Isoprene

Safety Data Sheet

according to the REACH Regulation (EC) 1907/2006 amended by Regulation (EU) 2020/878
Issue date: 5 October 2011 Revision date: 11 August 2023 Supersedes version of: 14 April 2023 Version: 7.0

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

1.1. Product identifier

Product form	:	Substance
Trade name	:	Isoprene
Chemical name	:	Isoprene
EC Index-No.	:	601-014-00-5
EC-No.	:	201-143-3
CAS-No.	:	78-79-5
REACH registration No.	:	01-2119457891-21-0032
Formula	:	C5H8
Synonyms	:	Methyl-1,3-butadiene / 2-Methylbutadiene / beta-Methylbivynil / 2-Methyleteno / Isopentadiene / Isoprene, Isoprene stabilizer

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

1.2.1. Relevant identified uses

Use of the substance/mixture	:	Manufacturer. Distribution Polymer production

Title	Use descriptors
Use at industrial sites ; Distribution of a substance (ES Ref.: ES3)	PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC9, PROC15, ERC7
Use at industrial sites ; Intermediate use of the substance (ES Ref.: ES4)	PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC15, ERC6a
Use at industrial sites ; Polymer production (ES Ref.: ES5)	PROC1, PROC2, PROC3, PROC4, PROC5, PROC6, PROC8a, PROC8b, PROC14, ERC6c
Use at industrial sites , Polymer processing (ES Ref.: ES6)	PROC1, PROC2, PROC3, PROC4, PROC5, PROC6, PROC8a, PROC8b, PROC9, PROC13, PROC14, PROC15, ERC4
Use at industrial sites ; Use as a fuel (ES Ref.: ES7)	PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC16, ERC7
Widespread use by professional workers ; Use as a fuel (ES Ref.: ES8)	PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC16, ERC9a, ERC9b
Formulation or re-packing ; Formulation & (re)packing of substances and mixtures (ES Ref.: ES2)	PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC14, PROC15, ERC2

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

Only Representative:
Braskem Netherlands B.V.
Weena 240 / Tower C 9th Floor
3012 NJ Rotterdam -The Netherlands
T 31 107985002
productsafety@braskem.com

1.4. Emergency telephone number

Emergency number	:	1 703-741-5970 (Chemtrec –24h)

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

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

Flammable liquids, Category 1	H224
Germ cell mutagenicity, Category 2	H341
Carcinogenicity, Category 1B	H350

Hazardous to the aquatic environment – Chronic Hazard, Category 3 H412
Full text of H- and EUH-statements: see section 16

Adverse physicochemical, human health and environmental effects

Extremely flammable liquid and vapour. May cause cancer. May cause genetic defects. Harmful to aquatic life with long lasting effects.

2.2. Label elements

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

Hazard pictograms (CLP) :

GHS02 GHS08

Signal word (CLP) : Danger

Hazard statements (CLP) : H224 - Extremely flammable liquid and vapour.
H341 - Suspected of causing genetic defects.
H350 - May cause cancer.
H412 - Harmful to aquatic life with long lasting effects.

Precautionary statements (CLP) : P202 - Do not handle until all safety precautions have been read and understood.
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. heat, hot surfaces, open flames, sparks.
P243 - Take precautionary measures against static discharge.
P273 - Avoid release to the environment.
P280 - Wear protective clothing, protective gloves, eye protection.
P303+P361+P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.

2.3. Other hazards

other hazards which do not result in classification : May cause eye,skin and respiratory system irritation. Prolonged or repeated contact with skin or mucous membrane result in irritation symptoms such as redness, blistering, dermatitis, etc. CNS depression. In high concentrations may cause asphyxiation. Vapours can travel considerable distances to a source of ignition where they can ignite, flash back, or explode. This material or its emissions may induce blood disorders and/or aggravate pre-existing blood disorders. This substance does not meet the criteria for classification as PBT or vPvB.

This substance/mixture does not meet the PBT criteria of REACH regulation, annex XIII
This substance/mixture does not meet the vPvB criteria of REACH regulation, annex XIII
Contains no PBT/vPvB substances ≥ 0.1% assessed in accordance with REACH Annex XIII

The substance is not included in the list established in accordance with Article 59(1) of REACH for having endocrine disrupting properties, or is not identified as having endocrine disrupting properties in accordance with the criteria set out in Commission Delegated Regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605

SECTION 3: Composition/information on ingredients

3.1. Substances

Substance type : Mono-constituent
Name : isoprene (stabilised); 2-methyl-1,3-butadiene
CAS-No. : 78-79-5
EC-No. : 201-143-3
EC Index-No. : 601-014-00-5

Name	Product identifier	%
isoprene (stabilised); 2-methyl-1,3-butadiene	CAS-No.: 78-79-5 EC-No.: 201-143-3 EC Index-No.: 601-014-00-5	≥99,5

3.2. Mixtures

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures after inhalation : Remove victim to fresh air. Do not apply mouth-to-mouth resuscitation. In case of irregular breathing or respiratory arrest provide artificial respiration. Immediately get medical attention.

First-aid measures after skin contact : Rinse immediately with plenty of water for 15 minutes. Do not rub the skin and eyes after direct contact with the product. Remove contaminated clothing and shoes. Discard contaminated clothing. Immediately get medical attention.

First-aid measures after eye contact : Rinse immediately and thoroughly, pulling the eyelids well away from the eye (15 minutes minimum). Remove contact lenses, if present and easy to do. Continue rinsing. Do not rub the skin and eyes after direct contact with the product. Seek immediate medical advice.

First-aid measures after ingestion : Do not induce vomiting. If the person is fully conscious, make him/her drink water. Never give an unconscious person anything to drink. Seek medical attention immediately.

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

Symptoms/effects after inhalation : Inhalation may cause irritation, cough, shortness of breath. Asphyxiant in high concentrations. May have a narcotic effect at high concentrations.

Symptoms/effects after skin contact : May cause moderate irritation. Effects of skin contact may include : redness.

Symptoms/effects after eye contact : May cause moderate irritation.

Symptoms/effects after ingestion : Ingestion may cause nausea and vomiting.

Chronic symptoms : This material or its emissions may induce blood disorders and/or aggravate pre-existing blood disorders.

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

Use personal protective equipment as required. Refer to chapter 8.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Carbon dioxide (CO_2), dry chemical powder, foam. Water fog.

Unsuitable extinguishing media : Do not use water jet. Use of heavy stream of water may spread fire.

5.2. Special hazards arising from the substance or mixture

Fire hazard : Extremely flammable liquid and vapour. This material can accumulate static charge by flow or agitation and can be ignited by static discharge. The vapours are heavier than air and can accumulate in high concentrations on the ground, in cavities, channels and cellars. Vapours can travel considerable distances to a source of ignition where they can ignite, flash back, or explode. Combustion generates: hydrocarbons.

Explosion hazard : Prolonged exposure to fire may cause containers to rupture/explode. Can polymerise exothermically if heated, exposed to air, sunlight or by addition or free radical initiators.

Reactivity in case of fire : React violently in contact with oxidation agents. Reacts violently with (some) halogens. Can polymerise exothermically if heated, exposed to air, sunlight or by addition or free radical initiators.

5.3. Advice for firefighters

Firefighting instructions : In case of fire: Evacuate area. Fight fire remotely due to the risk of explosion. Stop leak if safe to do so. Fight fire with normal precautions from a reasonable distance. Do not approach fire except upwind and only with proper skin and respiratory protection (supplied air only). Cool adjacent tanks / containers / drums with water jet.

Protective equipment for firefighters : Wear recommended personal protective equipment. In case of fire: Wear self-contained breathing apparatus.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures : Eliminate all ignition sources if safe to do so. When using do not smoke. Use personal protective equipment as required. Stop leak if safe to do so.

6.1.1. For non-emergency personnel

Protective equipment : Wear suitable protective clothing, gloves and eye/face protection. Refer to chapter 8.

Emergency procedures : Avoid all eye and skin contact and do not breathe vapour and mist. Evacuate unnecessary personnel. Eliminate all ignition sources if safe to do so. Do not smoke.

6.1.2. For emergency responders

Protective equipment : Wear suitable protective clothing, gloves and eye/face protection. In case of fire: Wear self-contained breathing apparatus. Refer to chapter 8.

Emergency procedures : Avoid all eye and skin contact and do not breathe vapour and mist. Evacuate and limit access. Eliminate every possible source of ignition. Stop leak if safe to do so.

6.2. Environmental precautions

Prevent spread over a wide area (e.g. by containment or oil barriers). Absorb remaining liquid with sand or inert absorbent and remove to safe place. Collect in closed containers for disposal. Do not empty into drains.

6.3. Methods and material for containment and cleaning up

For containment : Prevent spread over a wide area (e.g. by containment or oil barriers). Contain any spills with dikes or absorbents to prevent migration and entry into sewers or streams.

Methods for cleaning up : Absorb with liquid-binding material (e.g. sand, diatomaceous earth, acid- or universal binding agents). Take up large spills with pump or vacuum. Place spent adsorbent in sealed packages and contact specialist waste disposal contractor.

6.4. Reference to other sections

No additional information available

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : Avoid producing mist or vapours by heating of opened receptacle/container. Ground/bond container and receiving equipment. Keep container closed when not in use. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose containers to flames, sparks, heat, or other potential ignition sources.

Hygiene measures : Do not eat, drink or smoke when using this product. Wash hands thoroughly after handling.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures : Use explosion-proof ventilating equipment. Use explosion-proof electrical equipment. Use grounded electrical/mechanical equipment. Use only non-sparking tools.

Storage conditions : Store in a well-ventilated place. Keep cool. Store in tightly closed, properly ventilated containers away from heat, sparks, open flame. Protect containers against damage. Keep stored the least quantity possible.

Incompatible materials : Strong oxidizing agents. Halogens.

Packaging materials : PVC (Polyvinyl chloride). stainless steel. Carbon steel. This material may attack some forms of plastics, rubbers and coatings.

7.3. Specific end use(s)

For further information see section 1.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

8.1.1 National occupational exposure and biological limit values

isoprene (stabilised); 2-methyl-1,3-butadiene (78-79-5)	
Lithuania - Occupational Exposure Limits	
IPRV (OEL TWA)	40 mg/m³
Poland - Occupational Exposure Limits	
NDS (OEL TWA)	100 mg/m³
NDSCh (OEL STEL)	300 mg/m³

8.1.2. Recommended monitoring procedures

No additional information available

8.1.3. Air contaminants formed

No additional information available

8.1.4. DNEL and PNEC

Isoprene (78-79-5)	
DNEL/DMEL (Workers)	
Long-term - systemic effects, dermal	40 mg/kg bodyweight/day
Long-term - systemic effects, inhalation	8.4 mg/m³
DNEL/DMEL (General population)	
Long-term - systemic effects,oral	0.2 mg/kg bodyweight/day
Long-term - systemic effects, inhalation	2 mg/m³

Isoprene (78-79-5)	
Long-term - systemic effects, dermal	9.5 mg/kg bodyweight/day
PNEC (Water)	
PNEC aqua (freshwater)	0.108 mg/l
PNEC aqua (marine water)	10.8 µg/L
PNEC aqua (intermittent, freshwater)	57.7 µg/L
PNEC aqua (intermittent, marine water)	5.77 µg/L
PNEC (Sediment)	
PNEC sediment (freshwater)	1.75 mg/kg dwt
PNEC sediment (marine water)	0.175 mg/kg dwt
PNEC (Soil)	
PNEC soil	0.286 mg/kg dwt
PNEC (Oral)	
PNEC oral (secondary poisoning)	Not applicable
PNEC (STP)	
PNEC sewage treatment plant	0.2 mg/l

8.1.5. Control banding

No additional information available

8.2. Exposure controls

8.2.1. Appropriate engineering controls

Appropriate engineering controls:
Use explosion-proof ventilating equipment. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.

8.2.2. Personal protection equipment

Personal protective equipment:
An approved organic vapour respirator/supplied air or self-contained breathing apparatus must be used when vapour concentration exceeds applicable exposure limits. Gloves. Protective goggles. Protective clothing.

Personal protective equipment symbol(s):

8.2.2.1. Eye and face protection

Eye protection:
if necessary: tightly fitting safety goggles

8.2.2.2. Skin protection

Skin and body protection:
Use chemically protective clothing

Hand protection:
Protective gloves made of PVC. Materials to avoid. Butyl caoutchouc (butyl rubber). NR (Natural rubber (caoutchouc), Natural latex).

Other skin protection

Materials for protective clothing:
PVC (Polyvinyl chloride). PE (polyethylene).

8.2.2.3. Respiratory protection

Respiratory protection:
An approved organic vapour respirator/supplied air or self-contained breathing apparatus must be used when vapour concentration exceeds applicable exposure limits

8.2.2.4. Thermal hazards

No additional information available

8.2.3. Environmental exposure controls

Environmental exposure controls:
Avoid release to the environment.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	:	Liquid
Colour	:	Colourless.
Molecular mass	:	68.13 g/mol
Odour	:	aromatic hydrocarbons.
Odour threshold	:	Not available
Melting point	:	- 145.9 °C
Freezing point	:	Not available
Boiling point	:	34 °C @ 760 mmHg
Flammability	:	Not available
Explosive limits	:	1.5 – 8.9 vol %
Lower explosion limit	:	Not available
Upper explosion limit	:	Not available
Flash point	:	- 54 °C Closed cup
Auto-ignition temperature	:	Not available
Decomposition temperature	:	Not available
pH	:	Not applicable
Viscosity, kinematic	:	0.308 mm²/s
Viscosity, dynamic	:	0.21 mPa·s @ 20-25ºC
Solubility	:	Soluble in: Benzene. Diethyl ether. acetone. Ether. Water: 642 mg/l (25°C)
Partition coefficient n-octanol/water (Log Kow)	:	2.58
Partition coefficient n-octanol/water (Log Pow)	:	2.42
Vapour pressure	:	63.397 kPa (21.1°C)
Vapour pressure at 50°C	:	Not available
Critical pressure	:	37896 hPa
Density	:	0.681 @ 20ºC (Water = 1)
Relative density	:	0.679 g/cm³
Relative vapour density at 20°C	:	2.4 Relative density (air = 1)
Particle characteristics	:	Not applicable

9.2. Other information

9.2.1. Information with regard to physical hazard classes

Explosion limits	:	1.5 – 8.9 vol %

9.2.2. Other safety characteristics

Relative evaporation rate (butylacetate=1)	:	Not applicable

SECTION 10: Stability and reactivity

10.1. Reactivity

React violently in contact with oxidation agents. Reacts violently with (some) halogens. Can polymerise exothermically if heated, exposed to air, sunlight or by addition or free radical initiators.

10.2. Chemical stability

May form explosive peroxides.

10.3. Possibility of hazardous reactions

hazardous polymerization. Can polymerise exothermically if heated, exposed to air, sunlight or by addition or free radical initiators.

10.4. Conditions to avoid

Direct sunlight. Pure oxygen. sparks. heat. Open flame. Rust.

10.5. Incompatible materials

Strong oxidizing agents. Halogens. Strong acids. alcohols.

10.6. Hazardous decomposition products

Toxic fumes. irritating gases.

SECTION 11: Toxicological information

11.1. Information on hazard classes as defined in Regulation (EC) No 1272/2008

Acute toxicity (oral) : Not classified (Based on available data, the classification criteria are not met)

Acute toxicity (dermal) : Not classified (Based on available data, the classification criteria are not met)

Acute toxicity (inhalation) : Not classified (Based on available data, the classification criteria are not met)

Isoprene (78-79-5)	
LD50 oral rat	2125 mg/kg
LD50 dermal rat	> 2000 mg/kg
LC50 Inhalation - Rat	180000 mg/m³ 4 Hours

Skin corrosion/irritation : Not classified (Based on available data, the classification criteria are not met)

Serious eye damage/irritation : Not classified (Based on available data, the classification criteria are not met)

Respiratory or skin sensitisation : Not classified (Based on available data, the classification criteria are not met)

Germ cell mutagenicity : Suspected of causing genetic defects.

Carcinogenicity : May cause cancer.

isoprene (stabilised); 2-methyl-1,3-butadiene (78-79-5)	
IARC group	2B - Possibly carcinogenic to humans

Reproductive toxicity : Not classified (Based on available data, the classification criteria are not met)

STOT-single exposure : Not classified (Based on available data, the classification criteria are not met)

STOT-repeated exposure : Not classified (Based on available data, the classification criteria are not met)

Isoprene (78-79-5)	
LOAEC (inhalation, rat, gas, 90 days)	195 mg/m3 (subacute; mouse [common rodent species])
NOAEC (inhalation, rat, dust/mist/fume, 90 days)	28 mg/m³ (chronic); (mouse [common rodent species])

Aspiration hazard : Not classified (Based on available data, the classification criteria are not met)

Isoprene (78-79-5)	
Viscosity, kinematic	0.308 mm²/s
Hydrocarbon	Yes

11.2. Information on other hazards

11.2.1. Endocrine disrupting properties

No additional information available

11.2.2. Other information

Potential Adverse human health effects and symptoms : Central nervous system depression,Asphyxiant in high concentrations,May cause irritation to the respiratory tract and to other mucous membranes,May cause skin irritation,May cause minor eye irritation,This material or its emissions may induce blood disorders and/or aggravate pre-existing blood disorders.

SECTION 12: Ecological information

12.1. Toxicity

Ecology - air : Contributes to the formation of photochemical smog.

Hazardous to the aquatic environment, short–term (acute) : Not classified (Based on available data, the classification criteria are not met)

Hazardous to the aquatic environment, long–term (chronic) : Harmful to aquatic life with long lasting effects.

Not rapidly degradable

Isoprene (78-79-5)	
LC50 - Fish [1]	7.43 mg/l
EC50 - Crustacea [1]	5.77 mg/l Daphnia magna
EC50 72h - Algae [1]	17.761 mg/l
ErC50 algae	> 35.2 mg/l 72 hr Pseudokircherella subcapitata
NOEC chronic fish	1.08 mg/l
NOEC chronic crustacea	6.149 mg/l
NOEC chronic algae	3.403 mg/l

12.2. Persistence and degradability

Isoprene (78-79-5)	
Persistence and degradability	Inherently biodegradable.
BOD (% of ThOD)	61 % ThOD (28 d - activated sludge, non-adapted)

12.3. Bioaccumulative potential

Isoprene (78-79-5)	
Partition coefficient n-octanol/water (Log Pow)	2.42
Partition coefficient n-octanol/water (Log Kow)	2.58
Bioaccumulative potential	Low bioaccumulation potential.

12.4. Mobility in soil

Isoprene (78-79-5)	
Ecology - soil	Very mobile.

12.5. Results of PBT and vPvB assessment

Isoprene (78-79-5)	
This substance/mixture does not meet the PBT criteria of REACH regulation, annex XIII	
This substance/mixture does not meet the vPvB criteria of REACH regulation, annex XIII	
Results of PBT assessment	This substance does not meet the criteria for classification as PBT or vPvB.

12.6. Endocrine disrupting properties

Adverse effects on the environment caused by endocrine disrupting properties : No information available.

12.7. Other adverse effects

Other adverse effects : No additional information available.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Product/Packaging disposal recommendations : Disposal through controlled incineration or authorised waste dump.

SECTION 14: Transport information

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

ADR	IMDG	IATA	ADN	RID
14.1. UN number or ID number				
UN 1218	UN 1218	UN 1218	UN 1218	UN 1218
14.2. UN proper shipping name				
ISOPRENE, STABILIZED	ISOPRENE, STABILIZED	Isoprene, stabilized	ISOPRENE, STABILIZED	ISOPRENE, STABILIZED
Transport document description				
UN 1218 ISOPRENE, STABILIZED, 3, I, (D/E)	UN 1218 ISOPRENE, STABILIZED, 3, I, MARINE POLLUTANT (-48°C c.c.)	UN 1218 Isoprene, stabilized, 3, I	UN 1218 ISOPRENE, STABILIZED, 3, I	UN 1218 ISOPRENE, STABILIZED, 3, I

ADR	IMDG	IATA	ADN	RID
14.3. Transport hazard class(es)				
3	3	3	3	3
				
14.4. Packing group				
I	I	I	I	I
14.5. Environmental hazards				
Dangerous for the environment: No	Dangerous for the environment: No Marine pollutant: Yes	Dangerous for the environment: No	Dangerous for the environment: No	Dangerous for the environment: No

Consult the associated transport regulations for available and applicable exceptions or exemptions.

The suitable shipping classification must be evaluated at the time of shipment due to the possibility for variations in regard to the transportation of this material considering the requirements, modes of transport, packaging, packaging configuration, quantity etc. Please consult the appropriate regulation for specific shipping information and requirements.

This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Additional transportation information can be obtained through the authorized transporting corporation. It is the responsibility of the transporting corporation to follow all applicable laws, regulations and rules relating to the transportation of this product.

14.6. Special precautions for user

Overland transport

Classification code (ADR)	:	F1
Special provisions (ADR)	:	386
Limited quantities (ADR)	:	0
Excepted quantities (ADR)	:	E3
Packing instructions (ADR)	:	P001
Mixed packing provisions (ADR)	:	MP7, MP17
Portable tank and bulk container instructions (ADR)	:	T11
Portable tank and bulk container special provisions (ADR)	:	TP2
Tank code (ADR)	:	L4BN
Vehicle for tank carriage	:	FL
Transport category (ADR)	:	1
Special provisions for carriage - Packages (ADR)	:	V8
Special provisions for carriage - Operation (ADR)	:	S2, S4, S20
Hazard identification number (Kemler No.)	:	339
Orange plates	:	
Tunnel restriction code (ADR)	:	D/E

Transport by sea

Special provisions (IMDG)	:	386
Limited quantities (IMDG)	:	0
Excepted quantities (IMDG)	:	E3
Packing instructions (IMDG)	:	P001
Tank instructions (IMDG)	:	T11
Tank special provisions (IMDG)	:	TP2
EmS-No. (Fire)	:	F-E
EmS-No. (Spillage)	:	S-D
Stowage category (IMDG)	:	D
Stowage and handling (IMDG)	:	SW1

Flash point (IMDG)	:	-48°C c.c.
Properties and observations (IMDG)	:	Colourless, volatile liquid. Flashpoint: -48°C c.c. Explosive limits: 1.5% to 9.7% Boiling point: 34°C. Immiscible with water.

Air transport

PCA Excepted quantities (IATA)	:	E3
PCA Limited quantities (IATA)	:	Forbidden
PCA limited quantity max net quantity (IATA)	:	Forbidden
PCA packing instructions (IATA)	:	351
PCA max net quantity (IATA)	:	1L
CAO packing instructions (IATA)	:	361
CAO max net quantity (IATA)	:	30L
Special provisions (IATA)	:	A209
ERG code (IATA)	:	3H

Inland waterway transport

Classification code (ADN)	:	F1
Special provisions (ADN)	:	386, 676
Limited quantities (ADN)	:	0
Excepted quantities (ADN)	:	E3
Carriage permitted (ADN)	:	T
Equipment required (ADN)	:	PP, EX, A
Ventilation (ADN)	:	VE01
Number of blue cones/lights (ADN)	:	1

Rail transport

Classification code (RID)	:	F1
Special provisions (RID)	:	386
Limited quantities (RID)	:	0
Excepted quantities (RID)	:	E3
Packing instructions (RID)	:	P001
Mixed packing provisions (RID)	:	MP7, MP17
Portable tank and bulk container instructions (RID)	:	T11
Portable tank and bulk container special provisions (RID)	:	TP2
Tank codes for RID tanks (RID)	:	L4BN
Transport category (RID)	:	1
Hazard identification number (RID)	:	339

14.7. Maritime transport in bulk according to IMO instruments

Not applicable

SECTION 15: Regulatory information

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

15.1.1. EU-Regulations

REACH Annex XVII (Restriction List)

Not listed on REACH Annex XVII

REACH Annex XIV (Authorisation List)

Not listed on REACH Annex XIV (Authorisation List)

REACH Candidate List (SVHC)

Not listed on the REACH Candidate List

PIC Regulation (Prior Informed Consent)

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

POP Regulation (Persistent Organic Pollutants)

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

Ozone Regulation (1005/2009)

Not listed on the Ozone Depletion list (Regulation EU 1005/2009)

Explosives Precursors Regulation (2019/1148)

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

Drug Precursors Regulation (273/2004)

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

15.1.2. National regulations

Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)

Germany

Water hazard class (WGK)	:	WGK 3, Highly hazardous to water (KBwS-Beschluss; ID No. 1285).
Chemicals Prohibition Ordinance (ChemVerbotsV)	:	This product is subject to ChemVerbotsV Annex 2 Entry 1. The following requirements must be observed: authorization requirement (according to § 6 paragraph 1 sentence 1), basic requirements for carrying out the delivery (according to § 8 paragraph 1, 3 and 4), identification and documentation (according to § 9 paragraph 1 to 3) and exclusion of the shipping route (according to § 10).
Hazardous Incident Ordinance (12. BImSchV)	:	Is not subject of the Hazardous Incident Ordinance (12. BImSchV)

Netherlands

SZW-lijst van kankerverwekkende stoffen	:	isoprene (stabilised); 2-methyl-1,3-butadiene is listed
SZW-lijst van mutagene stoffen	:	The substance is not listed
SZW-lijst van reprotoxische stoffen – Borstvoeding	:	The substance is not listed
SZW-lijst van reprotoxische stoffen – Vruchtbaarheid	:	The substance is not listed
SZW-lijst van reprotoxische stoffen – Ontwikkeling	:	The substance is not listed

Denmark

Class for fire hazard	:	Class II-1
Store unit	:	5 liter
Classification remarks	:	R10 <H224;H341;H350;H412>; Emergency management guidelines for the storage of flammable liquids must be followed
Danish National Regulations	:	Young people under 18 years are not allowed to use the product Pregnant/breastfeeding women working with the product must not be in direct contact with it The requirements from the Danish Working Environment Authorities regarding work with carcinogens must be followed during use and disposal

15.2. Chemical safety assessment

CSA has been established. Exposure scenario is attached.

SECTION 16: Other information

Indication of changes:

Exposure scenarios annexed to the safety data sheet.

Indication of changes			
Section	**Changed item**	**Change**	**Comments**
2.3	Adverse health effects caused by endocrine disrupting properties	Added	
5.2	Reactivity	Modified	
8.1	Control parameters	Modified	
9	Physical and chemical properties	Modified	
11	Toxicological information	Modified	
12.	Ecological information	Modified	
15.2	Chemical safety assessment	Modified	

Abbreviations and acronyms:	
CAS	CAS (Chemical Abstracts Service) number

Abbreviations and acronyms:	
CLP	CLP - Classification, Labelling and Packaging
CSR	CSR - Chemical Safety Report
EC	EC - European Community
EEC	EEC - European Economic Community
REACH	REACH - Registration, Evaluation, Authorisation and Restriction of Chemicals
SDS	SDS - Safety Data Sheet

Sources of Key data : MSDS. CSR - Chemical Safety Report.

Full text of H- and EUH-statements:	
Aquatic Chronic 3	Hazardous to the aquatic environment – Chronic Hazard, Category 3
Carc. 1B	Carcinogenicity, Category 1B
Flam. Liq. 1	Flammable liquids, Category 1
H224	Extremely flammable liquid and vapour.
H341	Suspected of causing genetic defects.
H350	May cause cancer.
H412	Harmful to aquatic life with long lasting effects.
Muta. 2	Germ cell mutagenicity, Category 2

Full text of use descriptors	
ERC2	Formulation into mixture
ERC4	Use of non-reactive processing aid at industrial site (no inclusion into or onto article)
ERC6a	Use of intermediate
ERC6c	Use of monomer in polymerisation processes at industrial site (inclusion or not into/onto article)
ERC7	Use of functional fluid at industrial site
ERC9a	Widespread use of functional fluid (indoor)
ERC9b	Widespread use of functional fluid (outdoor)
PROC1	Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions
PROC13	Treatment of articles by dipping and pouring
PROC14	Tabletting, compression, extrusion, pelettisation, granulation
PROC15	Use as laboratory reagent
PROC16	Use of fuels
PROC2	Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions
PROC3	Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition
PROC4	Chemical production where opportunity for exposure arises
PROC5	Mixing or blending in batch processes
PROC6	Calendering operations
PROC8a	Transfer of substance or mixture (charging and discharging) at non-dedicated facilities

Full text of use descriptors	
PROC8b	Transfer of substance or mixture (charging and discharging) at dedicated facilities
PROC9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product. It warns that the handling of any chemical substance requires the previous knowledge of its hazards for the user. It is up to the user of the product company providing this SDS to and promote the training of its employees about possible risks come upon of the product. The information contained herein is not absolute, but only general information on the use of the chemical and indication of safety and security measures.

Annex to the safety data sheet

Product exposure scenario(s)	
ES Type	**ES title**
Worker	Formulation or re-packing ; Formulation & (re)packing of substances and mixtures
Worker	Use at industrial sites ; Distribution of a substance
Worker	Use at industrial sites ; Intermediate use of the substance
Worker	Use at industrial sites ; Polymer production
Worker	Use at industrial sites , Polymer processing
Worker	Use at industrial sites ; Use as a fuel
Worker	Widespread use by professional workers ; Use as a fuel

1. Exposure scenario ES2

	Formulation or re-packing ; Formulation & (re)packing of substances and mixtures	
	ES Ref.: ES2 ES Type: Worker	Association ref code: ES2

Use descriptors	PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC14, PROC15 ERC2

2. Operational conditions and risk management measures

2.2. Contributing scenario controlling environmental exposure (ERC2)

Formulation	
ERC2	Formulation into mixture

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Amounts used	Maximum daily use at site	≤ 1 t/d
	Annual site tonnage	≤ 70 t/yr
	Percentage of tonnage used at regional scale:	10 %
Other given operational conditions affecting environmental exposure	Equipment cleaning and maintenance	No release to wastewater from process as such, wastewater emissions limited to release generated from final equipment cleaning step using water
	Indoor or outdoor use	Indoor use

Risk Management Measures		
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	Process efficiency:	Process optimized for highly efficient use of raw materials (very minimal environmental release)
	On-site treament of wastewater: Acclimated biological treatment	Acclimated biological treatment [Effectiveness Water: 70%]
	On-site treatment of off-air:	Upgrade of the system in place or additional air treatment measures [Effectiveness Air: 50%]. Typical measures to maintain workplace concentrations or airborne VOCs and particulates below respective OELS
Conditions and measures related to sewage treatment plant	Biological STP: Standard	95.44 %
	Discharge rate of Municipal STP	2000 m³/d
	Application of the STP sludge on agricultural soil:	Yes.

Risk Management Measures		
Conditions and measures related to external treatment of waste for disposal	Particular considerations on the waste treatment operations:	No (low risk)
	Receiving surface water flow rate	18000 m3/day

2.1.1. Contributing scenario controlling worker exposure (PROC1)

General exposures (closed systems)	
PROC1	Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	One hand face only (240 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed process without likelihood of exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	Not required
	General ventilation	Basic general ventilation (1-3 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.2. Contributing scenario controlling worker exposure (PROC2)

General exposures (closed systems) ; with sample collection ; With occasional controlled exposure	
PROC2	Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day

Operational conditions		
Human factors not influenced by risk management	Skin contact	Two hands face (480 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed continuous process with occasional controlled exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.3. Contributing scenario controlling worker exposure (PROC3)

General exposures (closed systems) ; Use in contained batch processes	
PROC3	Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 4 h/day
Human factors not influenced by risk management	Skin contact	One hand face only (240 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed continuous process with occasional controlled exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.4. Contributing scenario controlling worker exposure (PROC4)

General exposures (open systems) ; Batch process ; with sample collection ; With potential for aerosol generation	
PROC4	Chemical production where opportunity for exposure arises

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 1 h/day
Human factors not influenced by risk management	Skin contact	Two hands face (480 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.5. Contributing scenario controlling worker exposure (PROC3)

Batch processes at elevated temperatures ; Use in contained batch processes	
PROC3	Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %

Product characteristics	
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 4 h/day
Human factors not influenced by risk management	Skin contact	One hand face only (240 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed batch process with occasional controlled exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.6. Contributing scenario controlling worker exposure (PROC3)

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

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 4 h/day
Human factors not influenced by risk management	Skin contact	One hand face only (240 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed batch process with occasional controlled exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]

Risk Management Measures		
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.7. Contributing scenario controlling worker exposure (PROC15)

Laboratory activities	
PROC15	Use as laboratory reagent

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 4 h/day
Human factors not influenced by risk management	Skin contact	One hand face only (240 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.8. Contributing scenario controlling worker exposure (PROC8b)

Bulk transfers ; Dedicated facility	
PROC8b	Transfer of substance or mixture (charging and discharging) at dedicated facilities

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 1 h/day
Human factors not influenced by risk management	Skin contact	Two hands (960 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 95%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.9. Contributing scenario controlling worker exposure (PROC5)

Mixing operations (open systems) ; With potential for aerosol generation	
PROC5	Mixing or blending in batch processes

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 4 h/day
Human factors not influenced by risk management	Skin contact	Two hands face (480 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	Yes (Respirator with APF of 10) [Effectiveness Inhalation: 90%]

2.1.10. Contributing scenario controlling worker exposure (PROC8a)

Manual ; Transfer from/pouring from containers ; Non-dedicated facility	
PROC8a	Transfer of substance or mixture (charging and discharging) at non-dedicated facilities

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 4 h/day
Human factors not influenced by risk management	Skin contact	Two hands (960 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	Yes (Respirator with APF of 10) [Effectiveness Inhalation: 90%]

2.1.11. Contributing scenario controlling worker exposure (PROC8b)

Drum/batch transfers ; Dedicated facility	
PROC8b	Transfer of substance or mixture (charging and discharging) at dedicated facilities

Product characteristics	
Physical form of product	Liquid

Product characteristics	
Concentration of substance in product	≤ 25 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 4 h/day
Human factors not influenced by risk management	Skin contact	Two hands (960 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 95%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.12. Contributing scenario controlling worker exposure (PROC14)

tabletting, compression, extrusion or pelletisation	
PROC14	Tabletting, compression, extrusion, pelettisation, granulation

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 4 h/day
Human factors not influenced by risk management	Skin contact	Two hands face (480 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]

Risk Management Measures		
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	Yes (Respirator with APF of 10) [Effectiveness Inhalation: 90%]

2.1.13. Contributing scenario controlling worker exposure (PROC9)

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

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 4 h/day
Human factors not influenced by risk management	Skin contact	Two hands face (480 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	Yes (Respirator with APF of 10) [Effectiveness Inhalation: 90%]

2.1.14. Contributing scenario controlling worker exposure (PROC8a)

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

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 25 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 1 h/day
Human factors not influenced by risk management	Skin contact	Two hands (960 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.15. Contributing scenario controlling worker exposure (PROC1)

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

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	One hand face only (240 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed process without likelihood of exposure	
	Occupational Health and Safety Management System:	Advanced

Risk Management Measures		
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation	Not required
	General ventilation	Basic general ventilation (1-3 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.16. Contributing scenario controlling worker exposure (PROC2)

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

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	Two hands face (480 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed continuous process with occasional controlled exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

3. Exposure estimation and reference to its source

3.1. Health

Long-term - systemic effects						
DNEL			Inhalation: 8.4 mg/m³ Dermal: 40 mg/kg bodyweight/day			
Contributing scenario	**inhalation exposure**	**RCR**	**dermal exposure**	**RCR**	**Sum RCR**	**Assessment method**
PROC1	0.028 mg/m³	0.003	0.034 mg/kg bw/day	0.001	0.004	
PROC2	4.967 mg/m³	0.591	1.37 mg/kg bw/day	0.034	0.625	

Long-term - systemic effects						
PROC3	5.96 mg/m³	0.71	0.414 mg/kg bw/day	0.01	0.72	
PROC4	3.973 mg/m³	0.473	1.372 mg/kg bw/day	0.034	0.507	
PROC3	5.96 mg/m³	0.71	0.414 mg/kg bw/day	0.01	0.72	
PROC3	5.96 mg/m³	0.71	0.414 mg/kg bw/day	0.01	0.72	
PROC15	5.96 mg/m³	0.71	0.204 mg/kg bw/day	0.005	0.715	
PROC8b	2.98 mg/m³	0.355	2.742 mg/kg bw/day	0.069	0.424	
PROC5	2.98 mg/m³	0.355	8.226 mg/kg bw/day	0.206	0.561	
PROC8a	2.98 mg/m³	0.355	8.226 mg/kg bw/day	0.206	0.561	
PROC8b	5.364 mg/m³	0.639	4.936 mg/kg bw/day	0.123	0.762	
PROC14	2.98 mg/m³	0.355	2.058 mg/kg bw/day	0.051	0.406	
PROC9	2.384 mg/m³	0.284	4.116 mg/kg bw/day	0.103	0.387	
PROC8a	5.96 mg/m³	0.71	1.645 mg/kg bw/day	0.041	0.751	
PROC1	0.028 mg/m³	0.003	0.034 mg/kg bw/day	0.001	0.004	
PROC2	4.967 mg/m³	0.591	1.37 mg/kg bw/day	0.034	0.625	

3.2. Environment

Environmental exposure	Unit	Exposure estimation	PNEC	RCR	Assessment method
Freshwater	mg/l	0.00138	0.108	0.013	EUSES 2.1.2
Marine water	mg/l	0.000137	10.8	0.013	EUSES 2.1.2
Freshwater sediment	mg/kg dwt	0.022	1.75	0.013	EUSES v2.1
Marine water sediment	mg/kg dwt	0.00222	0.175	0.013	EUSES 2.1.2
Sewage treatment plant	mg/l	0.014	0.2	0.068	EUSES 2.1.2
Soil	mg/kg dwt	0.00264	0.286	0.009	EUSES 2.1.2

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

4.1. Health

No data available

4.2. Environment

No data available

Additional good practice advice beyond the REACH CSA

No data available

1. Exposure scenario ES3

	Use at industrial sites ; Distribution of a substance	
	ES Ref.: ES3 ES Type: Worker	Association ref code: ES3

Use descriptors	PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC9, PROC15 ERC7

2. Operational conditions and risk management measures

2.2. Contributing scenario controlling environmental exposure (ERC7)

Distribution of substance	
ERC7	Use of functional fluid at industrial site

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Amounts used	Maximum daily use at site	≤ 20 t/d
	Annual site tonnage	≤ 5460 t/yr
	Percentage of tonnage used at regional scale:	15 %
Other given operational conditions affecting environmental exposure	Equipment cleaning and maintenance	No release to wastewater from process as such, wastewater emissions limited to release generated from final equipment cleaning step using water
	Indoor or outdoor use	Covers indoor and outdoor use.

Risk Management Measures		
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	Process efficiency:	Process optimized for efficient use of raw materials
	On-site treament of wastewater: Acclimated biological treatment	Acclimated biological treatment [Effectiveness Water: 70%]
	On-site treatment of off-air:	Vapor recovery (adsorption) [Effectiveness Air: 90%]. Typical measures to maintain workplace concentrations or airborne VOCs and particulates below respective OELS
Conditions and measures related to sewage treatment plant	Biological STP: Standard	95.44 %
	Discharge rate of Municipal STP	≥ 2000 m³/d
	Application of the STP sludge on agricultural soil:	Yes.
Conditions and measures related to external treatment of waste for disposal	Particular considerations on the waste treatment operations:	No (low risk)
	Receiving surface water flow rate	18000 m3/day

2.1.1. Contributing scenario controlling worker exposure (PROC1)

General exposures (closed systems)	
PROC1	Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	One hand face only (240 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed process without likelihood of exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	Not required
	General ventilation	Basic general ventilation (1-3 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.2. Contributing scenario controlling worker exposure (PROC2)

General exposures (closed systems) ; with sample collection ; With occasional controlled exposure	
PROC2	Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	Two hands face (480 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed continuous process with occasional controlled exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.3. Contributing scenario controlling worker exposure (PROC3)

General exposures (closed systems) ; Use in contained batch processes	
PROC3	Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %

Product characteristics	
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 4 h/day
Human factors not influenced by risk management	Skin contact	One hand face only (240 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed batch process with occasional controlled exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.4. Contributing scenario controlling worker exposure (PROC4)

General exposures (open systems) ; Batch process ; with sample collection	
PROC4	Chemical production where opportunity for exposure arises

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 1 h/day
Human factors not influenced by risk management	Skin contact	Two hands face (480 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)

Risk Management Measures		
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.5. Contributing scenario controlling worker exposure (PROC3)

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

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 4 h/day
Human factors not influenced by risk management	Skin contact	One hand face only (240 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed batch process with occasional controlled exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.6. Contributing scenario controlling worker exposure (PROC15)

Laboratory activities	
PROC15	Use as laboratory reagent

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 4 h/day
Human factors not influenced by risk management	Skin contact	One hand face only (240 cm2)

Operational conditions		
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.7. Contributing scenario controlling worker exposure (PROC8b)

Bulk transfers ; Closed systems	
PROC8b	Transfer of substance or mixture (charging and discharging) at dedicated facilities

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 1 h/day
Human factors not influenced by risk management	Skin contact	Two hands (960 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 95%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.8. Contributing scenario controlling worker exposure (PROC8b)

Bulk transfers ; Open systems	
PROC8b	Transfer of substance or mixture (charging and discharging) at dedicated facilities

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 1 h/day
Human factors not influenced by risk management	Skin contact	Two hands (960 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Role of standard operating procedures in managing exposure :	Ensure material transfers are under containment or extract ventilation [E66] [Effectiveness Inhal: 90%]
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 95%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.9. Contributing scenario controlling worker exposure (PROC9)

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

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 4 h/day
Human factors not influenced by risk management	Skin contact	Two hands face (480 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Role of standard operating procedures in managing exposure :	Ensure material transfers are under containment or extract ventilation [E66] [Effectiveness Inhal: 90%]
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	Yes (Respirator with APF of 10) [Effectiveness Inhalation: 90%]

2.1.10. Contributing scenario controlling worker exposure (PROC8a)

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

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 25 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 1 h/day
Human factors not influenced by risk management	Skin contact	Two hands (960 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.11. Contributing scenario controlling worker exposure (PROC1)

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

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	One hand face only (240 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed process without likelihood of exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	Not required
	General ventilation	Basic general ventilation (1-3 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.12. Contributing scenario controlling worker exposure (PROC2)

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

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	Two hands face (480 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed continuous process with occasional controlled exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]

Risk Management Measures		
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

3. Exposure estimation and reference to its source

3.1. Health

Long-term - systemic effects						
DNEL			Inhalation: 8.4 mg/m³ Dermal: 40 mg/kg bodyweight/day			
Contributing scenario	**inhalation exposure**	**RCR**	**dermal exposure**	**RCR**	**Sum RCR**	**Assessment method**
PROC1	0.028 mg/m³	0.003	0.034 mg/kg bw/day	0.001	0.004	
PROC2	4.967 mg/m³	0.591	1.37 mg/kg bw/day	0.034	0.625	
PROC3	5.96 mg/m³	0.71	0.414 mg/kg bw/day	0.01	0.72	
PROC4	3.973 mg/m³	0.473	1.372 mg/kg bw/day	0.034	0.507	
PROC3	5.96 mg/m³	0.71	0.414 mg/kg bw/day	0.01	0.72	
PROC15	5.96 mg/m³	0.71	0.204 mg/kg bw/day	0.005	0.715	
PROC8b	2.98 mg/m³	0.355	2.742 mg/kg bw/day	0.069	0.424	
PROC8b	2.98 mg/m³	0.355	2.742 mg/kg bw/day	0.069	0.424	
PROC9	2.384 mg/m³	0.284	4.116 mg/kg bw/day	0.103	0.387	
PROC8a	5.96 mg/m³	0.71	1.645 mg/kg bw/day	0.041	0.751	
PROC1	0.028 mg/m³	0.003	0.034 mg/kg bw/day	0.001	0.004	
PROC2	4.967 mg/m³	0.591	1.37 mg/kg bw/day	0.034	0.625	

3.2. Environment

Environmental exposure	Unit	Exposure estimation	PNEC	RCR	Assessment method
Freshwater	mg/l	0.000145	0.108	0.001	EUSES 2.1.2
Marine water	mg/l	0.0000143	10.8	0.001	EUSES 2.1.2
Freshwater sediment	mg/kg dwt	0.00235	1.75	0.001	EUSES v2.1
Marine water sediment	mg/kg dwt	0.000232	0.175	0.001	EUSES 2.1.2
Sewage treatment plant	mg/l	0.00137	0.2	0.007	EUSES 2.1.2
Soil	mg/kg dwt	0.000272	0.286	0.001	EUSES 2.1.2

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

4.1. Health

No data available

4.2. Environment

No data available

Additional good practice advice beyond the REACH CSA

No data available

1. Exposure scenario ES4

	Use at industrial sites ; Intermediate use of the substance	
	ES Ref.: ES4 ES Type: Worker	Association ref code: ES4

Use descriptors	PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC15 ERC6a

2. Operational conditions and risk management measures

2.1.1. Contributing scenario controlling worker exposure (PROC3)

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

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 5 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	One hand face only (240 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed batch process with occasional controlled exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.2. Contributing scenario controlling environmental exposure (ERC6a)

Distribution of substance	
ERC6a	Use of intermediate

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Amounts used	Maximum daily use at site	≤ 3 t/d
	Annual site tonnage	≤ 700 t/yr
	Percentage of tonnage used at regional scale:	10 %
Other given operational conditions affecting environmental exposure	Equipment cleaning and maintenance	No release to wastewater from process as such, wastewater emissions limited to release generated from final equipment cleaning step using water
	Indoor or outdoor use	Indoor use

Risk Management Measures		
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	Process efficiency:	Process optimized for highly efficient use of raw materials (very minimal environmental release)
	On-site treament of wastewater: Acclimated biological treatment	Acclimated biological treatment [Effectiveness Water: 70%]
	On-site treatment of off-air:	Upgrade of the system in place or additional air treatment measures [Effectiveness Air: 50%]. Typical measures to maintain workplace concentrations or airborne VOCs and particulates below respective OELS
Conditions and measures related to sewage treatment plant	Biological STP: Standard	92.46 %
	Discharge rate of Municipal STP	≥ 2000 m³/d
	Application of the STP sludge on agricultural soil:	No
Conditions and measures related to external treatment of waste for disposal	Particular considerations on the waste treatment operations:	No (low risk)
	Receiving surface water flow rate	18000 m3/day

2.1.2. Contributing scenario controlling worker exposure (PROC1)

General exposures (closed systems)	
PROC1	Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	One hand face only (240 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed process without likelihood of exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	Not required
	General ventilation	Basic general ventilation (1-3 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.3. Contributing scenario controlling worker exposure (PROC2)

General exposures (closed systems) ; with sample collection	
PROC2	Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	Two hands face (480 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed continuous process with occasional controlled exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.4. Contributing scenario controlling worker exposure (PROC3)

General exposures (closed systems)	
PROC3	Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 4 h/day
Human factors not influenced by risk management	Skin contact	One hand face only (240 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed batch process with occasional controlled exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.5. Contributing scenario controlling worker exposure (PROC4)

General exposures (open systems)	
PROC4	Chemical production where opportunity for exposure arises

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %

Product characteristics	
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 1 h/day
Human factors not influenced by risk management	Skin contact	Two hands face (480 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.6. Contributing scenario controlling worker exposure (PROC8b)

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

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 1 h/day
Human factors not influenced by risk management	Skin contact	Two hands (960 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 95%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)

Risk Management Measures		
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.7. Contributing scenario controlling worker exposure (PROC15)

Laboratory activities	
PROC15	Use as laboratory reagent

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 4 h/day
Human factors not influenced by risk management	Skin contact	One hand face only (240 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.8. Contributing scenario controlling worker exposure (PROC8b)

Bulk transfers ; Open systems	
PROC8b	Transfer of substance or mixture (charging and discharging) at dedicated facilities

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 1 h/day
Human factors not influenced by risk management	Skin contact	Two hands (960 cm2)
	Operating temperature	≤ 40 °C

Operational conditions		
Other given operational conditions affecting workers exposure	Indoor use	

Risk Management Measures		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 95%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.9. Contributing scenario controlling worker exposure (PROC8b)

Bulk transfers ; Closed systems	
PROC8b	Transfer of substance or mixture (charging and discharging) at dedicated facilities

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 1 h/day
Human factors not influenced by risk management	Skin contact	Two hands (960 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 95%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.10. Contributing scenario controlling worker exposure (PROC8a)

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

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 25 %

Product characteristics	
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 1 h/day
Human factors not influenced by risk management	Skin contact	Two hands (960 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.11. Contributing scenario controlling worker exposure (PROC2)

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

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	Two hands face (480 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed continuous process with occasional controlled exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]

Risk Management Measures		
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

3. Exposure estimation and reference to its source

3.1. Health

Long-term - systemic effects						
DNEL			Inhalation: 8.4 mg/m³ Dermal: 40 mg/kg bodyweight/day			
Contributing scenario	**inhalation exposure**	**RCR**	**dermal exposure**	**RCR**	**Sum RCR**	**Assessment method**
PROC3	1.987 mg/m³	0.237	0.138 mg/kg bw/day	0.003	0.24	
PROC1	0.028 mg/m³	0.003	0.034 mg/kg bw/day	0.001	0.004	
PROC2	4.967 mg/m³	0.591	1.37 mg/kg bw/day	0.034	0.625	
PROC3	5.96 mg/m³	0.71	0.414 mg/kg bw/day	0.01	0.72	
PROC4	3.973 mg/m³	0.473	1.372 mg/kg bw/day	0.034	0.507	
PROC8b	2.98 mg/m³	0.355	2.742 mg/kg bw/day	0.069	0.424	
PROC15	5.96 mg/m³	0.71	0.204 mg/kg bw/day	0.005	0.715	
PROC8b	2.98 mg/m³	0.355	2.742 mg/kg bw/day	0.069	0.424	
PROC8b	2.98 mg/m³	0.355	2.742 mg/kg bw/day	0.069	0.424	
PROC8a	5.96 mg/m³	0.71	1.645 mg/kg bw/day	0.041	0.751	
PROC2	4.967 mg/m³	0.591	1.37 mg/kg bw/day	0.034	0.625	

3.2. Environment

Environmental exposure	Unit	Exposure estimation	PNEC	RCR	Assessment method
Freshwater	mg/l	0.01	0.108	0.093	EUSES 2.1.2
Marine water	mg/l	0.00102	10.8	0.094	EUSES 2.1.2
Freshwater sediment	mg/kg dwt	0.165	1.75	0.094	EUSES v2.1
Marine water sediment	mg/kg dwt	0.016	0.175	0.091	EUSES 2.1.2
Sewage treatment plant	mg/l	0.102	0.2	0.51	EUSES 2.1.2
Soil	mg/kg dwt	0.000143	0.286	0.001	EUSES 2.1.2

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

4.1. Health

No data available

4.2. Environment

No data available

Additional good practice advice beyond the REACH CSA

No data available

1. Exposure scenario ES5

	Use at industrial sites ; Polymer production	
	ES Ref.: ES5 ES Type: Worker	Association ref code: ES5

Use descriptors	PROC1, PROC2, PROC3, PROC4, PROC5, PROC6, PROC8a, PROC8b, PROC14 ERC6c

2. Operational conditions and risk management measures

2.2. Contributing scenario controlling environmental exposure (ERC6c)

Polymer production	
ERC6c	Use of monomer in polymerisation processes at industrial site (inclusion or not into/onto article)

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Amounts used	Maximum daily use at site	≤ 14 t/d
	Annual site tonnage	≤ 3990 t/yr
	Percentage of tonnage used at regional scale:	10 %

Risk Management Measures		
Conditions and measures related to sewage treatment plant	Biological STP: Standard	95.44 %
	Discharge rate of Municipal STP	2000 m³/d
	Application of the STP sludge on agricultural soil:	Yes.
Conditions and measures related to external treatment of waste for disposal	Particular considerations on the waste treatment operations:	No (low risk)
	Receiving surface water flow rate	18000 m3/day

2.1.1. Contributing scenario controlling worker exposure (PROC1)

General exposures (closed systems) ; Continuous process ; no sampling	
PROC1	Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day

Operational conditions		
Human factors not influenced by risk management	Skin contact	One hand face only (240 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed process without likelihood of exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	Not required
	General ventilation	Basic general ventilation (1-3 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.2. Contributing scenario controlling worker exposure (PROC8b)

Bulk transfers ; Transport; with sample collection	
PROC8b	Transfer of substance or mixture (charging and discharging) at dedicated facilities

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 1 h/day
Human factors not influenced by risk management	Skin contact	Two hands (960 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 95%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.3. Contributing scenario controlling worker exposure (PROC2)

polymerization (Bulk and batch) ; Continuous process ; with sample collection	
PROC2	Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	Two hands face (480 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed continuous process with occasional controlled exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.4. Contributing scenario controlling worker exposure (PROC3)

polymerization (Bulk and batch) ; Batch process ; with sample collection	
PROC3	Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition

Product characteristics	
Physical form of product	Liquid

Product characteristics	
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 4 h/day
Human factors not influenced by risk management	Skin contact	One hand face only (240 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed batch process with occasional controlled exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.5. Contributing scenario controlling worker exposure (PROC3)

polymerization (Bulk and batch) ; Batch process ; with sample collection ; elevated temperature	
PROC3	Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 4 h/day
Human factors not influenced by risk management	Skin contact	One hand face only (240 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed batch process with occasional controlled exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]

Risk Management Measures		
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.6. Contributing scenario controlling worker exposure (PROC3)

Finishing operations ; Batch process ; with sample collection	
PROC3	Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 5 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	One hand face only (240 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed batch process with occasional controlled exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.7. Contributing scenario controlling worker exposure (PROC4)

Intermediate polymer storage	
PROC4	Chemical production where opportunity for exposure arises

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 5 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	Two hands face (480 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.1. Contributing scenario controlling worker exposure (PROC3)

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

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 5 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	One hand face only (240 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed batch process with occasional controlled exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.9. Contributing scenario controlling worker exposure (PROC5)

Mixing in containers ; Batch process	
PROC5	Mixing or blending in batch processes

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 5 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 4 h/day
Human factors not influenced by risk management	Skin contact	Two hands face (480 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.10. Contributing scenario controlling worker exposure (PROC6)

Pelletizing ; Extrusion and masterbatching	
PROC6	Calendering operations

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 5 %

Product characteristics	
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 4 h/day
Human factors not influenced by risk management	Skin contact	Two hands (960 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.11. Contributing scenario controlling worker exposure (PROC14)

Pelletizing	
PROC14	Tabletting, compression, extrusion, pelettisation, granulation

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 5 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 4 h/day
Human factors not influenced by risk management	Skin contact	Two hands face (480 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)

Risk Management Measures		
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.12. Contributing scenario controlling worker exposure (PROC8b)

Pelletisation and pellet screening ; (open systems)	
PROC8b	Transfer of substance or mixture (charging and discharging) at dedicated facilities

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 5 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	Two hands (960 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 95%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.13. Contributing scenario controlling worker exposure (PROC3)

Bulk transfers ; Continuous process ; with sample collection	
PROC3	Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 5 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	One hand face only (240 cm2)

Operational conditions		
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed batch process with occasional controlled exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.14. Contributing scenario controlling worker exposure (PROC8b)

Transport ; with sample collection	
PROC8b	Transfer of substance or mixture (charging and discharging) at dedicated facilities

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 5 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	Two hands (960 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 95%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.15. Contributing scenario controlling worker exposure (PROC8a)

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

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 25 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 4 h/day
Human factors not influenced by risk management	Skin contact	Two hands (960 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	Yes (Respirator with APF of 10) [Effectiveness Inhalation: 90%]

2.1.16. Contributing scenario controlling worker exposure (PROC2)

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

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	Two hands face (480 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed continuous process with occasional controlled exposure	
	Occupational Health and Safety Management System:	Advanced

Risk Management Measures		
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

3. Exposure estimation and reference to its source

3.1. Health

Long-term - systemic effects						
DNEL			Inhalation: 8.4 mg/m³ Dermal: 40 mg/kg bodyweight/day			
Contributing scenario	**inhalation exposure**	**RCR**	**dermal exposure**	**RCR**	**Sum RCR**	**Assessment method**
PROC1	0.028 mg/m³	0.003	0.034 mg/kg bw/day	0.001	0.004	
PROC8b	2.98 mg/m³	0.355	2.742 mg/kg bw/day	0.069	0.424	
PROC2	4.967 mg/m³	0.591	1.37 mg/kg bw/day	0.034	0.625	
PROC3	5.96 mg/m³	0.71	0.414 mg/kg bw/day	0.01	0.72	
PROC3	5.96 mg/m³	0.71	0.414 mg/kg bw/day	0.01	0.72	
PROC3	1.987 mg/m³	0.237	0.138 mg/kg bw/day	0.003	0.24	
PROC4	3.973 mg/m³	0.473	1.372 mg/kg bw/day	0.034	0.507	
PROC3	1.987 mg/m³	0.237	0.138 mg/kg bw/day	0.003	0.24	
PROC5	5.96 mg/m³	0.71	1.645 mg/kg bw/day	0.041	0.751	
PROC6	5.96 mg/m³	0.71	3.292 mg/kg bw/day	0.082	0.792	
PROC14	5.96 mg/m³	0.71	0.412 mg/kg bw/day	0.01	0.72	
PROC8b	2.98 mg/m³	0.355	2.742 mg/kg bw/day	0.069	0.424	
PROC3	1.987 mg/m³	0.237	0.138 mg/kg bw/day	0.003	0.24	
PROC8b	2.98 mg/m³	0.355	2.742 mg/kg bw/day	0.069	0.424	
PROC8a	1.788 mg/m³	0.213	4.936 mg/kg bw/day	0.123	0.336	
PROC2	4.967 mg/m³	0.591	1.37 mg/kg bw/day	0.034	0.625	

3.2. Environment

Environmental exposure	Unit	Exposure estimation	PNEC	RCR	Assessment method
Freshwater	mg/l	0.00958	0.108	0.089	EUSES 2.1.2
Marine water	mg/l	0.000958	10.8	0.089	EUSES 2.1.2
Freshwater sediment	mg/kg dwt	0.155	1.75	0.089	EUSES v2.1
Marine water sediment	mg/kg dwt	0.016	0.175	0.089	EUSES 2.1.2
Sewage treatment plant	mg/l	0.096	0.2	0.48	EUSES 2.1.2
Soil	mg/kg dwt	0.018	0.286	0.063	EUSES 2.1.2

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

4.1. Health

No data available

4.2. Environment

No data available

Additional good practice advice beyond the REACH CSA

No data available

1. Exposure scenario ES6

	Use at industrial sites , Polymer processing	
	ES Ref.: ES6 ES Type: Worker	Association ref code: ES6

Use descriptors	PROC1, PROC2, PROC3, PROC4, PROC5, PROC6, PROC8a, PROC8b, PROC9, PROC13, PROC14, PROC15 ERC4

2. Operational conditions and risk management measures

2.2. Contributing scenario controlling environmental exposure (ERC4)

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

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Amounts used	Maximum daily use at site	≤ 50 t/d
	Annual site tonnage	≤ 525 t/yr
	Percentage of tonnage used at regional scale:	10 %
Other given operational conditions affecting environmental exposure	Equipment cleaning and maintenance	No release to wastewater form process as such
	Indoor or outdoor use	Indoor use

Risk Management Measures		
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	Process efficiency:	Process optimized for highly efficient use of raw materials (very minimal environmental release)
	On-site treament of wastewater: Acclimated biological treatment	Acclimated biological treatment [Effectiveness Water: 70%]
	On-site treatment of off-air:	Upgrade of the system in place or additional air treatment measures [Effectiveness Air: 50%]. Typical measures to maintain workplace concentrations or airborne VOCs and particulates below respective OELS
Conditions and measures related to sewage treatment plant	Biological STP: Standard	95.44 %
	Discharge rate of Municipal STP	2000 m³/d
	Application of the STP sludge on agricultural soil:	Yes.
Conditions and measures related to external treatment of waste for disposal	Particular considerations on the waste treatment operations:	No (low risk)
	Receiving surface water flow rate	18000 m3/day

2.1.1. Contributing scenario controlling worker exposure (PROC1)

Bulk transfers , Closed systems	
PROC1	Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	One hand face only (240 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed process without likelihood of exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	Not required
	General ventilation	Basic general ventilation (1-3 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.2. Contributing scenario controlling worker exposure (PROC2)

Bulk transfers , Closed systems ; With occasional controlled exposure	
PROC2	Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 1 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	Two hands face (480 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed continuous process with occasional controlled exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	Not required
	General ventilation	70 % Enhanced general ventilation (5-10 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.3. Contributing scenario controlling worker exposure (PROC8b)

Bulk transfers ; Dedicated facility	
PROC8b	Transfer of substance or mixture (charging and discharging) at dedicated facilities

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 1 %

Product characteristics	
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	Two hands (960 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 95%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.4. Contributing scenario controlling worker exposure (PROC1)

Bulk weighing ; Closed systems	
PROC1	Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 1 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	One hand face only (240 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed process without likelihood of exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	Not required
	General ventilation	Basic general ventilation (1-3 air changes per hour)
	Dermal Protection:	No

Risk Management Measures		
Conditions and measures related to personal protection, hygiene and health evaluation	Respiratory protection:	No

2.1.5. Contributing scenario controlling worker exposure (PROC2)

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

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	Two hands face (480 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed continuous process with occasional controlled exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	Not required
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.6. Contributing scenario controlling worker exposure (PROC9)

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

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 1 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	Two hands face (480 cm2)

Operational conditions		
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.7. Contributing scenario controlling worker exposure (PROC3)

Additive premixing ; Closed systems	
PROC3	Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 1 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	One hand face only (240 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed batch process with occasional controlled exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.8. Contributing scenario controlling worker exposure (PROC4)

Additive premixing ; Open systems ; with sample collection	
PROC4	Chemical production where opportunity for exposure arises

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 1 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	Two hands face (480 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.9. Contributing scenario controlling worker exposure (PROC5)

Additive premixing ; General exposures (open systems)	
PROC5	Mixing or blending in batch processes

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 1 %

Product characteristics	
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	Two hands face (480 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.10. Contributing scenario controlling worker exposure (PROC8b)

Bulk transfers ; Drum/batch transfers	
PROC8b	Transfer of substance or mixture (charging and discharging) at dedicated facilities

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 1 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	Two hands (960 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 95%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)

Risk Management Measures		
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.11. Contributing scenario controlling worker exposure (PROC9)

Bulk transfers ; Small package filling	
PROC9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 1 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	Two hands face (480 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.12. Contributing scenario controlling worker exposure (PROC6)

Calendering (including Banburys)	
PROC6	Calendering operations

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 1 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	Two hands (960 cm2)
	Operating temperature	≤ 40 °C

Operational conditions		
Other given operational conditions affecting workers exposure	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.13. Contributing scenario controlling worker exposure (PROC13)

Production of articles by dipping and pouring	
PROC13	Treatment of articles by dipping and pouring

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 1 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	Two hands face (480 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.14. Contributing scenario controlling worker exposure (PROC14)

Extrusion and masterbatching	
PROC14	Tabletting, compression, extrusion, pelettisation, granulation

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 1 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	Two hands face (480 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.15. Contributing scenario controlling worker exposure (PROC14)

Injection moulding of articles	
PROC14	Tabletting, compression, extrusion, pelettisation, granulation

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 1 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	Two hands face (480 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]

Risk Management Measures		
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.16. Contributing scenario controlling worker exposure (PROC8a)

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

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 1 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	Two hands (960 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.17. Contributing scenario controlling worker exposure (PROC2)

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

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 1 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	Two hands face (480 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed continuous process with occasional controlled exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	Not required
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

3. Exposure estimation and reference to its source

3.1. Health

Long-term - systemic effects						
DNEL			Inhalation: 8.4 mg/m³ Dermal: 40 mg/kg bodyweight/day			
Contributing scenario	**inhalation exposure**	**RCR**	**dermal exposure**	**RCR**	**Sum RCR**	**Assessment method**
PROC1	0.028 mg/m³	0.003	0.034 mg/kg bw/day	0.001	0.004	
PROC2	2.129 mg/m³	0.253	0.137 mg/kg bw/day	0.003	0.256	
PROC8b	1.49 mg/m³	0.177	1.371 mg/kg bw/day	0.034	0.211	
PROC1	0.00284 mg/m³	0	0.0034 mg/kg bw/day	0	0	
PROC2	4.967 mg/m³	0.591	0.137 mg/kg bw/day	0.003	0.594	
PROC9	3.973 mg/m³	0.473	0.069 mg/kg bw/day	0.002	0.475	
PROC3	0.993 mg/m³	0.118	0.0069 mg/kg bw/day	0	0.118	
PROC4	1.987 mg/m³	0.237	0.686 mg/kg bw/day	0.017	0.254	
PROC5	4.967 mg/m³	0.591	1.371 mg/kg bw/day	0.034	0.625	
PROC8b	1.49 mg/m³	0.177	1.371 mg/kg bw/day	0.034	0.211	
PROC9	3.973 mg/m³	0.473	0.686 mg/kg bw/day	0.017	0.49	

Long-term - systemic effects						
PROC6	4.967 mg/m³	0.591	0.274 mg/kg bw/day	0.007	0.598	
PROC13	4.967 mg/m³	0.591	1.371 mg/kg bw/day	0.034	0.625	
PROC14	4.967 mg/m³	0.591	0.343 mg/kg bw/day	0.009	0.6	
PROC14	4.967 mg/m³	0.591	0.343 mg/kg bw/day	0.009	0.6	
PROC8a	4.967 mg/m³	0.591	1.371 mg/kg bw/day	0.034	0.625	
PROC2	4.967 mg/m³	0.591	0.137 mg/kg bw/day	0.003	0.594	

3.2. Environment

Environmental exposure	Unit	Exposure estimation	PNEC	RCR	Assessment method
Freshwater	mg/l	0.00000844	0.108	0	EUSES 2.1.2
Marine water	mg/l	0.00000067	10.8	0	EUSES 2.1.2
Freshwater sediment	mg/kg dwt	0.000137	1.75	0	EUSES v2.1
Marine water sediment	mg/kg dwt	0.0000109	0.175	0	EUSES 2.1.2
Sewage treatment plant	mg/l	0	0.2	0	EUSES 2.1.2
Soil	mg/kg dwt	0.00301	0.286	0.011	EUSES 2.1.2

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

4.1. Health

No data available

4.2. Environment

No data available

Additional good practice advice beyond the REACH CSA

No data available

1. Exposure scenario ES7

	Use at industrial sites ; Use as a fuel	
	ES Ref.: ES7 ES Type: Worker	Association ref code: ES7

Use descriptors	PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC16 ERC7

2. Operational conditions and risk management measures

2.2. Contributing scenario controlling environmental exposure (ERC7)

Distribution of substance	
ERC7	Use of functional fluid at industrial site

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Amounts used	Maximum daily use at site	≤ 1 t/d
	Annual site tonnage	≤ 84 t/yr
	Percentage of tonnage used at regional scale:	10 %

Risk Management Measures		
Conditions and measures related to sewage treatment plant	Biological STP: Standard	95.44 %
	Discharge rate of Municipal STP	≥ 2000 m³/d
	Application of the STP sludge on agricultural soil:	Yes.
Conditions and measures related to external treatment of waste for disposal	Particular considerations on the waste treatment operations:	No (low risk)
	Receiving surface water flow rate	18000 m3/day

2.1.1. Contributing scenario controlling worker exposure (PROC4)

Bulk transfers	
PROC4	Chemical production where opportunity for exposure arises

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 1 h/day
Human factors not influenced by risk management	Skin contact	Two hands face (480 cm2)

Operational conditions		
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.2. Contributing scenario controlling worker exposure (PROC8b)

Drum/batch transfers	
PROC8b	Transfer of substance or mixture (charging and discharging) at dedicated facilities

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 1 h/day
Human factors not influenced by risk management	Skin contact	Two hands (960 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 95%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.3. Contributing scenario controlling worker exposure (PROC1)

General exposures (closed systems)	
PROC1	Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	One hand face only (240 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed process without likelihood of exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	Not required
	General ventilation	Basic general ventilation (1-3 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.4. Contributing scenario controlling worker exposure (PROC2)

General exposures (closed systems) ; With occasional controlled exposure	
PROC2	Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %

Product characteristics	
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	Two hands face (480 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed continuous process with occasional controlled exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	Basic general ventilation (1-3 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.5. Contributing scenario controlling worker exposure (PROC3)

General exposures (closed systems) ; Batch process	
PROC3	Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 4 h/day
Human factors not influenced by risk management	Skin contact	One hand face only (240 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed batch process with occasional controlled exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)

Risk Management Measures		
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.6. Contributing scenario controlling worker exposure (PROC16)

General exposures (open systems) ; (closed systems)	
PROC16	Use of fuels

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	One hand face only (240 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.7. Contributing scenario controlling worker exposure (PROC3)

General exposures (open systems) ; (open systems)	
PROC3	Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 4 h/day
Human factors not influenced by risk management	Skin contact	One hand face only (240 cm2)
	Operating temperature	≤ 40 °C

Operational conditions		
Other given operational conditions affecting workers exposure	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed batch process with occasional controlled exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.8. Contributing scenario controlling worker exposure (PROC8a)

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

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 4 h/day
Human factors not influenced by risk management	Skin contact	Two hands (960 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	Yes (Respirator with APF of 10) [Effectiveness Inhalation: 90%]

2.1.9. Contributing scenario controlling worker exposure (PROC8a)

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

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 4 h/day
Human factors not influenced by risk management	Skin contact	Two hands (960 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	Yes (Respirator with APF of 10) [Effectiveness Inhalation: 90%]

2.1.10. Contributing scenario controlling worker exposure (PROC1)

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

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %

Product characteristics	
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	One hand face only (240 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed process without likelihood of exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	Not required
	General ventilation	Basic general ventilation (1-3 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.11. Contributing scenario controlling worker exposure (PROC2)

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

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	Two hands face (480 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed continuous process with occasional controlled exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Advanced
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)

Risk Management Measures		
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

3. Exposure estimation and reference to its source

3.1. Health

Long-term - systemic effects						
DNEL			Inhalation: 8.4 mg/m³ Dermal: 40 mg/kg bodyweight/day			
Contributing scenario	**inhalation exposure**	**RCR**	**dermal exposure**	**RCR**	**Sum RCR**	**Assessment method**
PROC4	3.973 mg/m³	0.473	1.372 mg/kg bw/day	0.034	0.507	
PROC8b	2.98 mg/m³	0.355	2.742 mg/kg bw/day	0.069	0.424	
PROC1	0.028 mg/m³	0.003	0.034 mg/kg bw/day	0.001	0.004	
PROC2	7.096 mg/m³	0.845	1.37 mg/kg bw/day	0.034	0.879	
PROC3	5.96 mg/m³	0.71	0.414 mg/kg bw/day	0.01	0.72	
PROC16	4.967 mg/m³	0.591	0.34 mg/kg bw/day	0.009	0.6	
PROC3	5.96 mg/m³	0.71	0.414 mg/kg bw/day	0.01	0.72	
PROC8a	2.98 mg/m³	0.355	8.226 mg/kg bw/day	0.206	0.561	
PROC8a	2.98 mg/m³	0.355	8.226 mg/kg bw/day	0.206	0.561	
PROC1	0.028 mg/m³	0.003	0.034 mg/kg bw/day	0.001	0.004	
PROC2	4.967 mg/m³	0.591	1.37 mg/kg bw/day	0.034	0.625	

3.2. Environment

Environmental exposure	Unit	Exposure estimation	PNEC	RCR	Assessment method
Freshwater	mg/l	0.0000312	0.108	0	EUSES 2.1.2
Marine water	mg/l	0.00000295	10.8	0	EUSES 2.1.2
Freshwater sediment	mg/kg dwt	0.000506	1.75	0	EUSES v2.1
Marine water sediment	mg/kg dwt	0.0000478	0.175	0	EUSES 2.1.2
Sewage treatment plant	mg/l	0.000228	0.2	0.001	EUSES 2.1.2
Soil	mg/kg dwt	0.0000471	0.286	0	EUSES 2.1.2

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

4.1. Health

No data available

4.2. Environment

No data available

Additional good practice advice beyond the REACH CSA

No data available

1. Exposure scenario ES8

	Widespread use by professional workers ; Use as a fuel	
	ES Ref.: ES8 ES Type: Worker	Association ref code: ES8

Use descriptors	PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC16 ERC9a, ERC9b

2. Operational conditions and risk management measures

2.2. Contributing scenario controlling environmental exposure (ERC9a, ERC9b)

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

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Amounts used	Daily local widespread use amount (t/day)	≤ 0.00066 t/d
	Percentage of tonnage used at regional scale:	10 %

Risk Management Measures		
Conditions and measures related to sewage treatment plant	Biological STP: Standard	95.44 %
Conditions and measures related to external treatment of waste for disposal	Particular considerations on the waste treatment operations:	No (low risk)

2.1.1. Contributing scenario controlling worker exposure (PROC4)

Bulk transfers	
PROC4	Chemical production where opportunity for exposure arises

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 0.25 h/day
Human factors not influenced by risk management	Skin contact	Two hands face (480 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Basic
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No. Yes (Respirator with APF of 10) [Effectiveness Inhalation: 90%]

2.1.2. Contributing scenario controlling worker exposure (PROC8b)

Drum/batch transfers	
PROC8b	Transfer of substance or mixture (charging and discharging) at dedicated facilities

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 1 h/day
Human factors not influenced by risk management	Skin contact	Two hands (960 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Basic
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	Yes (Respirator with APF of 10) [Effectiveness Inhalation: 90%]

2.1.3. Contributing scenario controlling worker exposure (PROC8b)

Dipping, immersion and pouring	
PROC8b	Transfer of substance or mixture (charging and discharging) at dedicated facilities

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa

Product characteristics	
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 1 h/day
Human factors not influenced by risk management	Skin contact	Two hands (960 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Basic
	Local exhaust ventilation	yes [Effectiveness Inhal: 90%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	Yes (Respirator with APF of 10) [Effectiveness Inhalation: 90%]

2.1.4. Contributing scenario controlling worker exposure (PROC1)

General exposures (closed systems)	
PROC1	Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	One hand face only (240 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed process without likelihood of exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Basic
	Local exhaust ventilation	Not required
	General ventilation	Basic general ventilation (1-3 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.5. Contributing scenario controlling worker exposure (PROC2)

General exposures (closed systems) ; With occasional controlled exposure	
PROC2	Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 1 h/day
Human factors not influenced by risk management	Skin contact	Two hands face (480 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed continuous process with occasional controlled exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Basic
	Local exhaust ventilation	yes [Effectiveness Inhal: 80%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.6. Contributing scenario controlling worker exposure (PROC3)

General exposures (open systems) ; (closed systems) ; Batch process	
PROC3	Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 25 %

Product characteristics	
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 1 h/day
Human factors not influenced by risk management	Skin contact	One hand face only (240 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed batch process with occasional controlled exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Basic
	Local exhaust ventilation	yes [Effectiveness Inhal: 80%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

2.1.7. Contributing scenario controlling worker exposure (PROC16)

General exposures (open systems) ; (closed systems)	
PROC16	Use of fuels

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 5 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	One hand face only (240 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Basic
	Local exhaust ventilation	yes [Effectiveness Inhal: 80%]
	General ventilation	30 % Good general ventilation (3-5 air changes per hour)
	Dermal Protection:	No

Risk Management Measures		
Conditions and measures related to personal protection, hygiene and health evaluation	Respiratory protection:	No

2.1.8. Contributing scenario controlling worker exposure (PROC8a)

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

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 25 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 1 h/day
Human factors not influenced by risk management	Skin contact	Two hands (960 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Basic
	Local exhaust ventilation	Not required
	General ventilation	70 % Good general ventilation (3-5 air changes per hour). Enhanced general ventilation (5-10 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	Yes (Respirator with APF of 10) [Effectiveness Inhalation: 90%]

2.1.9. Contributing scenario controlling worker exposure (PROC8a)

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

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 25 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 1 h/day

Operational conditions		
Human factors not influenced by risk management	Skin contact	Two hands (960 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Basic
	Local exhaust ventilation	Not required
	General ventilation	70 % Good general ventilation (3-5 air changes per hour). Enhanced general ventilation (5-10 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	Yes (Respirator with APF of 10) [Effectiveness Inhalation: 90%]

2.1.10. Contributing scenario controlling worker exposure (PROC1)

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

Product characteristics	
Physical form of product	Liquid
Concentration of substance in product	≤ 100 %
Vapour pressure	63397 Pa
Viscosity, dynamic	0 mPa·s

Operational conditions		
Frequency and duration of use	Duration of activity	≤ 8 h/day
Human factors not influenced by risk management	Skin contact	One hand face only (240 cm2)
Other given operational conditions affecting workers exposure	Operating temperature	≤ 40 °C
	Indoor use	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Closed process without likelihood of exposure	
Technical conditions and measures to control dispersion from source towards the worker	Occupational Health and Safety Management System:	Basic
	Local exhaust ventilation	Not required
	General ventilation	Basic general ventilation (1-3 air changes per hour)
Conditions and measures related to personal protection, hygiene and health evaluation	Dermal Protection:	No
	Respiratory protection:	No

3. Exposure estimation and reference to its source

3.1. Health

Long-term - systemic effects						
DNEL			Inhalation: 8.4 mg/m³ Dermal: 40 mg/kg bodyweight/day			
Contributing scenario	**inhalation exposure**	**RCR**	**dermal exposure**	**RCR**	**Sum RCR**	**Assessment method**
PROC4	4.967 mg/m³	0.591	0.686 mg/kg bw/day	0.017	0.608	
PROC8b	0.993 mg/m³	0.118	2.742 mg/kg bw/day	0.069	0.187	
PROC8b	0.993 mg/m³	0.118	2.742 mg/kg bw/day	0.069	0.187	
PROC1	0.284 mg/m³	0.034	0.034 mg/kg bw/day	0.001	0.035	
PROC2	3.973 mg/m³	0.473	0.274 mg/kg bw/day	0.007	0.48	
PROC3	4.768 mg/m³	0.568	0.083 mg/kg bw/day	0.002	0.57	
PROC16	3.973 mg/m³	0.473	0.068 mg/kg bw/day	0.002	0.475	
PROC8a	5.109 mg/m³	0.608	1.645 mg/kg bw/day	0.041	0.649	
PROC8a	5.109 mg/m³	0.608	1.645 mg/kg bw/day	0.041	0.649	
PROC1	0.284 mg/m³	0.034	0.034 mg/kg bw/day	0.001	0.035	

3.2. Environment

Environmental exposure	Unit	Exposure estimation	PNEC	RCR	Assessment method
Freshwater	mg/l	0.0000836	0.108	0.001	EUSES 2.1.2
Marine water	mg/l	0.00000819	10.8	0.001	EUSES 2.1.2
Freshwater sediment	mg/kg dwt	0.00135	1.75	0.001	EUSES v2.1
Marine water sediment	mg/kg dwt	0.000133	0.175	0.001	EUSES 2.1.2
Sewage treatment plant	mg/l	0.000145	0.2	0.001	EUSES 2.1.2
Soil	mg/kg dwt	0.000145	0.286	0.001	EUSES 2.1.2

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

4.1. Health

No data available

4.2. Environment

No data available

Additional good practice advice beyond the REACH CSA

No data available