

Safety data sheet

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BASF Safety data sheet according to Regulation UK SI 2019/758 and UK SI 2020/1577 as amended from time to time.

Date / Revised: 16.01.2023

Version: 10.0

Date previous version: 13.04.2021

Previous version: 9.0

Date / First version: 03.07.2002

Product: **N-BUTYLENE-1,2-OXIDE**

(ID no. 30054229/SDS_GEN_GB/EN)

Date of print 04.07.2026

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

1.1. Product identifier

N-BUTYLENE-1,2-OXIDE

Chemical name: 1,2-epoxy-n-butane

CAS Number: 106-88-7

REACH registration number: 01-2119449161-46-0000

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

Relevant identified uses: Chemical, Intermediate, Monomer.

For the detailed identified uses of the product see appendix of the safety data sheet.

1.3. Details of the supplier of the safety data sheet

Company:

BASF SE
67056 Ludwigshafen
GERMANY

Contact address:

BASF plc
4th and 5th Floors, 2 Stockport Exchange
Railway Road, Stockport, SK1 3GG
UNITED KINGDOM

Telephone: +44 161 475 3000

E-mail address: product-safety-uk-and-ireland@basf.com

1.4. Emergency telephone number

International emergency number:

Telephone: +49 180 2273-112

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SECTION 2: Hazards Identification

2.1. Classification of the substance or mixture

According to GB-CLP Regulations UK SI 2019/720 and UK SI 2020/1567

Flam. Liq. 2	H225 Highly flammable liquid and vapour.
Acute Tox. 4 (Inhalation - vapour)	H332 Harmful if inhaled.
Acute Tox. 4 (oral)	H302 Harmful if swallowed.
Acute Tox. 4 (dermal)	H312 Harmful in contact with skin.
Skin Corr./Irrit. 2	H315 Causes skin irritation.
Eye Dam./Irrit. 2	H319 Causes serious eye irritation.
Carc. 2	H351 Suspected of causing cancer.
STOT SE 3	H335 May cause respiratory irritation.
Aquatic Chronic 3	H412 Harmful to aquatic life with long lasting effects.

For the classifications not written out in full in this section the full text can be found in section 16.

2.2. Label elements

According to GB-CLP Regulations UK SI 2019/720 and UK SI 2020/1567

Pictogram:



Signal Word:

Danger

Hazard Statement:

H225	Highly flammable liquid and vapour.
H319	Causes serious eye irritation.
H315	Causes skin irritation.
H335	May cause respiratory irritation.
H351	Suspected of causing cancer.
H302 + H312 + H332	Harmful if swallowed, in contact with skin or if inhaled
H412	Harmful to aquatic life with long lasting effects.

Precautionary Statements (Prevention):

P280	Wear protective gloves, protective clothing and eye protection or face protection.
P271	Use only outdoors or in a well-ventilated area.

Precautionary Statements (Response):

P312	Call a POISON CENTER or physician if you feel unwell.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

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Precautionary Statements (Storage):

P403 + P235 Store in a well-ventilated place. Keep cool.

Precautionary Statements (Disposal):

P501 Dispose of contents and container to hazardous or special waste collection point.

2.3. Other hazards

According to GB-CLP Regulations UK SI 2019/720 and UK SI 2020/1567

If applicable information is provided in this section on other hazards which do not result in classification but which may contribute to the overall hazards of the substance or mixture.

The product does not contain a substance above legal limits fulfilling the PBT (persistent/bioaccumulative/toxic) criteria or the vPvB (very persistent/very bioaccumulative) criteria.

SECTION 3: Composition/Information on Ingredients

3.1. Substances

Chemical nature

1,2-epoxybutane

CAS Number: 106-88-7

EC-Number: 203-438-2

INDEX-Number: 603-102-00-9

For the classifications not written out in full in this section, including the hazard classes and the hazard statements, the full text is listed in section 16.

3.2. Mixtures

Not applicable

SECTION 4: First-Aid Measures

4.1. Description of first aid measures

First aid personnel should pay attention to their own safety. If the patient is likely to become unconscious, place and transport in stable sideways position (recovery position). Immediately remove contaminated clothing.

If inhaled:

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Keep patient calm, remove to fresh air, seek medical attention.

On skin contact:

Wash thoroughly with soap and water

On contact with eyes:

Wash affected eyes for at least 15 minutes under running water with eyelids held open, consult an eye specialist.

On ingestion:

Immediately rinse mouth and then drink 200-300 ml of water, seek medical attention.

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

Symptoms: Information, i.e. additional information on symptoms and effects may be included in the GHS labeling phrases available in Section 2 and in the Toxicological assessments available in Section 11.

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

Treatment: Treat according to symptoms (decontamination, vital functions), no known specific antidote.

SECTION 5: Fire-Fighting Measures

5.1. Extinguishing media

Suitable extinguishing media:

water spray, dry powder, alcohol-resistant foam, carbon dioxide

5.2. Special hazards arising from the substance or mixture

Advice: Vapours may form explosive mixture with air.

5.3. Advice for fire-fighters

Special protective equipment:

Wear self-contained breathing apparatus and chemical-protective clothing.

Further information:

The degree of risk is governed by the burning substance and the fire conditions. Contaminated extinguishing water must be disposed of in accordance with official regulations.

SECTION 6: Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Personal protection: wear a tightly closed chemical protection suit and a self-contained breathing apparatus.

6.2. Environmental precautions

Do not discharge into drains/surface waters/groundwater.

6.3. Methods and material for containment and cleaning up

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For large amounts: Pump off product.

For residues: Pick up with suitable absorbent material (e.g. sand, sawdust, general-purpose binder, kieselguhr). Dispose of absorbed material in accordance with regulations.

6.4. Reference to other sections

Information regarding exposure controls/personal protection and disposal considerations can be found in section 8 and 13.

SECTION 7: Handling and Storage

7.1. Precautions for safe handling

Ensure thorough ventilation of stores and work areas. Handle in protective atmosphere.

Protection against fire and explosion:

Prevent electrostatic charge - sources of ignition should be kept well clear - fire extinguishers should be kept handy. Vapours may form explosive mixture with air.

7.2. Conditions for safe storage, including any incompatibilities

Segregate from acids and bases.

Further information on storage conditions: Keep under inert gas. Keep container tightly closed in a cool, well-ventilated place.

7.3. Specific end use(s)

See exposure scenario(s) in the attachment to this safety data sheet.

SECTION 8: Exposure Controls/Personal Protection

8.1. Control parameters

Components with occupational exposure limits

No occupational exposure limits known.

PNEC

freshwater: 0.07 mg/l

marine water: 0.007 mg/l

intermittent release: 0.7 mg/l

STP: 9 mg/l

| sediment (freshwater): 0.0859 mg/kg

soil: 0.0335 mg/kg

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oral (secondary poisoning):
No hazard identified.

DNEL

worker:

Long-term exposure - systemic and local effects, Inhalation: 3 mg/m³

The value corresponds to a DMEL.

8.2. Exposure controls

Appropriate engineering controls

Exhaust fans should be explosion proof.

Personal protective equipment

Respiratory protection:

Self-contained breathing apparatus.

Hand protection:

Chemical resistant protective gloves (EN ISO 374-1)

Suitable materials for short-term contact (recommended: At least protective index 2, corresponding > 30 minutes of permeation time according to EN ISO 374-1)

butyl rubber (butyl) - 0.7 mm coating thickness

Manufacturer's directions for use should be observed because of great diversity of types.

Supplementary note: The specifications are based on tests, literature data and information of glove manufacturers or are derived from similar substances by analogy. Due to many conditions (e.g. temperature) it must be considered, that the practical usage of a chemical-protective glove in practice may be much shorter than the permeation time determined through testing.

Eye protection:

Safety glasses with side-shields (frame goggles) (e.g. EN 166)

Body protection:

Body protection must be chosen depending on activity and possible exposure, e.g. apron, protecting boots, chemical-protection suit (according to EN 14605 in case of splashes or EN ISO 13982 in case of dust).

General safety and hygiene measures

Wearing of closed work clothing is required additionally to the stated personal protection equipment.

Avoid all contact with the substance.

SECTION 9: Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Form: liquid
Colour: colourless, clear

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Odour:	sweetish	
Odour threshold:	not determined	
pH value:	not applicable	
solidification temperature:	-129.5 °C	(other)
Boiling point:	63.4 °C (1,013.25 hPa)	(measured)
Flash point:	-25.5 °C	
Evaporation rate:	Value can be approximated from Henry's Law Constant or vapor pressure.	
Flammability:	Highly flammable.	(derived from flash - and boiling point)
Lower explosion limit:	3.9 %(V) (-25.5 °C, 40 hPa) For liquids not relevant for classification and labelling.	(BASF method)
Upper explosion limit:	20.6 %(V) (12.5 °C, 206.6 hPa) For liquids not relevant for classification and labelling.	(, air)
Ignition temperature:	370 °C	(DIN 51794)
Vapour pressure:	227 hPa (24 °C) dynamic	(measured)
Density:	0.83 g/cm ³ (20 °C)	(ISO 2811-1)
Relative density:	0.83 (20 °C)	(ISO 2811-1)
Relative vapour density (air):	not determined	
Solubility in water:	86.8 g/l (25 °C)	
Solubility (qualitative) solvent(s):	polar solvents soluble	
Partitioning coefficient n-octanol/water (log Kow):	0.68 (25 °C)	(measured)
Self ignition:	Based on its structural properties the product is not classified as self-igniting.	Test type: Spontaneous self-ignition at room-temperature.
Thermal decomposition:	385 °C, > 1,000 J/g, (internal method) Exothermic reaction above the indicated temperature.	
Viscosity, dynamic:	0.421 mPa.s (20 °C)	
Viscosity, kinematic:	0.51 mm ² /s (20 °C)	

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Explosion hazard: Based on the chemical structure there is no indication of explosive properties.

Fire promoting properties: not fire-propagating

9.2. Other information

Self heating ability: It is not a substance capable of spontaneous heating.

pKA:

The substance does not dissociate.

Adsorption/water - soil: KOC: 20.43; log KOC: 1.3 (calculated)

Surface tension:

Based on chemical structure, surface activity is not to be expected.

Grain size distribution: The substance / product is marketed or used in a non solid or granular form.

Molar mass: 72.11 g/mol

SECTION 10: Stability and Reactivity

10.1. Reactivity

Corrosion to metals: No corrosive effect on metal.

Formation of flammable gases: Remarks: Forms no flammable gases in the presence of water.

10.2. Chemical stability

The product is stable if stored and handled as prescribed/indicated.

10.3. Possibility of hazardous reactions

Risk of polymerization.

The product is chemically stable.

10.4. Conditions to avoid

Avoid humidity.

10.5. Incompatible materials

Substances to avoid:

acids, bases, organometal salts, strong oxidizing agents

10.6. Hazardous decomposition products

Hazardous decomposition products:

No hazardous decomposition products if stored and handled as prescribed/indicated.

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SECTION 11: Toxicological Information

11.1. Information on toxicological effects

Acute toxicity

Assessment of acute toxicity:

Of moderate toxicity after short-term inhalation. Of moderate toxicity after short-term skin contact. Of moderate toxicity after single ingestion.

Experimental/calculated data:

LD50 rat (oral): approx. 900 mg/kg (BASF-Test)

LC50 rat (by inhalation): > 6.3 mg/l 4 h (BASF-Test)

No mortality was observed. The vapour was tested.

LD50 rabbit (dermal): 1,469 mg/kg

Irritation

Assessment of irritating effects:

Skin contact causes irritation. Eye contact causes irritation. Causes temporary irritation of the respiratory tract.

Experimental/calculated data:

Skin corrosion/irritation

rabbit: non-irritant (Draize test)

The European Union (EU) has classified this substance with 'H315: Causes skin irritation.'

Serious eye damage/irritation

rabbit: Irritant. (BASF-Test)

Respiratory/Skin sensitization

Assessment of sensitization:

Skin sensitizing effects were not observed in animal studies.

Experimental/calculated data:

Guinea pig maximization test guinea pig: Non-sensitizing. (similar to OECD guideline 406)

Germ cell mutagenicity

Assessment of mutagenicity:

Mutagenic properties can not be excluded on the basis of experimental data.

Carcinogenicity

Assessment of carcinogenicity:

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Indication of possible carcinogenic effect in animal tests. IARC (International Agency for Research on Cancer) has classified this substance as group 2B (The agent is possibly carcinogenic to humans).

Reproductive toxicity

Assessment of reproduction toxicity:

No data available. The chemical structure does not suggest a specific alert for such an effect.

Developmental toxicity

Assessment of teratogenicity:

No indications of a developmental toxic / teratogenic effect were seen in animal studies.

Specific target organ toxicity (single exposure)

Assessment of STOT single:

Causes temporary irritation of the respiratory tract.

Repeated dose toxicity and Specific target organ toxicity (repeated exposure)

Assessment of repeated dose toxicity:

After repeated exposure the prominent effect is local irritation.

Aspiration hazard

not applicable

Other relevant toxicity information

neurotoxic effect.

SECTION 12: Ecological Information

12.1. Toxicity

Assessment of aquatic toxicity:

Acutely harmful for aquatic organisms. The inhibition of the degradation activity of activated sludge is not anticipated when introduced to biological treatment plants in appropriate low concentrations.

Toxicity to fish:

LC50 (96 h) > 100 - < 215 mg/l, *Leuciscus idus* (DIN 38412 Part 15, static)

Nominal concentration.

Aquatic invertebrates:

EC50 (48 h) 70 mg/l, *Daphnia magna* (Directive 84/449/EEC, C.2, static)

Nominal concentration.

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Aquatic plants:

EC50 (72 h) > 500 mg/l (growth rate), *Scenedesmus subspicatus* (DIN 38412 Part 9)

Nominal concentration.

Microorganisms/Effect on activated sludge:

EC20 (0.5 h) approx. 160 mg/l, (OECD Guideline 209)

Chronic toxicity to fish:

No data available.

Chronic toxicity to aquatic invertebrates:

No data available.

Assessment of terrestrial toxicity:

No data available.

Soil living organisms:

No data available.

Terrestrial plants:

No data available.

Other terrestrial non-mammals:

No data available.

12.2. Persistence and degradability

Assessment biodegradation and elimination (H₂O):

Readily biodegradable (according to OECD criteria).

Elimination information:

80 - 90 % CO₂ formation relative to the theoretical value (28 d) (ISO 14593) (aerobic, activated sludge, domestic, non-adapted)

Assessment of stability in water:

No data available.

Information on Stability in Water (Hydrolysis):

No data available.

12.3. Bioaccumulative potential

Assessment bioaccumulation potential:

Because of the n-octanol/water distribution coefficient (log Pow) accumulation in organisms is not to be expected.

Bioaccumulation potential:

No data available.

12.4. Mobility in soil

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Assessment transport between environmental compartments:

Volatility: The substance will slowly evaporate into the atmosphere from the water surface.

Adsorption in soil: Adsorption to solid soil phase is not expected.

12.5. Results of PBT and vPvB assessment

According to Annex XIII of Regulation (EC) No.1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH): The product does not fulfill the criteria for PBT (Persistent/bioaccumulative/toxic) and vPvB (very persistent/very bioaccumulative). Self classification

12.6. Other adverse effects

The substance is not listed in Regulation (EC) 1005/2009 on substances that deplete the ozone layer.

SECTION 13: Disposal Considerations

13.1. Waste treatment methods

Incinerate in suitable incineration plant, observing local authority regulations.

The UK Environmental Protection (Duty of Care) Regulations (EP) and amendments should be noted (United Kingdom).

This product and any uncleaned containers must be disposed of as hazardous waste in accordance with the 2005 Hazardous Waste Regulations and amendments (United Kingdom)

Contaminated packaging:

Uncontaminated packaging can be re-used.

Packs that cannot be cleaned should be disposed of in the same manner as the contents.

SECTION 14: Transport Information

Land transport

ADR

UN number or ID number: UN3022

UN proper shipping name: 1,2-BUTYLENE OXIDE, STABILIZED

Transport hazard class(es): 3

Packing group: II

Environmental hazards: no

Special precautions for user: Tunnel code: D/E

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RID

UN number or ID number: UN3022
UN proper shipping name: 1,2-BUTYLENE OXIDE, STABILIZED
Transport hazard class(es): 3
Packing group: II
Environmental hazards: no
Special precautions for user: None known

Inland waterway transport

ADN

UN number or ID number: UN3022
UN proper shipping name: 1,2-BUTYLENE OXIDE, STABILIZED
Transport hazard class(es): 3
Packing group: II
Environmental hazards: no
Special precautions for user: None known

Transport in inland waterway vessel

Not evaluated

Sea transport

IMDG

UN number or ID number: UN 3022
UN proper shipping name: 1,2-BUTYLENE OXIDE, STABILIZED
Transport hazard class(es): 3
Packing group: II
Environmental hazards: no
Marine pollutant: NO
Special precautions for user:

Air transport

IATA/ICAO

UN number or ID number: UN 3022
UN proper shipping name: 1,2-BUTYLENE OXIDE, STABILIZED
Transport hazard class(es): 3
Packing group: II
Environmental hazards: No Mark as dangerous for the environment is needed

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Special precautions for user: None known

14.1. UN number or ID number

See corresponding entries for "UN number or ID number" for the respective regulations in the tables above.

14.2. UN proper shipping name

See corresponding entries for "UN proper shipping name" for the respective regulations in the tables above.

14.3. Transport hazard class(es)

See corresponding entries for "Transport hazard class(es)" for the respective regulations in the tables above.

14.4. Packing group

See corresponding entries for "Packing group" for the respective regulations in the tables above.

14.5. Environmental hazards

See corresponding entries for "Environmental hazards" for the respective regulations in the tables above.

14.6. Special precautions for user

See corresponding entries for "Special precautions for user" for the respective regulations in the tables above.

14.7. Maritime transport in bulk according to IMO instruments

Regulation:	IBC-Code
Product name:	1,2-Butylene oxide
Pollution category:	Y
Ship Type:	3

Further information

This product is subject to the most recent edition of "The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations" and their amendments (United Kingdom).

SECTION 15: Regulatory Information

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

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Prohibitions, Restrictions and Authorizations

Annex XVII of Regulation (EC) No 1907/2006: Number on List: 3, 40, 75

Directive 2012/18/EU - Control of Major Accident Hazards involving dangerous substances (EU):
List entry in regulation: P5b

The data should be considered when making any assessment under the Control of Substances Hazardous to Health Regulations (COSHH), and related guidance, for example, 'COSHH Essentials' (United Kingdom).

This product may be subject to the Control of Major Accident Hazards Regulations (COMAH), and amendments if specific threshold tonnages are exceeded (United Kingdom).

If other regulatory information applies that is not already provided elsewhere in this safety data sheet, then it is described in this subsection.

15.2. Chemical Safety Assessment

Chemical Safety Assessment performed

SECTION 16: Other Information

Assessment of the hazard classes according to UN GHS criteria (most recent version)

Acute Tox. 4 (oral)
Acute Tox. 4 (dermal)
Acute Tox. 4 (Inhalation - vapour)
Carc. 2
Skin Corr./Irrit. 2
Eye Dam./Irrit. 2A
Aquatic Acute 3
Flam. Liq. 2
STOT SE 3 (irritating to respiratory system)
Aquatic Chronic 3

Full text of the classifications, including the hazard classes and the hazard statements, if mentioned in section 2 or 3:

Flam. Liq.	Flammable liquids
Acute Tox.	Acute toxicity
Skin Corr./Irrit.	Skin corrosion/irritation
Eye Dam./Irrit.	Serious eye damage/eye irritation
Carc.	Carcinogenicity
STOT SE	Specific target organ toxicity — single exposure
Aquatic Chronic	Hazardous to the aquatic environment - chronic
H225	Highly flammable liquid and vapour.
H319	Causes serious eye irritation.
H315	Causes skin irritation.
H335	May cause respiratory irritation.

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H351	Suspected of causing cancer.
H302 + H312 + H332	Harmful if swallowed, in contact with skin or if inhaled
H412	Harmful to aquatic life with long lasting effects.

Abbreviations

ADR = The European Agreement concerning the International Carriage of Dangerous Goods by Road.
 ADN = The European Agreement concerning the International Carriage of Dangerous Goods by Inland waterways. ATE = Acute Toxicity Estimates. CAO = Cargo Aircraft Only. CAS = Chemical Abstract Service. CLP = Classification, Labelling and Packaging of substances and mixtures. DIN = German national organization for standardization. DNEL = Derived No Effect Level. EC50 = Effective concentration median for 50% of the population. EC = European Community. EN = European Standards. IARC = International Agency for Research on Cancer. IATA = International Air Transport Association. IBC-Code = Intermediate Bulk Container code. IMDG = International Maritime Dangerous Goods Code. ISO = International Organization for Standardization. STEL = Short-Term Exposure Limit. LC50 = Lethal concentration median for 50% of the population. LD50 = Lethal dose median for 50% of the population. TLV = Threshold Limit Value. MARPOL = The International Convention for the Prevention of Pollution from Ships. NEN = Dutch Norm. NOEC = No Observed Effect Concentration. OEL = Occupational Exposure Limit. OECD = Organization for Economic Cooperation and Development. PBT = Persistent, Bioaccumulative and Toxic. PNEC = Predicted No Effect Level. PPM = Parts per million. RID = The European Agreement concerning the International Carriage of Dangerous Goods by Rail. TWA = Time Weight Average. UN-number = UN number at transport. vPvB = very Persistent and very Bioaccumulative.

The data contained in this safety data sheet are based on our current knowledge and experience and describe the product only with regard to safety requirements. This safety data sheet is neither a Certificate of Analysis (CoA) nor technical data sheet and shall not be mistaken for a specification agreement. Identified uses in this safety data sheet do neither represent an agreement on the corresponding contractual quality of the substance/mixture nor a contractually designated use. It is the responsibility of the recipient of the product to ensure any proprietary rights and existing laws and legislation are observed.

Vertical lines in the left hand margin indicate an amendment from the previous version.

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(ID no. 30054229/SDS_GEN_GB/EN)

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Annex: Exposure Scenarios

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1. Short title of exposure scenario

Production

SU3; ERC1; PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC15

Control of exposure and risk management measures

Contributing exposure scenario	
Use descriptors covered	ERC1: Manufacture of the substance
Operational conditions	
Annual amount per site	12,000 t
Minimum emission days per year Continuous	300
Emission factor air	0.001 %
Emission factor water	0.001 %
Emission factor soil	0.001 %
Receive Surf. Water (Flow Rate).	726 m3/s
Dilution factor river	186
Other Factors: Environment	Indoor use.
Risk Management Measures	
Type of STP	onsite STP
Assumed sewage treatment plant flow (m3/d)	335,890 m3/d

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Exposure estimate and reference to its source	
Maximum amount of safe use	6,043.5 t/d
Risk from environmental exposure is driven by freshwater sediment.	

Contributing exposure scenario	
Use descriptors covered	PROC1: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions. Use domain: industrial
Operational conditions	
Concentration of the substance	1,2-epoxybutane Content: >= 0 % - <= 100 %
Physical state	Liquid, high fugacity
Vapour pressure of the substance during use	227 hPa
Duration and Frequency of activity	> 240 min <= 34 weeks per year
Indoor/Outdoor	Indoor
Assumes activities are at ambient temperature.	
Exposure estimate and reference to its source	
PROC1	
Assessment method	ECETOC TRA v2.0 Worker; modified version, The concentration of the substance has been considered using a linear approach., ECETOC TRA modified version: Reduction factor for local exhaust ventilation (LEV) has not been used for the calculation of dermal exposure estimates., ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, long-term - systemic
Exposure estimate	0.03 mg/m ³
Risk Characterization Ratio (RCR)	0.01
PROC1	
Assessment method	ECETOC TRA v2.0 Worker; modified version, The concentration of the substance has been considered using a linear approach., ECETOC TRA modified version: Reduction factor for local exhaust ventilation (LEV) has not been used for the calculation of dermal exposure estimates., ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, short-term - systemic
Exposure estimate	0.06 mg/m ³
Risk Characterization Ratio (RCR)	0.02

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Contributing exposure scenario	
Use descriptors covered	PROC2: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions Covered by PROC 1 and PROC 8b Use domain: industrial
Contributing exposure scenario	
Use descriptors covered	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 Use domain: industrial
Operational conditions	
Concentration of the substance	1,2-epoxybutane Content: $\geq 0\%$ - $\leq 100\%$
Physical state	Liquid, high fugacity
Vapour pressure of the substance during use	227 hPa
Duration and Frequency of activity	> 240 min ≤ 34 weeks per year
Indoor/Outdoor	Indoor
Assumes activities are at ambient temperature.	
Risk Management Measures	
Provide extract ventilation to points where emissions occur (LEV).	Effectiveness: 90 %
Wear suitable respiratory protection.	
Avoid frequent and direct contact with substance. Ensure minimization of manual phases Clean equipment and the work area every day. Supervision in place to check that the RMMs in place are being used correctly and OCs followed.	
Use suitable chemically resistant gloves. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin.	
Risk Management Measures are based on qualitative risk characterisation.	
Exposure estimate and reference to its source	
PROC3, PROC4	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.

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	Worker - inhalation, long-term - systemic
Exposure estimate	0.75 mg/m ³
Risk Characterization Ratio (RCR)	0.25
PROC3, PROC4	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, short-term - systemic
Exposure estimate	1.5 mg/m ³
Risk Characterization Ratio (RCR)	0.5
Guidance to Downstream Users	
For scaling see: http://www.ecetoc.org/tra	

Contributing exposure scenario	
Use descriptors covered	PROC5: Mixing or blending in batch processes PROC8a: Transfer of substance or mixture (charging and discharging) at non-dedicated facilities PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing).
Operational conditions	
Concentration of the substance	1,2-epoxybutane Content: >= 0 % - <= 100 %
Physical state	Liquid, high fugacity
Vapour pressure of the substance during use	227 hPa
Duration and Frequency of activity	60 min 240 days per year
Indoor/Outdoor	Indoor
Assumes activities are at ambient temperature.	
Risk Management Measures	
Provide extract ventilation to points where emissions occur (LEV).	Effectiveness: 90 %
Wear suitable respiratory protection.	Effectiveness: 97.5 %
Avoid frequent and direct contact with substance. Ensure minimization of manual phases Clean equipment and the work area every day. Supervision in place to check that the RMMs in place are being used correctly and OCs followed.	
Use suitable chemically resistant gloves. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin.	
Risk Management Measures are based on qualitative risk characterisation.	

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Exposure estimate and reference to its source	
PROC5, PROC8a	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, long-term - systemic
Exposure estimate	0.38 mg/m ³
Risk Characterization Ratio (RCR)	0.125
PROC5, PROC8a	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, short-term - systemic
Exposure estimate	1.88 mg/m ³
Risk Characterization Ratio (RCR)	0.625
PROC9	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, long-term - systemic
Exposure estimate	0.3 mg/m ³
Risk Characterization Ratio (RCR)	0.1
PROC9	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, short-term - systemic
Exposure estimate	1.5 mg/m ³
Risk Characterization Ratio (RCR)	0.5
Guidance to Downstream Users	
For scaling see: http://www.ecetoc.org/tra	

Contributing exposure scenario	
Use descriptors covered	PROC8b: Transfer of substance or mixture (charging and discharging) at dedicated facilities PROC15: Use a laboratory reagent. Use domain: industrial
Operational conditions	
Concentration of the substance	1,2-epoxybutane Content: >= 0 % - <= 100 %
Physical state	Liquid, high fugacity
Vapour pressure of the substance during use	227 hPa
Duration and Frequency of activity	240 min 240 days per year
Indoor/Outdoor	Indoor
Assumes activities are at ambient temperature.	

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Risk Management Measures	
Provide extract ventilation to points where emissions occur (LEV).	Effectiveness: 90 %
Wear suitable respiratory protection.	Effectiveness: 97.5 %
Avoid frequent and direct contact with substance. Ensure minimization of manual phases Clean equipment and the work area every day. Supervision in place to check that the RMMs in place are being used correctly and OCs followed.	
Use suitable chemically resistant gloves. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin.	
Risk Management Measures are based on qualitative risk characterisation.	
Exposure estimate and reference to its source	
PROC8b	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, long-term - systemic
Exposure estimate	0.20 mg/m ³
Risk Characterization Ratio (RCR)	0.0675
PROC8b	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, short-term - systemic
Exposure estimate	0.68 mg/m ³
Risk Characterization Ratio (RCR)	0.225
PROC15	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, long-term - systemic
Exposure estimate	0.23 mg/m ³
Risk Characterization Ratio (RCR)	0.075
PROC15	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, short-term - systemic
Exposure estimate	0.75 mg/m ³
Risk Characterization Ratio (RCR)	0.25
Guidance to Downstream Users	
For scaling see: http://www.ecetoc.org/tra	

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2. Short title of exposure scenario

Formulation & (re)packing of substances and mixtures

SU3; ERC2; PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC15

Control of exposure and risk management measures

Contributing exposure scenario	
Use descriptors covered	ERC2: Formulation into mixture
Operational conditions	
Annual amount per site	200,000 kg
Minimum emission days per year Continuous	100
Emission factor air	0.001 %
Emission factor water	0.10 %
Emission factor soil	0.01 %
	Negligible wastewater emissions as process operates without water contact.
Receive Surf. Water (Flow Rate).	18,000 m3/d
Dilution factor river	10
Dilution factor coast	100
Risk Management Measures	
Treat air emissions to provide a typical removal efficiency of (%)	> 99 %
Air treatment measures considered suitable are, e.g.	Waste gas treatment by thermal oxidation
Treat wastewater (prior to discharge to STP) to provide the required removal efficiency of (%)	>= 99.9 %
Type of STP	Municipal STP
Total effec. of removal from wastewater after RMMs and STP(%)	99.9 %
Assumed sewage treatment plant flow (m3/d)	2,000 m3/d
Exposure estimate and reference to its source	
Assessment method	ECETOC TRA v2.0 Environment
Risk Characterization Ratio (RCR)	0.7712
	Risk from environmental exposure is driven by freshwater sediment.
Maximum amount of safe use	2,593 kg
Risk from environmental exposure is driven by freshwater sediment.	

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Contributing exposure scenario	
Use descriptors covered	PROC1: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions. Use domain: industrial
Operational conditions	
Concentration of the substance	1,2-epoxybutane Content: $\geq 0\%$ - $\leq 100\%$
Physical state	Liquid, high fugacity
Vapour pressure of the substance during use	227 hPa
Duration and Frequency of activity	> 240 min ≤ 34 weeks per year
Indoor/Outdoor	Indoor
	Assumes activities are at ambient temperature.
Exposure estimate and reference to its source	
PROC1	
Assessment method	ECETOC TRA v2.0 Worker; modified version, The concentration of the substance has been considered using a linear approach., ECETOC TRA modified version: Reduction factor for local exhaust ventilation (LEV) has not been used for the calculation of dermal exposure estimates., ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, long-term - systemic
Exposure estimate	0.03 mg/m ³
Risk Characterization Ratio (RCR)	0.01
PROC1	
Assessment method	ECETOC TRA v2.0 Worker; modified version, The concentration of the substance has been considered using a linear approach., ECETOC TRA modified version: Reduction factor for local exhaust ventilation (LEV) has not been used for the calculation of dermal exposure estimates., ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, short-term - systemic
Exposure estimate	0.06 mg/m ³
Risk Characterization Ratio (RCR)	0.02
Contributing exposure scenario	
Use descriptors covered	PROC2: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions Covered by PROC 1 and PROC 8b Use domain: industrial

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Contributing exposure scenario	
Use descriptors covered	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 Use domain: industrial
Operational conditions	
Concentration of the substance	1,2-epoxybutane Content: >= 0 % - <= 100 %
Physical state	Liquid, high fugacity
Vapour pressure of the substance during use	227 hPa
Duration and Frequency of activity	> 240 min <= 34 weeks per year
Indoor/Outdoor	Indoor
	Assumes activities are at ambient temperature.
Risk Management Measures	
Provide extract ventilation to points where emissions occur (LEV).	Effectiveness: 90 %
Wear suitable respiratory protection.	
Avoid frequent and direct contact with substance. Ensure minimization of manual phases Clean equipment and the work area every day. Supervision in place to check that the RMMs in place are being used correctly and OCs followed.	
Use suitable chemically resistant gloves. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin.	
Risk Management Measures are based on qualitative risk characterisation.	
Exposure estimate and reference to its source	
PROC3, PROC4	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, long-term - systemic
Exposure estimate	0.75 mg/m ³
Risk Characterization Ratio (RCR)	0.25
PROC3, PROC4	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has

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	been used for respiratory protection.
	Worker - inhalation, short-term - systemic
Exposure estimate	1.5 mg/m ³
Risk Characterization Ratio (RCR)	0.5
Guidance to Downstream Users	
For scaling see: http://www.ecetoc.org/tra	

Contributing exposure scenario	
Use descriptors covered	PROC5: Mixing or blending in batch processes PROC8a: Transfer of substance or mixture (charging and discharging) at non-dedicated facilities PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing).
Operational conditions	
Concentration of the substance	1,2-epoxybutane Content: >= 0 % - <= 100 %
Physical state	Liquid, high fugacity
Vapour pressure of the substance during use	227 hPa
Duration and Frequency of activity	60 min 240 days per year
Indoor/Outdoor	Indoor
Assumes activities are at ambient temperature.	
Risk Management Measures	
Provide extract ventilation to points where emissions occur (LEV).	Effectiveness: 90 %
Wear suitable respiratory protection.	Effectiveness: 97.5 %
Avoid frequent and direct contact with substance. Ensure minimization of manual phases Clean equipment and the work area every day. Supervision in place to check that the RMMs in place are being used correctly and OCs followed.	
Use suitable chemically resistant gloves. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin.	
Risk Management Measures are based on qualitative risk characterisation.	
Exposure estimate and reference to its source	
PROC5, PROC8a	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, long-term - systemic

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Exposure estimate	0.38 mg/m ³
Risk Characterization Ratio (RCR)	0.125
PROC5, PROC8a	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, short-term - systemic
Exposure estimate	1.88 mg/m ³
Risk Characterization Ratio (RCR)	0.625
PROC9	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, long-term - systemic
Exposure estimate	0.3 mg/m ³
Risk Characterization Ratio (RCR)	0.1
PROC9	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, short-term - systemic
Exposure estimate	1.5 mg/m ³
Risk Characterization Ratio (RCR)	0.5
Guidance to Downstream Users	
For scaling see: http://www.ecetoc.org/tra	

Contributing exposure scenario	
Use descriptors covered	PROC8b: Transfer of substance or mixture (charging and discharging) at dedicated facilities PROC15: Use a laboratory reagent. Use domain: industrial
Operational conditions	
Concentration of the substance	1,2-epoxybutane Content: >= 0 % - <= 100 %
Physical state	Liquid, high fugacity
Vapour pressure of the substance during use	227 hPa
Duration and Frequency of activity	240 min 240 days per year
Indoor/Outdoor	Indoor
	Assumes activities are at ambient temperature.
Risk Management Measures	
Provide extract ventilation to points where emissions occur (LEV).	Effectiveness: 90 %
Wear suitable respiratory protection.	Effectiveness: 97.5 %
Avoid frequent and direct contact with substance. Ensure minimization of	

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manual phases Clean equipment and the work area every day. Supervision in place to check that the RMMs in place are being used correctly and OCs followed.	
Use suitable chemically resistant gloves. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin.	
Risk Management Measures are based on qualitative risk characterisation.	
Exposure estimate and reference to its source	
PROC8b	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, long-term - systemic
Exposure estimate	0.20 mg/m ³
Risk Characterization Ratio (RCR)	0.0675
PROC8b	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, short-term - systemic
Exposure estimate	0.68 mg/m ³
Risk Characterization Ratio (RCR)	0.225
PROC15	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, long-term - systemic
Exposure estimate	0.23 mg/m ³
Risk Characterization Ratio (RCR)	0.075
PROC15	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, short-term - systemic
Exposure estimate	0.75 mg/m ³
Risk Characterization Ratio (RCR)	0.25
Guidance to Downstream Users	
For scaling see: http://www.ecetoc.org/tra	

3. Short title of exposure scenario

Use as an intermediate, Use in chemical synthesis

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SU3; ERC6a; PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC15

Control of exposure and risk management measures

Contributing exposure scenario	
Use descriptors covered	ERC6a: Use of intermediate
Operational conditions	
Annual amount per site	400,000 kg
Minimum emission days per year Continuous	20
Emission factor air	0.001 %
Emission factor water	0.10 %
Emission factor soil	0.10 %
	Negligible wastewater emissions as process operates without water contact.
Receive Surf. Water (Flow Rate).	18,000 m3/d
Dilution factor river	10
Dilution factor coast	100
Risk Management Measures	
Treat air emissions to provide a typical removal efficiency of (%)	> 99 %
Air treatment measures considered suitable are, e.g.	Waste gas treatment by thermal oxidation
Treat wastewater (prior to discharge to STP) to provide the required removal efficiency of (%)	>= 99.9 %
Type of STP	Municipal STP
Total effc. of removal from wastewater after RMMs and STP(%)	99.9 %
Assumed sewage treatment plant flow (m3/d)	2,000 m3/d
Exposure estimate and reference to its source	
Assessment method	ECETOC TRA v2.0 Environment
Risk Characterization Ratio (RCR)	0.3865
	Risk from environmental exposure is driven by freshwater sediment.
Maximum amount of safe use	2,588 kg
Risk from environmental exposure is driven by freshwater sediment.	

Contributing exposure scenario	
Use descriptors covered	PROC1: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions. Use domain: industrial

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Operational conditions	
Concentration of the substance	1,2-epoxybutane Content: $\geq 0\%$ - $\leq 100\%$
Physical state	Liquid, high fugacity
Vapour pressure of the substance during use	227 hPa
Duration and Frequency of activity	> 240 min ≤ 34 weeks per year
Indoor/Outdoor	Indoor
	Assumes activities are at ambient temperature.
Exposure estimate and reference to its source	
PROC1	
Assessment method	ECETOC TRA v2.0 Worker; modified version, The concentration of the substance has been considered using a linear approach., ECETOC TRA modified version: Reduction factor for local exhaust ventilation (LEV) has not been used for the calculation of dermal exposure estimates., ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, long-term - systemic
Exposure estimate	0.03 mg/m ³
Risk Characterization Ratio (RCR)	0.01
PROC1	
Assessment method	ECETOC TRA v2.0 Worker; modified version, The concentration of the substance has been considered using a linear approach., ECETOC TRA modified version: Reduction factor for local exhaust ventilation (LEV) has not been used for the calculation of dermal exposure estimates., ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, short-term - systemic
Exposure estimate	0.06 mg/m ³
Risk Characterization Ratio (RCR)	0.02
Contributing exposure scenario	
Use descriptors covered	PROC2: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions Covered by PROC 1 and PROC 8b Use domain: industrial
Contributing exposure scenario	
Use descriptors covered	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

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	opportunity for exposure arises Use domain: industrial
Operational conditions	
Concentration of the substance	1,2-epoxybutane Content: >= 0 % - <= 100 %
Physical state	Liquid, high fugacity
Vapour pressure of the substance during use	227 hPa
Duration and Frequency of activity	> 240 min <= 34 weeks per year
Indoor/Outdoor	Indoor
	Assumes activities are at ambient temperature.
Risk Management Measures	
Provide extract ventilation to points where emissions occur (LEV).	Effectiveness: 90 %
Wear suitable respiratory protection.	
Avoid frequent and direct contact with substance. Ensure minimization of manual phases Clean equipment and the work area every day. Supervision in place to check that the RMMs in place are being used correctly and OCs followed.	
Use suitable chemically resistant gloves. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin.	
Risk Management Measures are based on qualitative risk characterisation.	
Exposure estimate and reference to its source	
PROC3, PROC4	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, long-term - systemic
Exposure estimate	0.75 mg/m ³
Risk Characterization Ratio (RCR)	0.25
PROC3, PROC4	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, short-term - systemic
Exposure estimate	1.5 mg/m ³
Risk Characterization Ratio (RCR)	0.5
Guidance to Downstream Users	
For scaling see: http://www.ecetoc.org/tra	

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Contributing exposure scenario	
Use descriptors covered	PROC5: Mixing or blending in batch processes PROC8a: Transfer of substance or mixture (charging and discharging) at non-dedicated facilities PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing).
Operational conditions	
Concentration of the substance	1,2-epoxybutane Content: >= 0 % - <= 100 %
Physical state	Liquid, high fugacity
Vapour pressure of the substance during use	227 hPa
Duration and Frequency of activity	60 min 240 days per year
Indoor/Outdoor	Indoor
	Assumes activities are at ambient temperature.
Risk Management Measures	
Provide extract ventilation to points where emissions occur (LEV).	Effectiveness: 90 %
Wear suitable respiratory protection.	Effectiveness: 97.5 %
Avoid frequent and direct contact with substance. Ensure minimization of manual phases Clean equipment and the work area every day. Supervision in place to check that the RMMs in place are being used correctly and OCs followed.	
Use suitable chemically resistant gloves. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin.	
Risk Management Measures are based on qualitative risk characterisation.	
Exposure estimate and reference to its source	
PROC5, PROC8a	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, long-term - systemic
Exposure estimate	0.38 mg/m ³
Risk Characterization Ratio (RCR)	0.125
PROC5, PROC8a	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.

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	Worker - inhalation, short-term - systemic
Exposure estimate	1.88 mg/m ³
Risk Characterization Ratio (RCR)	0.625
PROC9	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, long-term - systemic
Exposure estimate	0.3 mg/m ³
Risk Characterization Ratio (RCR)	0.1
PROC9	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, short-term - systemic
Exposure estimate	1.5 mg/m ³
Risk Characterization Ratio (RCR)	0.5
Guidance to Downstream Users	
For scaling see: http://www.ecetoc.org/tra	

Contributing exposure scenario	
Use descriptors covered	PROC8b: Transfer of substance or mixture (charging and discharging) at dedicated facilities PROC15: Use a laboratory reagent. Use domain: industrial
Operational conditions	
Concentration of the substance	1,2-epoxybutane Content: >= 0 % - <= 100 %
Physical state	Liquid, high fugacity
Vapour pressure of the substance during use	227 hPa
Duration and Frequency of activity	240 min 240 days per year
Indoor/Outdoor	Indoor
	Assumes activities are at ambient temperature.
Risk Management Measures	
Provide extract ventilation to points where emissions occur (LEV).	Effectiveness: 90 %
Wear suitable respiratory protection.	Effectiveness: 97.5 %
Avoid frequent and direct contact with substance. Ensure minimization of manual phases Clean equipment and the work area every day. Supervision in place to check that the RMMs in place are being used correctly and OCs followed.	
Use suitable chemically resistant	

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gloves. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin.	
Risk Management Measures are based on qualitative risk characterisation.	
Exposure estimate and reference to its source	
PROC8b	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, long-term - systemic
Exposure estimate	0.20 mg/m ³
Risk Characterization Ratio (RCR)	0.0675
PROC8b	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, short-term - systemic
Exposure estimate	0.68 mg/m ³
Risk Characterization Ratio (RCR)	0.225
PROC15	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, long-term - systemic
Exposure estimate	0.23 mg/m ³
Risk Characterization Ratio (RCR)	0.075
PROC15	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, short-term - systemic
Exposure estimate	0.75 mg/m ³
Risk Characterization Ratio (RCR)	0.25
Guidance to Downstream Users	
For scaling see: http://www.ecetoc.org/tra	

4. Short title of exposure scenario

Use as Monomer, Polymer production

SU3; ERC6c; PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC15

Control of exposure and risk management measures

Contributing exposure scenario	
Use descriptors covered	ERC6c: Use of monomer in polymerisation processes at industrial site (inclusion or not into/onto article)

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Operational conditions	
Annual amount per site	700,000 kg
Minimum emission days per year Continuous	20
Emission factor air	0.001 %
Emission factor water	0.10 %
Emission factor soil	0 %
	Negligible wastewater emissions as process operates without water contact.
Receive Surf. Water (Flow Rate).	18,000 m3/d
Dilution factor river	10
Dilution factor coast	100
Other Factors: Environment	Indoor use.
Risk Management Measures	
Treat air emissions to provide a typical removal efficiency of (%)	> 99 %
Air treatment measures considered suitable are, e.g.	Waste gas treatment by thermal oxidation
Treat wastewater (prior to discharge to STP) to provide the required removal efficiency of (%)	>= 99.9 %
Type of STP	Municipal STP
Total effc. of removal from wastewater after RMMs and STP(%)	99.9 %
Assumed sewage treatment plant flow (m3/d)	2,000 m3/d
Exposure estimate and reference to its source	
Assessment method	ECETOC TRA v2.0 Environment
Risk Characterization Ratio (RCR)	0.675
	Risk from environmental exposure is driven by freshwater sediment.
Maximum amount of safe use	2,593 kg
Risk from environmental exposure is driven by freshwater sediment.	
Contributing exposure scenario	
Use descriptors covered	PROC1: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions. Use domain: industrial
Operational conditions	
Concentration of the substance	1,2-epoxybutane Content: >= 0 % - <= 100 %

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Physical state	Liquid, high fugacity
Vapour pressure of the substance during use	227 hPa
Duration and Frequency of activity	> 240 min <= 34 weeks per year
Indoor/Outdoor	Indoor
	Assumes activities are at ambient temperature.
Exposure estimate and reference to its source	
PROC1	
Assessment method	ECETOC TRA v2.0 Worker; modified version, The concentration of the substance has been considered using a linear approach., ECETOC TRA modified version: Reduction factor for local exhaust ventilation (LEV) has not been used for the calculation of dermal exposure estimates., ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, long-term - systemic
Exposure estimate	0.03 mg/m ³
Risk Characterization Ratio (RCR)	0.01
PROC1	
Assessment method	ECETOC TRA v2.0 Worker; modified version, The concentration of the substance has been considered using a linear approach., ECETOC TRA modified version: Reduction factor for local exhaust ventilation (LEV) has not been used for the calculation of dermal exposure estimates., ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, short-term - systemic
Exposure estimate	0.06 mg/m ³
Risk Characterization Ratio (RCR)	0.02
Contributing exposure scenario	
Use descriptors covered	PROC2: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions Covered by PROC 1 and PROC 8b Use domain: industrial
Contributing exposure scenario	
Use descriptors covered	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 Use domain: industrial
Operational conditions	

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Concentration of the substance	1,2-epoxybutane Content: $\geq 0\%$ - $\leq 100\%$
Physical state	Liquid, high fugacity
Vapour pressure of the substance during use	227 hPa
Duration and Frequency of activity	> 240 min ≤ 34 weeks per year
Indoor/Outdoor	Indoor
	Assumes activities are at ambient temperature.
Risk Management Measures	
Provide extract ventilation to points where emissions occur (LEV).	Effectiveness: 90 %
Wear suitable respiratory protection.	
Avoid frequent and direct contact with substance. Ensure minimization of manual phases Clean equipment and the work area every day. Supervision in place to check that the RMMs in place are being used correctly and OCs followed.	
Use suitable chemically resistant gloves. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin.	
Risk Management Measures are based on qualitative risk characterisation.	
Exposure estimate and reference to its source	
PROC3, PROC4	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, long-term - systemic
Exposure estimate	0.75 mg/m ³
Risk Characterization Ratio (RCR)	0.25
PROC3, PROC4	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, short-term - systemic
Exposure estimate	1.5 mg/m ³
Risk Characterization Ratio (RCR)	0.5
Guidance to Downstream Users	
For scaling see: http://www.ecetoc.org/tra	
Contributing exposure scenario	
Use descriptors covered	PROC5: Mixing or blending in batch processes PROC8a: Transfer of substance or mixture (charging and

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	discharging) at non-dedicated facilities PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing).
Operational conditions	
Concentration of the substance	1,2-epoxybutane Content: $\geq 0\%$ - $\leq 100\%$
Physical state	Liquid, high fugacity
Vapour pressure of the substance during use	227 hPa
Duration and Frequency of activity	60 min 240 days per year
Indoor/Outdoor	Indoor
	Assumes activities are at ambient temperature.
Risk Management Measures	
Provide extract ventilation to points where emissions occur (LEV).	Effectiveness: 90 %
Wear suitable respiratory protection.	Effectiveness: 97.5 %
Avoid frequent and direct contact with substance. Ensure minimization of manual phases Clean equipment and the work area every day. Supervision in place to check that the RMMs in place are being used correctly and OCs followed.	
Use suitable chemically resistant gloves. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin.	
Risk Management Measures are based on qualitative risk characterisation.	
Exposure estimate and reference to its source	
PROC5, PROC8a	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, long-term - systemic
Exposure estimate	0.38 mg/m ³
Risk Characterization Ratio (RCR)	0.125
PROC5, PROC8a	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, short-term - systemic
Exposure estimate	1.88 mg/m ³
Risk Characterization Ratio (RCR)	0.625
PROC9	

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Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, long-term - systemic
Exposure estimate	0.3 mg/m ³
Risk Characterization Ratio (RCR)	0.1
PROC9	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, short-term - systemic
Exposure estimate	1.5 mg/m ³
Risk Characterization Ratio (RCR)	0.5
Guidance to Downstream Users	
For scaling see: http://www.ecetoc.org/tra	

Contributing exposure scenario	
Use descriptors covered	PROC8b: Transfer of substance or mixture (charging and discharging) at dedicated facilities PROC15: Use a laboratory reagent. Use domain: industrial
Operational conditions	
Concentration of the substance	1,2-epoxybutane Content: >= 0 % - <= 100 %
Physical state	Liquid, high fugacity
Vapour pressure of the substance during use	227 hPa
Duration and Frequency of activity	240 min 240 days per year
Indoor/Outdoor	Indoor
	Assumes activities are at ambient temperature.
Risk Management Measures	
Provide extract ventilation to points where emissions occur (LEV).	Effectiveness: 90 %
Wear suitable respiratory protection.	Effectiveness: 97.5 %
Avoid frequent and direct contact with substance. Ensure minimization of manual phases Clean equipment and the work area every day. Supervision in place to check that the RMMs in place are being used correctly and OCs followed.	
Use suitable chemically resistant gloves. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin.	
Risk Management Measures are	

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based on qualitative risk characterisation.	
Exposure estimate and reference to its source	
PROC8b	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, long-term - systemic
Exposure estimate	0.20 mg/m ³
Risk Characterization Ratio (RCR)	0.0675
PROC8b	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, short-term - systemic
Exposure estimate	0.68 mg/m ³
Risk Characterization Ratio (RCR)	0.225
PROC15	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, long-term - systemic
Exposure estimate	0.23 mg/m ³
Risk Characterization Ratio (RCR)	0.075
PROC15	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, short-term - systemic
Exposure estimate	0.75 mg/m ³
Risk Characterization Ratio (RCR)	0.25
Guidance to Downstream Users	
For scaling see: http://www.ecetoc.org/tra	

5. Short title of exposure scenario

Use as Monomer, Polymer production, Downstream User

SU3; ERC6c; PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC15

Control of exposure and risk management measures

Contributing exposure scenario	
Use descriptors covered	ERC6c: Use of monomer in polymerisation processes at industrial site (inclusion or not into/onto article)
Operational conditions	
Annual amount per site	700,000 kg

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Minimum emission days per year Continuous	20
Emission factor air	0.001 %
Emission factor water	0.10 %
Emission factor soil	0 %
	Negligible wastewater emissions as process operates without water contact.
Receive Surf. Water (Flow Rate).	18,000 m3/d
Dilution factor river	10
Dilution factor coast	100
Other Factors: Environment	Indoor use.
Risk Management Measures	
Treat air emissions to provide a typical removal efficiency of (%)	> 99 %
Air treatment measures considered suitable are, e.g.	Waste gas treatment by thermal oxidation
Treat wastewater (prior to discharge to STP) to provide the required removal efficiency of (%)	>= 99.9 %
Type of STP	Municipal STP
Total effc. of removal from wastewater after RMMs and STP(%)	99.9 %
Assumed sewage treatment plant flow (m3/d)	2,000 m3/d
Exposure estimate and reference to its source	
Assessment method	ECETOC TRA v2.0 Environment
Risk Characterization Ratio (RCR)	0.675
	Risk from environmental exposure is driven by freshwater sediment.
Maximum amount of safe use	2,593 kg
Risk from environmental exposure is driven by freshwater sediment.	

Contributing exposure scenario	
Use descriptors covered	PROC1: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions. Use domain: industrial
Operational conditions	
Concentration of the substance	1,2-epoxybutane Content: >= 0 % - <= 100 %
Physical state	Liquid, high fugacity
Vapour pressure of the substance during use	227 hPa
Duration and Frequency of activity	> 240 min <= 34 weeks per year

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Indoor/Outdoor	Indoor
	Assumes activities are at ambient temperature.
Exposure estimate and reference to its source	
PROC1	
Assessment method	ECETOC TRA v2.0 Worker; modified version, The concentration of the substance has been considered using a linear approach., ECETOC TRA modified version: Reduction factor for local exhaust ventilation (LEV) has not been used for the calculation of dermal exposure estimates., ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, long-term - systemic
Exposure estimate	0.03 mg/m ³
Risk Characterization Ratio (RCR)	0.01
PROC1	
Assessment method	ECETOC TRA v2.0 Worker; modified version, The concentration of the substance has been considered using a linear approach., ECETOC TRA modified version: Reduction factor for local exhaust ventilation (LEV) has not been used for the calculation of dermal exposure estimates., ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, short-term - systemic
Exposure estimate	0.06 mg/m ³
Risk Characterization Ratio (RCR)	0.02
Contributing exposure scenario	
Use descriptors covered	PROC2: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions Covered by PROC 1 and PROC 8b Use domain: industrial
Contributing exposure scenario	
Use descriptors covered	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 Use domain: industrial
Operational conditions	
Concentration of the substance	1,2-epoxybutane Content: >= 0 % - <= 100 %
Physical state	Liquid, high fugacity

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Vapour pressure of the substance during use	227 hPa
Duration and Frequency of activity	> 240 min <= 34 weeks per year
Indoor/Outdoor	Indoor
	Assumes activities are at ambient temperature.
Risk Management Measures	
Provide extract ventilation to points where emissions occur (LEV).	Effectiveness: 90 %
Wear suitable respiratory protection.	
Avoid frequent and direct contact with substance. Ensure minimization of manual phases Clean equipment and the work area every day. Supervision in place to check that the RMMs in place are being used correctly and OCs followed.	
Use suitable chemically resistant gloves. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin.	
Risk Management Measures are based on qualitative risk characterisation.	
Exposure estimate and reference to its source	
PROC3, PROC4	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, long-term - systemic
Exposure estimate	0.75 mg/m ³
Risk Characterization Ratio (RCR)	0.25
PROC3, PROC4	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, short-term - systemic
Exposure estimate	1.5 mg/m ³
Risk Characterization Ratio (RCR)	0.5
Guidance to Downstream Users	
For scaling see: http://www.ecetoc.org/tra	
Contributing exposure scenario	
Use descriptors covered	PROC5: Mixing or blending in batch processes PROC8a: Transfer of substance or mixture (charging and discharging) at non-dedicated facilities PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing).

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Operational conditions	
Concentration of the substance	1,2-epoxybutane Content: $\geq 0\%$ - $\leq 100\%$
Physical state	Liquid, high fugacity
Vapour pressure of the substance during use	227 hPa
Duration and Frequency of activity	60 min 240 days per year
Indoor/Outdoor	Indoor
	Assumes activities are at ambient temperature.
Risk Management Measures	
Provide extract ventilation to points where emissions occur (LEV).	Effectiveness: 90 %
Wear suitable respiratory protection.	Effectiveness: 97.5 %
Avoid frequent and direct contact with substance. Ensure minimization of manual phases Clean equipment and the work area every day. Supervision in place to check that the RMMs in place are being used correctly and OCs followed.	
Use suitable chemically resistant gloves. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin.	
Risk Management Measures are based on qualitative risk characterisation.	
Exposure estimate and reference to its source	
PROC5, PROC8a	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, long-term - systemic
Exposure estimate	0.38 mg/m ³
Risk Characterization Ratio (RCR)	0.125
PROC5, PROC8a	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, short-term - systemic
Exposure estimate	1.88 mg/m ³
Risk Characterization Ratio (RCR)	0.625
PROC9	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, long-term - systemic

BASF Safety data sheet according to Regulation UK SI 2019/758 and UK SI 2020/1577 as amended from time to time.

Date / Revised: 16.01.2023

Version: 10.0

Date previous version: 13.04.2021

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Date / First version: 03.07.2002

Product: **N-BUTYLENE-1,2-OXIDE**

(ID no. 30054229/SDS_GEN_GB/EN)

Date of print 04.07.2026

Exposure estimate	0.3 mg/m ³
Risk Characterization Ratio (RCR)	0.1
PROC9	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, short-term - systemic
Exposure estimate	1.5 mg/m ³
Risk Characterization Ratio (RCR)	0.5
Guidance to Downstream Users	
For scaling see: http://www.ecetoc.org/tra	

Contributing exposure scenario	
Use descriptors covered	PROC8b: Transfer of substance or mixture (charging and discharging) at dedicated facilities PROC15: Use a laboratory reagent. Use domain: industrial
Operational conditions	
Concentration of the substance	1,2-epoxybutane Content: >= 0 % - <= 100 %
Physical state	Liquid, high fugacity
Vapour pressure of the substance during use	227 hPa
Duration and Frequency of activity	240 min 240 days per year
Indoor/Outdoor	Indoor
	Assumes activities are at ambient temperature.
Risk Management Measures	
Provide extract ventilation to points where emissions occur (LEV).	Effectiveness: 90 %
Wear suitable respiratory protection.	Effectiveness: 97.5 %
Avoid frequent and direct contact with substance. Ensure minimization of manual phases Clean equipment and the work area every day. Supervision in place to check that the RMMs in place are being used correctly and OCs followed.	
Use suitable chemically resistant gloves. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin.	
Risk Management Measures are based on qualitative risk characterisation.	
Exposure estimate and reference to its source	
PROC8b	

BASF Safety data sheet according to Regulation UK SI 2019/758 and UK SI 2020/1577 as amended from time to time.

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Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, long-term - systemic
Exposure estimate	0.20 mg/m ³
Risk Characterization Ratio (RCR)	0.0675
PROC8b	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, short-term - systemic
Exposure estimate	0.68 mg/m ³
Risk Characterization Ratio (RCR)	0.225
PROC15	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, long-term - systemic
Exposure estimate	0.23 mg/m ³
Risk Characterization Ratio (RCR)	0.075
PROC15	
Assessment method	ECETOC TRA v2.0 Worker; modified version, ECETOC TRA modified version: Another effectiveness value has been used for respiratory protection.
	Worker - inhalation, short-term - systemic
Exposure estimate	0.75 mg/m ³
Risk Characterization Ratio (RCR)	0.25
Guidance to Downstream Users	
For scaling see: http://www.ecetoc.org/tra	
