exposure	Indoor	

Risk management measures		
Technical conditions and measures to control dispersion from source towards the worker	No specific measures identified	

2.1.2 Contributing scenario controlling worker exposure (PROC2)

PROC2	Use in closed, continuous process with occasional controlled exposure	
Product characteristics		
Concentration of substance in product	<= 100 %	
Operational conditions		
Amounts used	Maximum daily site tonnage (kg/day):	3000000 kg
Frequency and duration of use	Avoid carrying out operation for more than 4 hours,Covers daily exposures up to 8 hours (unless stated differently)	
Other given operational conditions affecting workers exposure	Indoor	
Risk management measures		
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation - efficiency of at least [%]:	90
Conditions and measures related to personal protection, hygiene and health evaluation	In case of inadequate ventilation wear respiratory protection	(efficacy 95%)

2.1.3 Contributing scenario controlling worker exposure (PROC3)

PROC3	Use in closed batch process (synthesis or formulation)	
Product characteristics		
Concentration of substance in product	<= 100 %	
Operational conditions		
Amounts used	Maximum daily site tonnage (kg/day):	3000000 kg
Frequency and duration of use	Avoid carrying out operation for more than 4 hours,Covers daily exposures up to 8 hours (unless stated differently)	
Other given operational conditions affecting workers exposure	Indoor	
Risk management measures		
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation - efficiency of at least [%]:	90
Conditions and measures related to personal protection, hygiene and health evaluation	In case of inadequate ventilation wear respiratory protection	(efficacy 95%)

2.1.4 Contributing scenario controlling worker exposure (PROC8b)

PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities	
Product characteristics		
Concentration of substance in product	<= 100 %	
Operational conditions		
Amounts used	Maximum daily site tonnage (kg/day):	3000000 kg
Frequency and duration of use	Avoid carrying out operation for more than 4 hours,Covers daily exposures up to 8 hours (unless stated differently)	
Other given operational conditions affecting workers exposure	Indoor	
Risk management measures		
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation - efficiency of at least [%]:	90
Conditions and measures related to personal protection, hygiene and health evaluation	In case of inadequate ventilation wear respiratory protection	(efficacy 95%)

2.1.5 Contributing scenario controlling worker exposure (PROC15)

PROC15	Use as laboratory reagent
Product characteristics	
Concentration of substance in product	<= 100 %

Operational conditions		
Amounts used	Maximum daily site tonnage (kg/day):	3000000 kg
Frequency and duration of use	Avoid carrying out operation for more than 4 hours,Covers daily exposures up to 8 hours (unless stated differently)	
Other given operational conditions affecting workers exposure	Indoor	
Risk management measures		
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation - efficiency of at least [%]:	90
Conditions and measures related to personal protection, hygiene and health evaluation	In case of inadequate ventilation wear respiratory protection	(efficacy 95%)

2.1.6 Contributing scenario controlling worker exposure (PROC5)

PROC5	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)

Product characteristics		
Concentration of substance in product	<= 100 %	
Operational conditions		
Amounts used	Maximum daily site tonnage (kg/day):	3000000 kg
Frequency and duration of use	Avoid carrying out operation for more than 4 hours	
Other given operational conditions affecting workers exposure	Indoor	
Risk management measures		
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation - efficiency of at least [%]:	90
Conditions and measures related to personal protection, hygiene and health evaluation	In case of inadequate ventilation wear respiratory protection	(efficacy 95%)

2.1.7 Contributing scenario controlling worker exposure (PROC8a)

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

Product characteristics		
Concentration of substance in product	<= 100 %	
Operational conditions		
Amounts used	Maximum daily site tonnage (kg/day):	3000000 kg
Frequency and duration of use	Avoid carrying out operation for more than 4 hours,Covers daily exposures up to 8 hours (unless stated differently)	
Other given operational conditions affecting workers exposure	Indoor	
Risk management measures		
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation - efficiency of at least [%]:	90
Conditions and measures related to personal protection, hygiene and health evaluation	In case of inadequate ventilation wear respiratory protection	(efficacy 95%)

2.1.8 Contributing scenario controlling worker exposure (PROC9)

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

Product characteristics		
Concentration of substance in product	<= 100 %	
Operational conditions		
Amounts used	Maximum daily site tonnage (kg/day):	3000000 kg
Frequency and duration of use	Avoid carrying out operation for more than 4 hours,Covers daily exposures up to 8 hours (unless stated differently)	
Other given operational conditions affecting workers exposure	Indoor	

Risk management measures		
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation - efficiency of at least [%]:	90
Conditions and measures related to personal protection, hygiene and health evaluation	In case of inadequate ventilation wear respiratory protection	(efficacy 95%)

3. Exposure estimation and reference to its source

3.1. Health

Long-term - systemic effects						
DNEL	Inhalation.: 47.6 mg/m³ Dermal: 6.8 mg/kg bodyweight/day					
Contributing scenario	inhalation exposure mg/m³	RCR	Dermal exposure mg/kg bodyweight/day	RCR	Sum RCR	Assessment method
PROC1	0.01	0.000	0.05	0.007	0.007	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC2	0.07	0.001	0.02	0.003	0.004	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC3	0.15	0.003	0.01	0.001	0.004	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC8b	0.07	0.001	0.1	0.015	0.016	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC15	0.04	0.001	0.01	0.001	0.002	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC5	0.22	0.005	0.01	0.001	0.006	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC8a	0.22	0.005	0.02	0.003	0.008	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC9	0.18	0.004	0.1	0.015	0.019	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model

Acute - systemic effects						
DNEL	Inhalation.: 47.6 mg/m³ Dermal: 6.8 mg/kg bodyweight/day					
Contributing scenario	inhalation exposure mg/m³	RCR	Dermal exposure mg/kg bodyweight/day	RCR	Sum RCR	Assessment method
PROC1	0.01	0.000	0.05	0.007	0.007	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC2	0.07	0.001	0.02	0.003	0.004	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC3	0.07	0.001	0.01	0.001	0.002	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC8b	0.07	0.001	0.02	0.003	0.004	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC15	0.04	0.001	0.01	0.001	0.002	Inhalation.: Used ECETOC TRA model

						Dermal: Used ECETOC TRA model
PROC5	0.22	0.005	0.01	0.001	0.006	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC8a	0.22	0.005	0.02	0.003	0.008	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC9	0.18	0.004	0.1	0.015	0.019	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model

Local - Inhalation.					
DNEL	Acute: 36 mg/m³ Long-term: 14 mg/m³				
Contributing scenario	Acute mg/m³	RCR	Long term mg/m³	RCR	Assessment method
PROC1	0.01	0.000	0.01	0.001	Acute: Used ECETOC TRA model Long term: Used ECETOC TRA model
PROC2	0.1	0.003	0.25	0.018	Acute: Used ECETOC TRA model Long term: Used ECETOC TRA model
PROC3	0.1	0.003	0.25	0.018	Acute: Used ECETOC TRA model Long term: Used ECETOC TRA model
PROC8b	0.09	0.003	0.23	0.016	Acute: Used ECETOC TRA model Long term: Used ECETOC TRA model
PROC15	0.06	0.002	0.15	0.011	Acute: Used ECETOC TRA model Long term: Used ECETOC TRA model
PROC5	0.3	0.008	0.04	0.003	Acute: Used ECETOC TRA model Long term: Used ECETOC TRA model
PROC8a	0.3	0.008	0.76	0.054	Acute: Used ECETOC TRA model Long term: Used ECETOC TRA model
PROC9	0.24	0.007	0.61	0.044	Acute: Used ECETOC TRA model Long term: Used ECETOC TRA model

3.2. Environment

environmental exposure	Unit	Exposure Estimation	PNEC	RCR	Assessment method
freshwater	mg/l	0.0013	0.001	1.3	Used EUSES model
marine water	mg/l	0.000314	0.001	0.314	Used EUSES model

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

4.1. Health

Guidance - Health	Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated

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. Used EUSES model

1. Exposure scenario 2

Use as an intermediate

ES Ref.: 2 ES Type: Worker	

Use descriptors	SU1, SU5, SU8, SU9, SU12, SU24 PROC1, PROC2, PROC3, PROC4, PROC5, PROC8b, PROC9, PROC15 PC19 ERC6a
Processes, tasks, activities covered	Use as an intermediate within closed or contained systems (not related to Strictly Controlled Conditions). Includes incidental exposures during recycling/ recovery, material transfers, storage, sampling, associated laboratory activities, maintenance and loading (ncluding marine vessel/barge, road/rail car and bulk container) Industrial use

2. Operational conditions and risk management measures

2.2 Contributing scenario controlling environmental exposure (ERC6a)

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

Product characteristics		
Concentration of substance in product	<= 100 %	
Operational conditions		
Amounts used	Annual site tonnage (tons/year):	800000
Frequency and duration of use	Emission days (days/year):	330
Environmental factors not influenced by risk management	Local freshwater dilution factor:	10
Environmental factors not influenced by risk management	Local marine water dilution factor:	10
Environmental factors not influenced by risk management	Receiving surface water flow (m³/day):	20000 m³/d
Other given operational conditions affecting environmental exposure	Release fraction to air from process (initial release prior to RMM):	5 %
Other given operational conditions affecting environmental exposure	Release fraction to wastewater from process (initial release prior to RMM):	2 %
Risk management measures		
Conditions and measures related to municipal sewage treatment plant	Estimated substance removal from wastewater via on-site sewage treatment (%):	99.9 %

2.1.1 Contributing scenario controlling worker exposure (PROC1)

PROC1	Use in closed process, no likelihood of exposure

Product characteristics		
Concentration of substance in product	<= 100 %	
Operational conditions		
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently)	
Other given operational conditions affecting workers exposure	Indoor	
Risk management measures		
Technical conditions and measures to control dispersion from source towards the worker	No specific measures identified	

2.1.2 Contributing scenario controlling worker exposure (PROC2)

PROC2	Use in closed, continuous process with occasional controlled exposure

Product characteristics		
Concentration of substance in product	<= 100 %	
Operational conditions		
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently)	
Other given operational conditions affecting workers exposure	Indoor	

Risk management measures		
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation - efficiency of at least [%]:	90
Conditions and measures related to personal protection, hygiene and health evaluation	In case of inadequate ventilation wear respiratory protection	(efficacy 95%)

2.1.3 Contributing scenario controlling worker exposure (PROC3)

PROC3	Use in closed batch process (synthesis or formulation)	
Product characteristics		
Concentration of substance in product	<= 100 %	
Operational conditions		
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently)	
Other given operational conditions affecting workers exposure	Indoor	
Risk management measures		
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation - efficiency of at least [%]:	90
Conditions and measures related to personal protection, hygiene and health evaluation	In case of inadequate ventilation wear respiratory protection	(efficacy 95%)

2.1.4 Contributing scenario controlling worker exposure (PROC4)

PROC4	Use in batch and other process (synthesis) where opportunity for exposure arises	
Product characteristics		
Concentration of substance in product	<= 100 %	
Operational conditions		
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently)	
Other given operational conditions affecting workers exposure	Indoor	
Risk management measures		
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation - efficiency of at least [%]:	90
Conditions and measures related to personal protection, hygiene and health evaluation	In case of inadequate ventilation wear respiratory protection	(efficacy 95%)

2.1.5 Contributing scenario controlling worker exposure (PROC8b)

PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities	
Product characteristics		
Concentration of substance in product	<= 100 %	
Operational conditions		
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently)	
Other given operational conditions affecting workers exposure	Indoor	
Risk management measures		
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation - efficiency of at least [%]:	90
Conditions and measures related to personal protection, hygiene and health evaluation	In case of inadequate ventilation wear respiratory protection	(efficacy 95%)

2.1.6 Contributing scenario controlling worker exposure (PROC15)

PROC15	Use as laboratory reagent
Product characteristics	
Concentration of substance in product	<= 100 %

Operational conditions		
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently)	
Other given operational conditions affecting workers exposure	Indoor	
Risk management measures		
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation - efficiency of at least [%]:	90
Conditions and measures related to personal protection, hygiene and health evaluation	In case of inadequate ventilation wear respiratory protection	(efficacy 95%)

2.1.7 Contributing scenario controlling worker exposure (PROC5)

PROC5	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)

Product characteristics		
Concentration of substance in product	<= 100 %	
Operational conditions		
Frequency and duration of use	Avoid carrying out operation for more than 4 hours	
Other given operational conditions affecting workers exposure	Indoor	
Risk management measures		
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation - efficiency of at least [%]:	90
Conditions and measures related to personal protection, hygiene and health evaluation	In case of inadequate ventilation wear respiratory protection	(efficacy 95%)

2.1.8 Contributing scenario controlling worker exposure (PROC9)

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

Product characteristics		
Concentration of substance in product	<= 100 %	
Operational conditions		
Frequency and duration of use	Avoid carrying out operation for more than 4 hours	
Other given operational conditions affecting workers exposure	Indoor	
Risk management measures		
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation - efficiency of at least [%]:	90
Conditions and measures related to personal protection, hygiene and health evaluation	In case of inadequate ventilation wear respiratory protection	(efficacy 95%)

3. Exposure estimation and reference to its source

3.1. Health

Long-term - systemic effects						
DNEL	Inhalation.: 47.6 mg/m³ Dermal: 6.8 mg/kg bodyweight/day					
Contributing scenario	inhalation exposure mg/m³	RCR	Dermal exposure mg/kg bodyweight/day	RCR	Sum RCR	Assessment method
PROC1	0.01	0.000	0.05	0.007	0.007	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC2	0.07	0.001	1.37	0.201	0.202	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC3	0.15	0.003	0.01	0.001	0.004	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC4	0.15	0.003	0.1	0.015	0.018	Inhalation.: Used ECETOC TRA model

						Dermal: Used ECETOC TRA model
PROC8b	0.07	0.001	0.1	0.015	0.016	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC15	0.04	0.001	0.01	0.001	0.002	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC5	0.37	0.008	0.01	0.001	0.009	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC9	0.3	0.006	0.1	0.015	0.021	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model

Acute - systemic effects						
DNEL	Inhalation.: 47.6 mg/m³ Dermal: 6.8 mg/kg bodyweight/day					
Contributing scenario	inhalation exposure mg/m³	RCR	Dermal exposure mg/kg bodyweight/day	RCR	Sum RCR	Assessment method
PROC1	0.01	0.000	0.05	0.007	0.007	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC2	0.07	0.001	1.37	0.201	0.202	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC3	0.15	0.003	0.01	0.001	0.004	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC4	0.15	0.003	0.1	0.015	0.018	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC8b	0.07	0.001	0.01	0.001	0.002	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC15	0.04	0.001	0.01	0.001	0.002	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC5	0.37	0.008	0.01	0.001	0.009	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC9	0.3	0.006	0.1	0.015	0.021	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model

Local - Inhalation.					
DNEL	Acute: 36 mg/m³ Long-term: 14 mg/m³				
Contributing scenario	Acute mg/m³	RCR	Long term mg/m³	RCR	Assessment method
PROC1	0.01	0.000	0.01	0.001	Acute: Used ECETOC TRA model Long term: Used ECETOC TRA model
PROC2	0.1	0.003	0.25	0.018	Acute: Used ECETOC TRA model Long term: Used ECETOC TRA model
PROC3	0.2	0.006	0.5	0.036	Acute: Used ECETOC TRA model Long term: Used ECETOC TRA model
PROC4	0.2	0.006	0.5	0.036	Acute: Used ECETOC TRA model Long term: Used ECETOC TRA model

PROC8b	0.09	0.003	0.23	0.016	Acute: Used ECETOC TRA model Long term: Used ECETOC TRA model
PROC15	0.06	0.002	0.1	0.007	Acute: Used ECETOC TRA model Long term: Used ECETOC TRA model
PROC5	0.49	0.014	0.06	0.004	Acute: Used ECETOC TRA model Long term: Used ECETOC TRA model
PROC9	0.39	0.011	0.05	0.004	Acute: Used ECETOC TRA model Long term: Used ECETOC TRA model

3.2. Environment

environmental exposure	Unit	Exposure Estimation	PNEC	RCR	Assessment method
freshwater	mg/l	0.00219	0.001	2.19	Used EUSES model
marine water	mg/l	0.000537	0.001	0.537	Used EUSES model

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

4.1. Health

Guidance - Health	Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated

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. Used EUSES model

1. Exposure scenario 3

Industrial use of reactive processing aids

ES Ref.: 3 ES Type: Worker	

Use descriptors	SU4, SU5, SU6a, SU6b, SU8, SU9, SU11, SU12, SU13, SU15, SU16, SU23, SU24 PROC1, PROC2, PROC3, PROC4, PROC5, PROC8b, PROC9, PROC13 PC1, PC9a, PC14, PC16, PC20, PC26, PC29, PC30, PC34, PC35, PC37, PC39 ERC4, ERC5, ERC6b, ERC7
Processes, tasks, activities covered	Use as an intermediate within closed or contained systems (not related to Strictly Controlled Conditions). Includes incidental exposures during recycling/ recovery, material transfers, storage, sampling, associated laboratory activities, maintenance and loading (ncluding marine vessel/barge, road/rail car and bulk container) Industrial use

2. Operational conditions and risk management measures

2.2.1 Contributing scenario controlling environmental exposure (ERC4)

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

Product characteristics		
Concentration of substance in product	<= 100 %	
Operational conditions		
Amounts used	Annual site tonnage (tons/year):	25000
Frequency and duration of use	Emission days (days/year):	330
Environmental factors not influenced by risk management	Local freshwater dilution factor:	10
Environmental factors not influenced by risk management	Local marine water dilution factor:	10
Environmental factors not influenced by risk management	Receiving surface water flow (m³/day):	20000 m³/d
Other given operational conditions affecting environmental exposure	Release fraction to air from process (initial release prior to RMM):	95 %
Other given operational conditions affecting environmental exposure	Release fraction to wastewater from process (initial release prior to RMM):	100 %
Risk management measures		
Conditions and measures related to municipal sewage treatment plant	Estimated substance removal from wastewater via on-site sewage treatment (%):	99.9 %

2.2.2 Contributing scenario controlling environmental exposure (ERC5)

ERC5	Industrial use resulting in inclusion into or onto a matrix

Product characteristics		
Concentration of substance in product	<= 100 %	
Operational conditions		
Amounts used	Annual site tonnage (tons/year):	25000
Frequency and duration of use	Emission days (days/year):	330
Environmental factors not influenced by risk management	Local freshwater dilution factor:	10
Environmental factors not influenced by risk management	Local marine water dilution factor:	10
Environmental factors not influenced by risk management	Receiving surface water flow (m³/day):	20000 m³/d
Other given operational conditions affecting environmental exposure	Release fraction to air from process (initial release prior to RMM):	50 %
Other given operational conditions affecting environmental exposure	Release fraction to wastewater from process (initial release prior to RMM):	50 %

Risk management measures		
Conditions and measures related to municipal sewage treatment plant	Estimated substance removal from wastewater via on-site sewage treatment (%):	99.9 %

2.2.3 Contributing scenario controlling environmental exposure (ERC6b)

ERC6b	Industrial use of reactive processing aids	
Product characteristics		
Concentration of substance in product	<= 100 %	
Operational conditions		
Amounts used	Annual site tonnage (tons/year):	25000
Frequency and duration of use	Emission days (days/year):	330
Environmental factors not influenced by risk management	Local freshwater dilution factor:	10
Environmental factors not influenced by risk management	Local marine water dilution factor:	10
Environmental factors not influenced by risk management	Receiving surface water flow (m³/day):	20000 m³/d
Other given operational conditions affecting environmental exposure	Release fraction to air from process (initial release prior to RMM):	0.1 %
Other given operational conditions affecting environmental exposure	Release fraction to wastewater from process (initial release prior to RMM):	5 %
Risk management measures		
Conditions and measures related to municipal sewage treatment plant	Estimated substance removal from wastewater via on-site sewage treatment (%):	99.9 %

2.2.4 Contributing scenario controlling environmental exposure (ERC7)

ERC7	Industrial use of substances in closed systems	
Product characteristics		
Concentration of substance in product	<= 100 %	
Operational conditions		
Amounts used	Annual site tonnage (tons/year):	25000
Frequency and duration of use	Emission days (days/year):	330
Environmental factors not influenced by risk management	Local freshwater dilution factor:	10
Environmental factors not influenced by risk management	Local marine water dilution factor:	10
Environmental factors not influenced by risk management	Receiving surface water flow (m³/day):	20000 m³/d
Other given operational conditions affecting environmental exposure	Release fraction to air from process (initial release prior to RMM):	5 %
Other given operational conditions affecting environmental exposure	Release fraction to wastewater from process (initial release prior to RMM):	5 %
Risk management measures		
Conditions and measures related to municipal sewage treatment plant	Estimated substance removal from wastewater via on-site sewage treatment (%):	99.9 %

2.1.1 Contributing scenario controlling worker exposure (PROC1)

PROC1	Use in closed process, no likelihood of exposure	
Product characteristics		
Concentration of substance in product	<= 100 %	
Operational conditions		
Amounts used	Annual site tonnage (tons/year):	25000
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently)	
Other given operational conditions affecting workers exposure	Indoor	
Risk management measures		
Technical conditions and measures to control dispersion from source towards the worker	No specific measures identified	

2.1.2 Contributing scenario controlling worker exposure (PROC2)

PROC2	Use in closed, continuous process with occasional controlled exposure	
Product characteristics		
Concentration of substance in product	<= 100 %	
Operational conditions		
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently)	
Other given operational conditions affecting workers exposure	Indoor	
Risk management measures		
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation - efficiency of at least [%]:	90
Conditions and measures related to personal protection, hygiene and health evaluation	In case of inadequate ventilation wear respiratory protection	(efficacy 95%)

2.1.3 Contributing scenario controlling worker exposure (PROC3)

PROC3	Use in closed batch process (synthesis or formulation)	
Product characteristics		
Concentration of substance in product	<= 100 %	
Operational conditions		
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently)	
Other given operational conditions affecting workers exposure	Indoor	
Risk management measures		
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation - efficiency of at least [%]:	90
Conditions and measures related to personal protection, hygiene and health evaluation	In case of inadequate ventilation wear respiratory protection	(efficacy 95%)

2.1.4 Contributing scenario controlling worker exposure (PROC4)

PROC4	Use in batch and other process (synthesis) where opportunity for exposure arises	
Product characteristics		
Concentration of substance in product	<= 100 %	
Operational conditions		
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently)	
Other given operational conditions affecting workers exposure	Indoor	
Risk management measures		
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation - efficiency of at least [%]:	90
Conditions and measures related to personal protection, hygiene and health evaluation	In case of inadequate ventilation wear respiratory protection	(efficacy 95%)

2.1.5 Contributing scenario controlling worker exposure (PROC8b)

PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities	
Product characteristics		
Concentration of substance in product	<= 100 %	
Operational conditions		
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently)	
Other given operational conditions affecting workers exposure	Indoor	
Risk management measures		
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation - efficiency of at least [%]:	90
Conditions and measures related to personal protection, hygiene and health evaluation	In case of inadequate ventilation wear respiratory protection	(efficacy 95%)

2.1.6 Contributing scenario controlling worker exposure (PROC5)

PROC5	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)

Product characteristics		
Concentration of substance in product	<= 100 %	
Operational conditions		
Frequency and duration of use	Avoid carrying out operation for more than 4 hours	
Other given operational conditions affecting workers exposure	Indoor	
Risk management measures		
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation - efficiency of at least [%]:	90
Conditions and measures related to personal protection, hygiene and health evaluation	In case of possible exposure to degradation products use a suitable respiratory protection	(efficacy 95%)

2.1.7 Contributing scenario controlling worker exposure (PROC9)

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

Product characteristics		
Concentration of substance in product	<= 100 %	
Operational conditions		
Frequency and duration of use	Avoid carrying out operation for more than 4 hours	
Other given operational conditions affecting workers exposure	Indoor	
Risk management measures		
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation - efficiency of at least [%]:	90
Conditions and measures related to personal protection, hygiene and health evaluation	In case of inadequate ventilation wear respiratory protection	(efficacy 95%)

3. Exposure estimation and reference to its source

3.1. Health

Long-term - systemic effects						
DNEL	Inhalation.: 47.6 mg/m³ Dermal: 6.8 mg/kg bodyweight/day					
Contributing scenario	inhalation exposure mg/m³	RCR	Dermal exposure mg/kg bodyweight/day	RCR	Sum RCR	Assessment method
PROC1	0.01	0.000	0.05	0.007	0.007	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC2	0.07	0.001	0.2	0.029	0.030	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC3	0.15	0.003	0.01	0.001	0.004	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC4	0.15	0.003	0.1	0.015	0.018	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC8b	0.04	0.001	0.1	0.015	0.016	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC5	0.22	0.005	0.01	0.001	0.006	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC9	0.18	0.004	0.1	0.015	0.019	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model

Acute - systemic effects						
DNEL	Inhalation.: 47.6 mg/m³ Dermal: 6.8 mg/kg bodyweight/day					
Contributing scenario	inhalation exposure mg/m³	RCR	Dermal exposure mg/kg bodyweight/day	RCR	Sum RCR	Assessment method
PROC1	0.01	0.000	0.05	0.007	0.007	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC2	0.07	0.001	0.2	0.029	0.030	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC3	0.15	0.003	0.01	0.001	0.004	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC4	0.15	0.003	0.1	0.015	0.018	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC8b	0.04	0.001	0.1	0.015	0.016	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC5	0.22	0.005	0.01	0.001	0.006	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC9	0.18	0.004	0.1	0.015	0.019	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model

Local - Inhalation.					
DNEL	Acute: 36 mg/m³ Long-term: 14 mg/m³				
Contributing scenario	Acute mg/m³	RCR	Long term mg/m³	RCR	Assessment method
PROC1	0.01	0.000	0.01	0.001	Acute: Used ECETOC TRA model Long term: Used ECETOC TRA model
PROC2	0.1	0.003	0.25	0.018	Acute: Used ECETOC TRA model Long term: Used ECETOC TRA model
PROC3	0.2	0.006	0.51	0.036	Acute: Used ECETOC TRA model Long term: Used ECETOC TRA model
PROC4	0.2	0.006	0.51	0.036	Acute: Used ECETOC TRA model Long term: Used ECETOC TRA model
PROC8b	0.05	0.001	0.14	0.01	Acute: Used ECETOC TRA model Long term: Used ECETOC TRA model
PROC5	0.3	0.008	0.76	0.054	Acute: Used ECETOC TRA model Long term: Used ECETOC TRA model
PROC9	0.24	0.007	0.61	0.044	Acute: Used ECETOC TRA model Long term: Used ECETOC TRA model

3.2. Environment

environmental exposure	Unit	Exposure Estimation	PNEC	RCR	Assessment method
freshwater	mg/l	0.00282	0.001	2.82	Used EUSES model
marine water	mg/l	0.000606	0.001	0.606	Used EUSES model

environmental exposure	Unit	Exposure Estimation	PNEC	RCR	Assessment method

freshwater	mg/l	0.00146	0.001	1.46	Used EUSES model
marine water	mg/l	0.00317	0.001	3.17	Used EUSES model

environmental exposure	Unit	Exposure Estimation	PNEC	RCR	Assessment method
freshwater	mg/l	0.000054	0.001	0.054	Used EUSES model
marine water	mg/l	0.0000519	0.001	0.052	Used EUSES model

environmental exposure	Unit	Exposure Estimation	PNEC	RCR	Assessment method
freshwater	mg/l	0.000146	0.001	0.146	Used EUSES model
marine water	mg/l	0.000317	0.001	0.317	Used EUSES model

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

4.1. Health

Guidance - Health	Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated

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. Used EUSES model

1. Exposure scenario 4

Professional use

ES Ref.: 4 ES Type: Worker	

Use descriptors	SU1, SU4, SU5, SU6a, SU6b, SU9, SU10, SU11, SU12, SU13, SU15, SU16, SU17, SU23, SU24 PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC13, PROC15, PROC20 PC9a, PC12, PC14, PC15, PC16, PC19, PC20, PC21, PC26, PC29, PC30, PC34, PC35, PC37, PC39, PC40 ERC8b, ERC8e, ERC9a, ERC9b
Processes, tasks, activities covered	Use as an intermediate within closed or contained systems (not related to Strictly Controlled Conditions). Includes incidental exposures during recycling/ recovery, material transfers, storage, sampling, associated laboratory activities, maintenance and loading (ncluding marine vessel/barge, road/rail car and bulk container) Professional use

2. Operational conditions and risk management measures

2.2 Contributing scenario controlling environmental exposure (ERC8b, ERC8e, ERC9a, ERC9b)

ERC8b	Wide dispersive indoor use of reactive substances in open systems
ERC8e	Wide dispersive outdoor use of reactive substances in open systems
ERC9a	Wide dispersive indoor use of substances in closed systems
ERC9b	Wide dispersive outdoor use of substances in closed systems
Assessment method	Not applicable for wide dispersive uses

Product characteristics

Concentration of substance in product	<= 100 %

Operational conditions

Not applicable for wide dispersive uses.

Risk management measures

Not applicable for wide dispersive uses.

2.1.1 Contributing scenario controlling worker exposure (PROC1)

PROC1	Use in closed process, no likelihood of exposure

Product characteristics

Concentration of substance in product	<= 100 %

Operational conditions

Amounts used	Annual site tonnage (tons/year):	25000
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently)	
Other given operational conditions affecting workers exposure	Indoor	

Risk management measures

Technical conditions and measures to control dispersion from source towards the worker	No specific measures identified	

2.1.2 Contributing scenario controlling worker exposure (PROC2)

PROC2	Use in closed, continuous process with occasional controlled exposure

Product characteristics

Concentration of substance in product	<= 100 %

Operational conditions

Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently)	
Other given operational conditions affecting workers exposure	Indoor	

Risk management measures

Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation - efficiency of at least [%]:	90

Conditions and measures related to personal protection, hygiene and health evaluation	In case of inadequate ventilation wear respiratory protection	(efficacy 95%)

2.1.3 Contributing scenario controlling worker exposure (PROC3)

PROC3	Use in closed batch process (synthesis or formulation)

Product characteristics		
Concentration of substance in product	<= 100 %	
Operational conditions		
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently)	
Other given operational conditions affecting workers exposure	Indoor	
Risk management measures		
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation - efficiency of at least [%]:	90
Conditions and measures related to personal protection, hygiene and health evaluation	In case of inadequate ventilation wear respiratory protection	(efficacy 95%)

2.1.4 Contributing scenario controlling worker exposure (PROC4)

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

Product characteristics		
Concentration of substance in product	<= 100 %	
Operational conditions		
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently)	
Other given operational conditions affecting workers exposure	Indoor	
Risk management measures		
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation - efficiency of at least [%]:	90
Conditions and measures related to personal protection, hygiene and health evaluation	In case of inadequate ventilation wear respiratory protection	(efficacy 95%)

2.1.5 Contributing scenario controlling worker exposure (PROC8b)

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

Product characteristics		
Concentration of substance in product	<= 100 %	
Operational conditions		
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently)	
Other given operational conditions affecting workers exposure	Indoor	
Risk management measures		
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation - efficiency of at least [%]:	90
Conditions and measures related to personal protection, hygiene and health evaluation	In case of inadequate ventilation wear respiratory protection	(efficacy 95%)

2.1.6 Contributing scenario controlling worker exposure (PROC15)

PROC15	Use as laboratory reagent

Product characteristics		
Concentration of substance in product	<= 100 %	
Operational conditions		
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently)	
Other given operational conditions affecting workers exposure	Indoor	

Risk management measures		
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation - efficiency of at least [%]:	90
Conditions and measures related to personal protection, hygiene and health evaluation	In case of inadequate ventilation wear respiratory protection	(efficacy 95%)

2.1.7 Contributing scenario controlling worker exposure (PROC20)

PROC20	Heat and pressure transfer fluids in dispersive use but closed systems
Product characteristics	
Concentration of substance in product	<= 100 %
Operational conditions	
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently)
Other given operational conditions affecting workers exposure	Indoor
Risk management measures	
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation - efficiency of at least [%]: 90
Conditions and measures related to personal protection, hygiene and health evaluation	In case of inadequate ventilation wear respiratory protection (efficacy 95%)

2.1.8 Contributing scenario controlling worker exposure (PROC5)

PROC5	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)
Product characteristics	
Concentration of substance in product	<= 100 %
Operational conditions	
Frequency and duration of use	Avoid carrying out operation for more than 4 hours
Other given operational conditions affecting workers exposure	Indoor
Risk management measures	
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation - efficiency of at least [%]: 90
Conditions and measures related to personal protection, hygiene and health evaluation	In case of possible exposure to degradation products use a suitable respiratory protection (efficacy 95%)

2.1.9 Contributing scenario controlling worker exposure (PROC9)

PROC9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
Product characteristics	
Concentration of substance in product	<= 100 %
Operational conditions	
Frequency and duration of use	Avoid carrying out operation for more than 4 hours
Other given operational conditions affecting workers exposure	Indoor
Risk management measures	
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation - efficiency of at least [%]: 90
Conditions and measures related to personal protection, hygiene and health evaluation	In case of inadequate ventilation wear respiratory protection (efficacy 95%)

2.1.10 Contributing scenario controlling worker exposure (PROC8a)

PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities
Product characteristics	
Concentration of substance in product	<= 100 %
Operational conditions	
Frequency and duration of use	Avoid carrying out operation for more than 4 hours
Other given operational conditions affecting workers exposure	Indoor

Risk management measures		
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation - efficiency of at least [%]:	90
Conditions and measures related to personal protection, hygiene and health evaluation	In case of inadequate ventilation wear respiratory protection	(efficacy 95%)

2.1.11 Contributing scenario controlling worker exposure (PROC13)

PROC13	Treatment of articles by dipping and pouring

Product characteristics	
Concentration of substance in product	<= 100 %

Operational conditions		
Frequency and duration of use	Avoid carrying out operation for more than 4 hours	
Other given operational conditions affecting workers exposure	Indoor	

Risk management measures		
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation - efficiency of at least [%]:	90
Conditions and measures related to personal protection, hygiene and health evaluation	In case of inadequate ventilation wear respiratory protection	(efficacy 95%)
Conditions and measures related to personal protection, hygiene and health evaluation	Wear suitable gloves tested to EN374	(efficacy 90%)

3. Exposure estimation and reference to its source

3.1. Health

Long-term - systemic effects						
DNEL	Inhalation.: 47.6 mg/m³ Dermal: 6.8 mg/kg bodyweight/day					
Contributing scenario	inhalation exposure mg/m³	RCR	Dermal exposure mg/kg bodyweight/day	RCR	Sum RCR	Assessment method
PROC1	0.01	0.000	0.05	0.007	0.007	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC2	0.07	0.001	0.2	0.029	0.030	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC3	0.15	0.003	0.01	0.001	0.004	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC4	0.15	0.003	0.1	0.015	0.018	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC8b	0.07	0.001	0.1	0.015	0.016	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC15	0.04	0.001	0.01	0.001	0.002	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC20	0.15	0.003	0.01	0.001	0.004	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC5	0.22	0.005	0.01	0.001	0.006	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC9	0.18	0.004	0.1	0.015	0.019	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model

PROC8a	0.22	0.005	0.02	0.003	0.008	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC13	0.22	0.005	0.2	0.029	0.034	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model

Acute - systemic effects						
DNEL	Inhalation.: 47.6 mg/m³ Dermal: 6.8 mg/kg bodyweight/day					
Contributing scenario	inhalation exposure mg/m³	RCR	Dermal exposure mg/kg bodyweight/day	RCR	Sum RCR	Assessment method
PROC1	0.01	0.000	0.05	0.007	0.007	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC2	0.07	0.001	0.2	0.029	0.030	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC3	0.15	0.003	0.01	0.001	0.004	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC4	0.15	0.003	0.1	0.015	0.018	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC8b	0.07	0.001	0.1	0.015	0.016	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC15	0.04	0.001	0.01	0.001	0.002	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC20	0.09	0.002	0.01	0.001	0.003	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC5	0.2	0.004	0.01	0.001	0.005	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC9	0.18	0.004	0.1	0.015	0.019	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC8a	0.22	0.005	0.02	0.003	0.008	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model
PROC13	0.22	0.005	0.2	0.029	0.034	Inhalation.: Used ECETOC TRA model Dermal: Used ECETOC TRA model

Local - Inhalation.					
DNEL	Acute: 36 mg/m³ Long-term: 14 mg/m³				
Contributing scenario	Acute mg/m³	RCR	Long term mg/m³	RCR	Assessment method
PROC1	0.01	0.000	0.01	0.001	Acute: Used ECETOC TRA model Long term: Used ECETOC TRA model
PROC2	0.1	0.003	0.25	0.018	Acute: Used ECETOC TRA model Long term: Used ECETOC TRA model
PROC3	0.2	0.006	0.51	0.036	Acute: Used ECETOC TRA model Long term: Used ECETOC TRA model

PROC4	0.2	0.006	0.51	0.036	Acute: Used ECETOC TRA model Long term: Used ECETOC TRA model
PROC8b	0.01	0.000	0.01	0.001	Acute: Used ECETOC TRA model Long term: Used ECETOC TRA model
PROC15	0.06	0.002	0.01	0.001	Acute: Used ECETOC TRA model Long term: Used ECETOC TRA model
PROC20	0.12	0.003	0.02	0.001	Acute: Used ECETOC TRA model Long term: Used ECETOC TRA model
PROC5	0.3	0.008	0.76	0.054	Acute: Used ECETOC TRA model Long term: Used ECETOC TRA model
PROC9	0.24	0.007	0.61	0.044	Acute: Used ECETOC TRA model Long term: Used ECETOC TRA model
PROC8a	0.3	0.008	0.76	0.054	Acute: Used ECETOC TRA model Long term: Used ECETOC TRA model
PROC13	0.3	0.008	0.76	0.054	Acute: Used ECETOC TRA model Long term: Used ECETOC TRA model

3.2. Environment

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

4.1. Health

Guidance - Health	Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated

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. Used EUSES model