1.1 Product information

<table>
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<tr>
<th>Material</th>
<th>1122450, 1122449, 1017944, 1068852, 1088828, 1086429, 1104362, 1093708, 1086428, 1021562, 1024822, 1021565, 1024821, 1021564, 1028369, 1033065, 1028386, 1028385, 1033120</th>
</tr>
</thead>
</table>

EC-No. Registration number

<table>
<thead>
<tr>
<th>Chemical name</th>
<th>CAS-No. EC-No. Index No.</th>
<th>Legal Entity Registration number</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-Mercaptoethanol</td>
<td>60-24-2 200-464-6</td>
<td>Chevron Phillips Chemicals International NV 01-2119517582-41-0000</td>
</tr>
</tbody>
</table>

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

- Manufacture
- Distribution
- Use as an intermediate
- Use in polymer production – industrial
- Use in Oil and Gas field drilling and production operations - Industrial
- Use in Water Treatment Chemicals

1.3 Details of the supplier of the safety data sheet

Company: Chevron Phillips Chemical Company LP
Specialty Chemicals
10001 Six Pines Drive
The Woodlands, TX 77380

Local: Chevron Phillips Chemicals International N.V.
Airport Plaza (Stockholm Building)
Leonardo Da Vincilaan 19
1831 Diegem
Belgium

SDS Number: 100000013444
2.1 Classification of the substance or mixture

REGULATION (EC) No 1272/2008

Acute toxicity, Category 3

H301: Toxic if swallowed.

H331: Toxic if inhaled.

Acute toxicity, Category 2

H310: Fatal in contact with skin.

Skin irritation, Category 2

H315: Causes skin irritation.

Serious eye damage, Category 1

H318: Causes serious eye damage.

Skin sensitization, Category 1

H317: May cause an allergic skin reaction.

Reproductive toxicity, Category 2

H361: Suspected of damaging fertility or the unborn child.

Specific target organ toxicity - repeated exposure, Category 2

H373: May cause damage to organs through prolonged or repeated exposure.

Short-term (acute) aquatic hazard, Category 1

H400: Very toxic to aquatic life.

Long-term (chronic) aquatic hazard, Category 2

H411: Toxic to aquatic life with long lasting effects.
2-Mercaptoethanol (BME)

Hazard pictograms:

Signal Word: Danger

Hazard Statements:
- H301 + H331: Toxic if swallowed or if inhaled.
- H310: Fatal in contact with skin.
- H315: Causes skin irritation.
- H317: May cause an allergic skin reaction.
- H318: Causes serious eye damage.
- H361: Suspected of damaging fertility or the unborn child.
- H373: May cause damage to organs through prolonged or repeated exposure.
- H410: Very toxic to aquatic life with long lasting effects.

Precautionary Statements:

Prevention:
- P260: Do not breathe dust/fume/gas/mist/vapor/spray.
- P280: Wear protective gloves/ protective clothing/ eye protection/ face protection.

Response:
- P302 + P352 + P310: IF ON SKIN: Wash with plenty of water. Immediately call a POISON CENTER/doctor.
- P305 + P351 + P338 + P310: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor.

Storage:
- P403 + P233: Store in a well-ventilated place. Keep container tightly closed.

Hazardous ingredients which must be listed on the label:
- 60-24-2: 2-Mercaptoethanol

SECTION 3: Composition/information on ingredients

3.1 - 3.2 Substance or Mixture

Synonyms:
- beta-Mercaptoethanol
- BME
- Thioglycol
- M, Mercaptoethanol
- 2-Hydroxyethyl Mercaptan
- 2-Mercaptoethanol Pure

Molecular formula: HSCH2CH2OH

SDS Number: 100000013444 3/50
### Hazardous ingredients

<table>
<thead>
<tr>
<th>Chemical name</th>
<th>CAS-No. EC-No. Index No.</th>
<th>Classification (REGULATION (EC) No 1272/2008)</th>
<th>Concentration [wt%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-Mercaptoethanol</td>
<td>60-24-2 200-464-6</td>
<td>Acute Tox. 3; H301 Acute Tox. 3; H331 Acute Tox. 2; H310 Skin Irrit. 2; H315 Eye Dam. 1; H318 Skin Sens. 1A; H317 Repr. 2; H361 STOT RE 2; H373 Aquatic Acute 1; H400 Aquatic Chronic 2; H411</td>
<td>99 - 100</td>
</tr>
</tbody>
</table>

For the full text of the H-Statements mentioned in this Section, see Section 16.

### SECTION 4: First aid measures

#### 4.1 Description of first-aid measures

**General advice**: Move out of dangerous area. Consult a physician. Show this material safety data sheet to the doctor in attendance.

**If inhaled**: If unconscious, place in recovery position and seek medical advice. If symptoms persist, call a physician.

**In case of skin contact**: Take victim immediately to hospital. If on skin, rinse well with water. If on clothes, remove clothes.

**In case of eye contact**: Small amounts splashed into eyes can cause irreversible tissue damage and blindness. In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Continue rinsing eyes during transport to hospital. Remove contact lenses. Protect unharmed eye. Keep eye wide open while rinsing. If eye irritation persists, consult a specialist.

**If swallowed**: Keep respiratory tract clear. Never give anything by mouth to an unconscious person. If symptoms persist, call a physician. Take victim immediately to hospital.

### SECTION 5: Firefighting measures

**Flash point**: 68,3 °C (154,9 °F)  
Method: Tag closed cup

**Autoignition temperature**: 295 °C (563 °F) estimated

#### 5.1 Extinguishing media

Suitable extinguishing media: Carbon dioxide (CO2).
2-Mercaptoethanol (BME)

Version 4.1

Unsuitable extinguishing media : High volume water jet.

5.2 Special hazards arising from the substance or mixture
Specific hazards during fire fighting : Do not allow run-off from fire fighting to enter drains or water courses.

5.3 Advice for firefighters
Special protective equipment for fire-fighters : Wear self-contained breathing apparatus for firefighting if necessary.

Further information : Collect contaminated fire extinguishing water separately. This must not be discharged into drains. Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations. For safety reasons in case of fire, cans should be stored separately in closed containments. Use a water spray to cool fully closed containers.

Fire and explosion protection : Do not spray on an open flame or any other incandescent material. Keep away from open flames, hot surfaces and sources of ignition.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Personal precautions : Use personal protective equipment.

6.2 Environmental precautions
Environmental precautions : Prevent product from entering drains. Prevent further leakage or spillage if safe to do so. If the product contaminates rivers and lakes or drains inform respective authorities.

6.3 Methods and materials for containment and cleaning up
Methods for cleaning up : Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13). Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

SECTION 7: Handling and storage

7.1 Precautions for safe handling
Handling

Advice on safe handling : Avoid formation of aerosol. Do not breathe vapors/dust. Avoid exposure - obtain special instructions before use. Avoid contact with skin and eyes. For personal protection see section 8. Smoking, eating and drinking should be prohibited.

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in the application area. Provide sufficient air exchange and/or exhaust in work rooms. To avoid spills during handling keep bottle on a metal tray. Dispose of rinse water in accordance with local and national regulations. Persons susceptible to skin sensitization problems or asthma, allergies, chronic or recurrent respiratory disease should not be employed in any process in which this mixture is being used.

Advice on protection against fire and explosion: Do not spray on an open flame or any other incandescent material. Keep away from open flames, hot surfaces and sources of ignition.

7.2 Conditions for safe storage, including any incompatibilities

Storage

Requirements for storage areas and containers: Prevent unauthorized access. No smoking. Keep in a well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Observe label precautions. Electrical installations / working materials must comply with the technological safety standards.

SECTION 8: Exposure controls/personal protection

Ingredients with workplace control parameters

<table>
<thead>
<tr>
<th>Component</th>
<th>Source</th>
<th>Value</th>
<th>Control Parameter</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-Mercaptoethanol</td>
<td>RU OEL</td>
<td>1 mg/m³</td>
<td>2, vapors and/or gases</td>
<td></td>
</tr>
</tbody>
</table>

RU

LT

DNEL: End Use: Workers
Routes of exposure: Skin contact
Potential health effects: Chronic effects, Systemic effects
Value: 0,6 mg/kg

DNEL: End Use: Workers
Routes of exposure: Inhalation
Potential health effects: Chronic effects, Systemic effects
Value: 4 mg/m³

PNEC: Fresh water
Value: 0,0004 mg/l

PNEC: Sea water
Value: 0,00004 mg/l

PNEC: Fresh water sediment
Value: 0,00084 mg/kg

PNEC: Soil
Value: 0,29175 mg/kg

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8.2 Exposure controls

Engineering measures

Adequate ventilation to control airborne concentrations below the exposure guidelines/limits. Consider the potential hazards of this material (see Section 2), applicable exposure limits, job activities, and other substances in the work place when designing engineering controls and selecting personal protective equipment. If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, the personal protective equipment listed below is recommended. The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances.

Personal protective equipment

Respiratory protection: Wear a supplied-air NIOSH approved respirator unless ventilation or other engineering controls are adequate to maintain minimal oxygen content of 19.5% by volume under normal atmospheric pressure. Wear a NIOSH approved respirator that provides protection when working with this material if exposure to harmful levels of airborne material may occur, such as: Full-Face Supplied-Air Respirator. Use a positive pressure, air-supplying respirator if there is potential for uncontrolled release, exposure levels are not known, or other circumstances where air-purifying respirators may not provide adequate protection.

Hand protection: The suitability for a specific workplace should be discussed with the producers of the protective gloves. Please observe the instructions regarding permeability and breakthrough time which are provided by the supplier of the gloves. Also take into consideration the specific local conditions under which the product is used, such as the danger of cuts, abrasion, and the contact time. Gloves should be discarded and replaced if there is any indication of degradation or chemical breakthrough.

Eye protection: Eye wash bottle with pure water.

Skin and body protection: Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place. Wear as appropriate: Flame retardant protective clothing. Personal protection through wearing a tightly closed chemical protection suit and a self-contained breathing apparatus. Remove and wash contaminated clothing before re-use. Skin should be washed after contact. Footwear protecting against chemicals.

Hygiene measures: Avoid contact with skin, eyes and clothing. When using do not eat or drink. When using do not smoke. Wash hands before breaks and immediately after handling the product.

For additional details, see the Exposure Scenario in the Annex portion.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance
2-Mercaptoethanol (BME)

Form: Liquid
Physical state: Liquid
Color: Water white
Odor: Repulsive

Safety data
Flash point: 68.3 °C (154.9 °F)
   Method: Tag closed cup
Lower explosion limit: 2.3 %(V)
Upper explosion limit: 18 %(V)
Oxidizing properties: No
Autoignition temperature: 295 °C (563 °F)
   estimated
Molecular formula: HSCH2CH2OH
Molecular weight: No data available
pH: Not applicable
Pour point: No data available

Freezing point: No data available

Boiling point/boiling range: 155 - 160 °C (311 - 320 °F)
Vapor pressure: 5,70 MMHG
   at 37.8 °C (100.0 °F)
Relative density: 1,12
   at 15,6 °C (60,1 °F)
Density: 1,12 G/ML

Partition coefficient: n-octanol/water
   Pow: 0,56
Viscosity, dynamic: 3,42 cP
Relative vapor density: 2,69
   (Air = 1.0)
Evaporation rate: 1
Percent volatile: > 99 %

SECTION 10: Stability and reactivity

10.2
2-Mercaptoethanol (BME)

Chemical stability: This material is considered stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.

10.3 Possibility of hazardous reactions

Hazardous reactions: Hazardous reactions: Hazardous polymerization does not occur. Further information: No decomposition if stored and applied as directed. Hazardous reactions: Vapors may form explosive mixture with air.

10.4 Conditions to avoid: Heat, flames and sparks.

10.5 Materials to avoid: May react with oxygen and strong oxidizing agents, such as chlorates, nitrates, peroxides, etc.

10.6 Other data: No decomposition if stored and applied as directed.

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute oral toxicity
2-Mercaptoethanol: LD50: 98 - 168 mg/kg
Species: Rat
Sex: male and female
Method: OECD Test Guideline 401

Acute inhalation toxicity
2-Mercaptoethanol: LC50: 625 ppm
Exposure time: 4 h
Test atmosphere: gas

Acute dermal toxicity
2-Mercaptoethanol: LD50: ca. 112 - 224 mg/kg
Species: Rabbit
Sex: male and female

Skin irritation
2-Mercaptoethanol: Skin irritation

Eye irritation
2-Mercaptoethanol (BME)

Sensitization

2-Mercaptoethanol : The product is a skin sensitizer, sub-category 1A.

Repeated dose toxicity

2-Mercaptoethanol : Species: Rat, Male and female
                   Sex: Male and female
                   Application Route: oral gavage
                   Dose: 0, 15, 50, 75 mg/kg
                   Exposure time: 7 wk
                   Number of exposures: daily
                   NOEL: 15 mg/kg
                   Lowest observable effect level: 50 mg/kg
                   Method: OECD Guideline 422
                   Target Organs: Heart, Liver

Genotoxicity in vitro

2-Mercaptoethanol : Test Type: Ames test
                   Method: Mutagenicity (Escherichia coli - reverse mutation assay)
                   Result: negative
                   Test Type: Chromosome aberration test in vitro
                   Method: OECD Guideline 473
                   Result: negative
                   Test Type: Mouse lymphoma assay
                   Method: OECD Guideline 476
                   Result: negative
                   Test Type: Sister Chromatid Exchange Assay
                   Result: Ambiguous

Genotoxicity in vivo

2-Mercaptoethanol : Test Type: Mouse micronucleus assay
                   Method: Mutagenicity (micronucleus test)
                   Result: negative

Reproductive toxicity

2-Mercaptoethanol : Species: Rat
                   Sex: male
                   Application Route: oral gavage
                   Dose: 0, 15, 50, 75 mg/kg
                   Number of exposures: daily
                   Test period: 7 wks
                   Method: OECD Guideline 422
                   NOAEL Parent: 75 mg/kg
2-Mercaptoethanol (BME)

Species: Rat
Sex: female
Application Route: oral gavage
Dose: 0.15, 50, 75 mg/kg
Number of exposures: daily
Test period: 7 wks
NOAEL Parent: 15 mg/kg

Developmental Toxicity
2-Mercaptoethanol
Species: Rat
Application Route: oral gavage
Dose: 5, 15, 25 mg/kg/bw/d
Exposure time: GD 6-19
Number of exposures: daily
Test period: 20 d
Method: OECD Guideline 414
NOAEL Teratogenicity: 25 mg/kg
NOAEL Maternal: 25 mg/kg
Animal testing did not show any effects on fetal development.

CMR effects
2-Mercaptoethanol
Carcinogenicity: Not available
Mutagenicity: Tests on bacterial or mammalian cell cultures did not show mutagenic effects.
Teratogenicity: Animal testing did not show any effects on fetal development.
Reproductive toxicity: Some evidence of adverse effects on sexual function and fertility, and/or on development, based on animal experiments.

Further information:
No data available.

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish
2-Mercaptoethanol
LC50: 37 mg/l
Exposure time: 96 h
Species: Leuciscus idus (Golden orfe)

Toxicity to daphnia and other aquatic invertebrates
2-Mercaptoethanol
EC50: 0.4 mg/l
Exposure time: 48 h
Species: Daphnia magna (Water flea)
Method: OECD Test Guideline 202

Toxicity to algae
2-Mercaptoethanol (BME)

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2-Mercaptoethanol: EC50: 19 mg/l
Exposure time: 72 h
Species: Desmodesmus subspicatus (green algae)
static test Method: OECD Test Guideline 201

M-Factor
2-mercaptoethanol: M-Factor (Acute Aquat. Tox.) 1

Toxicity to bacteria
2-Mercaptoethanol: EC50: 125 mg/l
Exposure time: 17 h
Growth rate
Species: Pseudomonas putida

Toxicity to daphnia and other aquatic invertebrates (Chronic toxicity)
2-Mercaptoethanol: NOEC: 0.0624 mg/l
Exposure time: 21 d
Species: Daphnia magna (Water flea)
static renewal
Method: OECD Test Guideline 211

12.2
Persistence and degradability

Biodegradability
2-Mercaptoethanol: Result: Not readily biodegradable.
< 10 %
Method: OECD Test Guideline 301

12.3
Bioaccumulative potential

Bioaccumulation
2-Mercaptoethanol: This material is not expected to bioaccumulate.

12.4
Mobility in soil

12.5
Results of PBT and vPvB assessment

Results of PBT assessment: This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

12.6
Other adverse effects

Additional ecological information: Very toxic to aquatic life., Toxic to aquatic life with long lasting effects.

Ecotoxicology Assessment
2-Mercaptoethanol (BME)

Version 4.1

Revision Date 2019-08-21

Short-term (acute) aquatic hazard
2-Mercaptoethanol : Very toxic to aquatic life.

Long-term (chronic) aquatic hazard
2-Mercaptoethanol : Toxic to aquatic life with long lasting effects.

SECTION 13: Disposal considerations

13.1 Waste treatment methods
The information in this SDS pertains only to the product as shipped.

Use material for its intended purpose or recycle if possible. This material, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA under RCRA (40 CFR 261) or other State and local regulations. Measurement of certain physical properties and analysis for regulated components may be necessary to make a correct determination. If this material is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility.

Product : The product should not be allowed to enter drains, water courses or the soil. Do not contaminate ponds, waterways or ditches with chemical or used container. Send to a licensed waste management company.

Contaminated packaging : Empty remaining contents. Dispose of as unused product. Do not re-use empty containers. Do not burn, or use a cutting torch on, the empty drum.

For additional details, see the Exposure Scenario in the Annex portion

SECTION 14: Transport information

14.1 - 14.7 Transport information
The shipping descriptions shown here are for bulk shipments only, and may not apply to shipments in non-bulk packages (see regulatory definition).

Consult the appropriate domestic or international mode-specific and quantity-specific Dangerous Goods Regulations for additional shipping description requirements (e.g., technical name or names, etc.). Therefore, the information shown here, may not always agree with the bill of lading shipping description for the material. Flashpoints for the material may vary slightly between the SDS and the bill of lading.

US DOT (UNITED STATES DEPARTMENT OF TRANSPORTATION)
UN2966, THIOGLYCOL, 6.1, II

IMO / IMDG (INTERNATIONAL MARITIME DANGEROUS GOODS)
UN2966, THIOGLYCOL, 6.1, II, (68,3 °C), MARINE POLLUTANT, (THIOGLYCOL)

IATA (INTERNATIONAL AIR TRANSPORT ASSOCIATION)
UN2966, THIOGLYCOL, 6.1, II

ADR (AGREEMENT ON DANGEROUS GOODS BY ROAD (EUROPE))

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2-Mercaptoethanol (BME)

UN2966, THIOGLYCOL, 6.1, II, (D/E), ENVIRONMENTALLY HAZARDOUS, (THIOGLYCOL)

RID (REGULATIONS CONCERNING THE INTERNATIONAL TRANSPORT OF DANGEROUS GOODS (EUROPE))
UN2966, THIOGLYCOL, 6.1, II, ENVIRONMENTALLY HAZARDOUS, (THIOGLYCOL)

ADN (EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY INLAND WATERWAYS)
UN2966, THIOGLYCOL, 6.1, II, ENVIRONMENTALLY HAZARDOUS, (THIOGLYCOL)

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

SECTION 15: Regulatory information

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

Water contaminating class (Germany) : WGK 3 highly water endangering

15.2 Chemical Safety Assessment

Components : 2-mercaptoethanol A Chemical Safety Assessment has been carried out for this substance. 200-464-6

Major Accident Hazard Legislation

96/82/EC Update: 2003
Toxic
2
Quantity 1: 50 t
Quantity 2: 200 t

96/82/EC Update: 2003
Dangerous for the environment
9a
Quantity 1: 100 t
Quantity 2: 200 t

ZEU_SEVES3 Update: ACUTE TOXIC
H2
Quantity 1: 50 t
Quantity 2: 200 t

ZEU_SEVES3 Update:
2-Mercaptoethanol (BME)

ENVELOPMENTAL HAZARDS
E1
Quantity 1: 100 t
Quantity 2: 200 t

Notification status
Europe REACH : On the inventory, or in compliance with the inventory
Switzerland CH INV : On the inventory, or in compliance with the inventory
United States of America (USA) : On or in compliance with the active portion of the TSCA
Canada DSL : All components of this product are on the Canadian DSL
Australia AICS : On the inventory, or in compliance with the inventory
New Zealand NZIoC : Not in compliance with the inventory
Japan ENCS : On the inventory, or in compliance with the inventory
Korea KECI : A substance(s) in this product was not registered, notified to be registered, or exempted from registration by CPChem according to K-REACH regulations. Importation or manufacture of this product is still permitted provided the Korean Importer of Record has themselves notified the substance.

Philippines PICCS : On the inventory, or in compliance with the inventory
China IECSC : On the inventory, or in compliance with the inventory
Taiwan TCSI : On the inventory, or in compliance with the inventory

SECTION 16: Other information

NFPA Classification : Health Hazard: 3
                     Fire Hazard: 2
                     Reactivity Hazard: 0

Further information
Legacy SDS Number : 26290

Significant changes since the last version are highlighted in the margin. This version replaces all previous versions.

The information in this SDS pertains only to the product as shipped.

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Key or legend to abbreviations and acronyms used in the safety data sheet

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACGIH</td>
<td>American Conference of Government Industrial Hygienists</td>
</tr>
<tr>
<td>LD50</td>
<td>Lethal Dose 50%</td>
</tr>
<tr>
<td>LOAEL</td>
<td>Lowest Observed Adverse Effect</td>
</tr>
</tbody>
</table>

SDS Number:100000013444 15/50
## 2-Mercaptoethanol (BME)

<table>
<thead>
<tr>
<th>Substances</th>
<th>Level</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSL</td>
<td>NFPA</td>
<td>National Fire Protection Agency</td>
</tr>
<tr>
<td>NDSL</td>
<td>NIOSH</td>
<td>National Institute for Occupational Safety &amp; Health</td>
</tr>
<tr>
<td>CNS</td>
<td>NTP</td>
<td>National Toxicology Program</td>
</tr>
<tr>
<td>CAS</td>
<td>NZIoC</td>
<td>New Zealand Inventory of Chemicals</td>
</tr>
<tr>
<td>EC50</td>
<td>NOAEL</td>
<td>No Observable Adverse Effect Level</td>
</tr>
<tr>
<td>EC50</td>
<td>NOEC</td>
<td>No Observed Effect Concentration</td>
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<tr>
<td>EGEST</td>
<td>OSHA</td>
<td>Occupational Safety &amp; Health Administration</td>
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<tr>
<td>EOSCA</td>
<td>PEL</td>
<td>Permissible Exposure Limit</td>
</tr>
<tr>
<td>EINECS</td>
<td>PICCS</td>
<td>Philippines Inventory of Commercial Chemical Substances</td>
</tr>
<tr>
<td>MAK</td>
<td>PRNT</td>
<td>Presumed Not Toxic</td>
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<tr>
<td>GHS</td>
<td>RCRA</td>
<td>Resource Conservation Recovery Act</td>
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<tr>
<td>IC50</td>
<td>STEL</td>
<td>Short-term Exposure Limit</td>
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<tr>
<td>IARC</td>
<td>TLV</td>
<td>Threshold Limit Value</td>
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<td>IECSC</td>
<td>TWA</td>
<td>Time Weighted Average</td>
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<td>ENCS</td>
<td>TSCA</td>
<td>Toxic Substance Control Act</td>
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<tr>
<td>KECI</td>
<td>UVCB</td>
<td>Unknown or Variable Composition, Complex Reaction Products, and Biological Materials</td>
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<tr>
<td>&lt;=</td>
<td>WHMIS</td>
<td>Workplace Hazardous Materials Information System</td>
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<tr>
<td>LC50</td>
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</tr>
</tbody>
</table>

### Full text of H-statements referred to under sections 2 and 3.

- **H301** Toxic if swallowed.
- **H310** Fatal if inhaled.
- **H315** Causes skin irritation.
- **H317** May cause an allergic skin reaction.
- **H318** Causes serious eye damage.
- **H331** Toxic if inhaled.
- **H361** Suspected of damaging fertility or the unborn child.
- **H373** May cause damage to organs through prolonged or repeated exposure.
- **H400** Very toxic to aquatic life.
- **H411** Toxic to aquatic life with long lasting effects.

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Annex

1. Short title of Exposure Scenario: **Manufacture**

   **Main User Groups**: SU 3: Industrial uses: Uses of substances as such or in preparations at industrial sites

   **Sector of use**: SU3, SU8, SU9: Industrial Manufacturing (all), Manufacture of bulk, large chemicals (including petroleum products), Manufacture of fine chemicals

   **Process category**:
   - PROC1: Use in closed process, no likelihood of exposure
   - PROC2: Use in closed, continuous process with occasional controlled exposure
   - PROC3: Use in closed batch process (synthesis or formulation)
   - PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities
   - PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
   - PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
   - PROC15: Use as laboratory reagent

   **Environmental release category**: ERC1, ERC4: Manufacture of substances, Industrial use of processing aids in processes and products, not becoming part of articles

   **Further information**: Manufacture of the substance or use as a process chemical or extraction agent. Includes recycling/recovery, material transfers, storage, maintenance and loading (including marine vessel/barge, road/rail car and bulk container), sampling and associated laboratory activities

2.1 Contributing scenario controlling environmental exposure for: ERC1, ERC4: Manufacture of substances, Industrial use of processing aids in processes and products, not becoming part of articles

   **(Msafe)**: 0,108 tonnes/day

   **Environment factors not influenced by risk management**
   - Flow rate: 18,000 m3/d
   - Dilution Factor (River): 10
   - Dilution Factor (Coastal Areas): 100

   **Other given operational conditions affecting environmental exposure**
   - Number of emission days per year: 300
   - Emission or Release Factor: Air: 0,1 %
   - Emission or Release Factor: Water: 0,006 %
   - Emission or Release Factor: Soil: 0,01 %

   **Technical conditions and measures / Organizational measures**
# 2-Mercaptoethanol (BME)

**Version 4.1**  
**Revision Date 2019-08-21**

| **Air** | Treat air emission to provide a typical removal efficiency of (%) : (Effectiveness: > 90 %) |
| **Remarks** | Prevent discharge of undissolved substance to or recover from wastewater. |
| **Remarks** | Do not apply industrial sludge to natural soils. |
| **Remarks** | Sludge should be incinerated, contained or reclaimed. |

### Conditions and measures related to municipal sewage treatment plant
- **Flow rate of sewage treatment plant effluent**: 2.000 m³/d  
- **Effectiveness (of a measure)**: 0.2 %

### Conditions and measures related to external treatment of waste for disposal
- **Waste treatment**: During manufacturing no waste of the substance is generated.

### Conditions and measures related to external recovery of waste
- **Recovery Methods**: During manufacturing no waste of the substance is generated.

### 2.2 Contributing scenario controlling worker exposure for: PROC1: Use in closed process, no likelihood of exposure

| **Product characteristics** | Remarks : Liquid, vapour pressure < 0.5 kPa at STP |
| **Amount used** | Remarks : Not applicable |
| **Frequency and duration of use** | Remarks : Covers daily exposures up to 8 hours (unless stated differently) |
| **Other operational conditions affecting workers exposure** | Remarks : Assumes a good basic standard of occupational hygiene is implemented., Assumes use at not more than 20°C above ambient temperature, unless stated differently. |

### Technical conditions and measures
- Ensure operation is undertaken outdoors.

### 2.2 Contributing scenario controlling worker exposure for: PROC2: Use in closed, continuous process with occasional controlled exposure

| **Product characteristics** | Remarks : Liquid, vapour pressure < 0.5 kPa at STP |
| **Amount used** | Remarks : Not applicable |
| **Frequency and duration of use** | Remarks : Covers daily exposures up to 8 hours (unless stated differently) |
| **Other operational conditions affecting workers exposure** | Remarks : Assumes a good basic standard of occupational hygiene is implemented., Assumes use at not more than 20°C above ambient temperature, unless stated differently. |

### Technical conditions and measures
### 2-Mercaptoethanol (BME)

**Ensure operation is undertaken outdoors.**

#### Conditions and measures related to personal protection, hygiene and health evaluation

**Wear suitable gloves tested to EN374.**

#### 2.2 Contributing scenario controlling worker exposure for: PROC3: Use in closed batch process (synthesis or formulation)

<table>
<thead>
<tr>
<th><strong>Product characteristics</strong></th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Liquid, vapour pressure &lt; 0.5 kPa at STP</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Amount used</strong></th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Frequency and duration of use</strong></th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Covers daily exposures up to 8 hours (unless stated differently)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Other operational conditions affecting workers exposure</strong></th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Assumes a good basic standard of occupational hygiene is implemented., Assumes use at not more than 20°C above ambient temperature, unless stated differently.</td>
</tr>
</tbody>
</table>

**Technical conditions and measures**

Provide enhanced general ventilation by mechanical means.

#### 2.1 Contributing scenario controlling environmental exposure for:ERC1, ERC4: Manufacture of substances, Industrial use of processing aids in processes and products, not becoming part of articles

#### 2.2 Contributing scenario controlling worker exposure for: PROC8a, PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities, Transfer of substance or preparation (charging/ discharging) from/to vessels/ large containers at dedicated facilities

<table>
<thead>
<tr>
<th><strong>Product characteristics</strong></th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Liquid, vapour pressure &lt; 0.5 kPa at STP</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Amount used</strong></th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Frequency and duration of use</strong></th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Covers daily exposures up to 8 hours (unless stated differently)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Other operational conditions affecting workers exposure</strong></th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Assumes a good basic standard of occupational hygiene is implemented., Assumes use at not more than 20°C above ambient temperature, unless stated differently.</td>
</tr>
</tbody>
</table>
# 2-Mercaptoethanol (BME)

## Technical conditions and measures
Provide enhanced general ventilation by mechanical means., Provide extraction ventilation at points where emissions occur.

## Conditions and measures related to personal protection, hygiene and health evaluation
Wear chemically resistant gloves (tested to EN374) in combination with specific activity training., Wear chemically resistant gloves (tested to EN374) in combination with intensive management supervision controls.

## 2.2 Contributing scenario controlling worker exposure for: PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

### Product characteristics
- **Remarks**: Liquid, vapour pressure < 0.5 kPa at STP

### Amount used
- **Remarks**: Not applicable

### Frequency and duration of use
- **Remarks**: Covers daily exposures up to 8 hours (unless stated differently)

### Other operational conditions affecting workers exposure
- **Remarks**: Assumes a good basic standard of occupational hygiene is implemented., Assumes use at not more than 20°C above ambient temperature, unless stated differently.

## Technical conditions and measures
Provide enhanced general ventilation by mechanical means.

## Conditions and measures related to personal protection, hygiene and health evaluation
Wear chemically resistant gloves (tested to EN374) in combination with specific activity training.

## 2.2 Contributing scenario controlling worker exposure for: PROC15: Use as laboratory reagent

### Product characteristics
- **Remarks**: Liquid, vapour pressure < 0.5 kPa at STP

### Amount used
- **Remarks**: Not applicable

### Frequency and duration of use
- **Remarks**: Covers daily exposures up to 8 hours (unless stated differently)

### Other operational conditions affecting workers exposure
- **Remarks**: Assumes a good basic standard of occupational hygiene is implemented., Assumes use at not more than 20°C above ambient temperature, unless stated differently.

## Technical conditions and measures
Provide enhanced general ventilation by mechanical means.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear suitable gloves tested to EN374.

3. Exposure estimation and reference to its source

Environment

<table>
<thead>
<tr>
<th>Contributing Scenario</th>
<th>Exposure Assessment Method</th>
<th>Specific conditions</th>
<th>Compartments</th>
<th>Value type</th>
<th>Level of Exposure</th>
<th>Risk characterization ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERC1, ERC4</td>
<td>EUSES</td>
<td>Air</td>
<td>0.0229 µg/m³</td>
<td>0.758</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fresh water</td>
<td>0.303 µg/L</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Freshwater sediment</td>
<td>0.302 µg/kg</td>
<td>0.926</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Marine sediment</td>
<td>0.0303 µg/kg</td>
<td>0.929</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Soil</td>
<td>0.0120 µg/kg</td>
<td>0.214</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Marine water</td>
<td>0.0034 µg/L</td>
<td>0.761</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ERC1: Manufacture of substances
ERC4: Industrial use of processing aids in processes and products, not becoming part of articles

Workers/Consumers

<table>
<thead>
<tr>
<th>Contributing Scenario</th>
<th>Exposure Assessment Method</th>
<th>Specific conditions</th>
<th>Value type</th>
<th>Level of Exposure</th>
<th>Risk characterization ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROC1, CS15</td>
<td>ECETOC TRA Modified</td>
<td>Worker – inhalation, long-term – systemic</td>
<td>0.01 ppm</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – dermal, long-term – systemic</td>
<td>0.34 mg/kg/d</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – long-term – systemic Combined routes</td>
<td>0.70 ppm</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td>PROC2, CS2</td>
<td>ECETOC TRA Modified</td>
<td>Worker – inhalation, long-term – systemic</td>
<td>0.27 mg/kg/d</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – long-term – systemic Combined routes</td>
<td>0.27 mg/kg/d</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – long-term – systemic Combined routes</td>
<td>1.47 ppm</td>
<td>0.4</td>
<td></td>
</tr>
<tr>
<td>PROC3, CS37</td>
<td>ECETOC TRA Modified</td>
<td>Worker – inhalation, long-term – systemic</td>
<td>0.34 mg/kg/d</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – long-term – systemic Combined routes</td>
<td>0.34 mg/kg/d</td>
<td>0.94</td>
<td></td>
</tr>
<tr>
<td>PROC8a, CS14</td>
<td>ECETOC TRA Modified</td>
<td>Outdoor Worker – inhalation, long-term – systemic</td>
<td>2.10 ppm</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – dermal, long-term – systemic Combined routes</td>
<td>0.27 mg/kg/d</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – long-term – systemic Combined routes</td>
<td>0.27 mg/kg/d</td>
<td>0.98</td>
<td></td>
</tr>
<tr>
<td>PROC8a, CS14</td>
<td>ECETOC TRA Modified</td>
<td>Indoor Worker – inhalation, long-term – systemic</td>
<td>2.00 ppm</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – dermal, long-term – systemic Combined routes</td>
<td>0.27 mg/kg/d</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – long-term – systemic Combined routes</td>
<td>0.27 mg/kg/d</td>
<td>0.96</td>
<td></td>
</tr>
<tr>
<td>PROC8b, CS14</td>
<td>ECETOC TRA Modified</td>
<td>Outdoor Worker – inhalation, long-term – systemic</td>
<td>1.05 ppm</td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – dermal, long-term – systemic Combined routes</td>
<td>0.34 mg/kg/d</td>
<td>0.6</td>
<td></td>
</tr>
</tbody>
</table>

SDS Number:100000013444
## 2-Mercaptoethanol (BME)

<table>
<thead>
<tr>
<th>PROC, CS</th>
<th>ECETOC TRA</th>
<th>Indoor/Outdoor</th>
<th>Route</th>
<th>Concentration</th>
<th>Health Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROC8b, CS14</td>
<td>ECETOC TRA Modified</td>
<td>Indoor</td>
<td>Worker – long-term – systemic Combined routes</td>
<td>0,83 ppm</td>
<td>0,4</td>
</tr>
<tr>
<td>PROC9, CS6</td>
<td>ECETOC TRA Modified</td>
<td>Outdoor</td>
<td>Worker – long-term – systemic Combined routes</td>
<td>1,50 ppm</td>
<td>0,4</td>
</tr>
<tr>
<td>PROC15, CS36</td>
<td>ECETOC TRA Modified</td>
<td>Indoor</td>
<td>Worker – long-term – systemic Combined routes</td>
<td>3,50 ppm</td>
<td>0,9</td>
</tr>
</tbody>
</table>

**PROC1:** Use in closed process, no likelihood of exposure  
**CS15:** General exposures (closed systems)

**PROC2:** Use in closed, continuous process with occasional controlled exposure  
**CS2:** Process sampling

**PROC3:** Use in closed batch process (synthesis or formulation)  
**CS37:** Use in contained batch processes

**PROC8a:** Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities  
**CS14:** Bulk transfers

**PROC8b:** Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities  
**CS14:** Bulk transfers

**PROC9:** Transfer of substance or preparation into small containers (dedicated filling line, including weighing)  
**CS6:** Drum and small package filling

**PROC15:** Use as laboratory reagent
4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

Confirm that RMMs and OCs are as described or of equivalent efficiency.

1. Short title of Exposure Scenario: Distribution

Main User Groups: SU3: Industrial uses: Uses of substances as such or in preparations at industrial sites
Sector of use: SU3, SU8, SU9: Industrial Manufacturing (all), Manufacture of bulk, large scale chemicals (including petroleum products), Manufacture of fine chemicals
Process category: PROC1: Use in closed process, no likelihood of exposure
PROC2: Use in closed, continuous process with occasional controlled exposure
PROC3: Use in closed batch process (synthesis or formulation)
PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities
PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
PROC15: Use as laboratory reagent

Environmental release category: An environmental exposure assessment is not required for distribution as it is considered within the other exposure scenarios.

Further information: Loading (including marine vessel/barge, rail/road car and IBC loading) and repacking (including drums and small packs) of substance, including its sampling, storage, unloading distribution and associated laboratory activities.

Covers injection as odourant in fuel and includes activities associated with its transfer, use, equipment maintenance and handling of waste.

2.2 Contributing scenario controlling worker exposure for: PROC1: Use in closed process, no likelihood of exposure

<table>
<thead>
<tr>
<th>Product characteristics</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount used</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Frequency and duration of use</td>
<td>Covers daily exposures up to 8 hours (unless stated differently)</td>
</tr>
</tbody>
</table>
### 2-Mercaptoethanol (BME)

**SAFETY DATA SHEET**

**Version 4.1**

**Revision Date 2019-08-21**

**Other operational conditions affecting workers exposure**

**Remarks**: Assumes a good basic standard of occupational hygiene is implemented., Assumes use at not more than 20°C above ambient temperature, unless stated differently.

**Technical conditions and measures**

Ensure operation is undertaken outdoors.

**2.2 Contributing scenario controlling worker exposure for: PROC2: Use in closed, continuous process with occasional controlled exposure**

**Product characteristics**

**Remarks**: Liquid, vapour pressure < 0.5 kPa at STP

**Amount used**

**Remarks**: Not applicable

**Frequency and duration of use**

**Remarks**: Covers daily exposures up to 8 hours (unless stated differently)

**Other operational conditions affecting workers exposure**

**Remarks**: Assumes a good basic standard of occupational hygiene is implemented., Assumes use at not more than 20°C above ambient temperature, unless stated differently.

**Technical conditions and measures**

Ensure operation is undertaken outdoors.

**Conditions and measures related to personal protection, hygiene and health evaluation**

Wear suitable gloves tested to EN374.

**2.2 Contributing scenario controlling worker exposure for: PROC3: Use in closed batch process (synthesis or formulation)**

**Product characteristics**

**Remarks**: Liquid, vapour pressure < 0.5 kPa at STP

**Amount used**

**Remarks**: Not applicable

**Frequency and duration of use**

**Remarks**: Covers daily exposures up to 8 hours (unless stated differently)

**Other operational conditions affecting workers exposure**

**Remarks**: Assumes a good basic standard of occupational hygiene is implemented., Assumes use at not more than 20°C above ambient temperature, unless stated differently.

**Technical conditions and measures**

Provide enhanced general ventilation by mechanical means.

**2.2 Contributing scenario controlling worker exposure for: PROC8a: Transfer of**

**SDS Number:**100000013444

24/50
## 2-Mercaptoethanol (BME)

### Substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities

<table>
<thead>
<tr>
<th>Product characteristics</th>
<th>Remarks</th>
<th>Liquid, vapour pressure &lt; 0.5 kPa at STP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount used</td>
<td>Remarks</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Frequency and duration of use</td>
<td>Remarks</td>
<td>Covers daily exposures up to 8 hours (unless stated differently)</td>
</tr>
<tr>
<td>Other operational conditions affecting workers exposure</td>
<td>Remarks</td>
<td>Assumes a good basic standard of occupational hygiene is implemented.; Assumes use at not more than 20°C above ambient temperature, unless stated differently.</td>
</tr>
</tbody>
</table>

### Technical conditions and measures
- Provide enhanced general ventilation by mechanical means. Provide extraction ventilation at points where emissions occur.

### Conditions and measures related to personal protection, hygiene and health evaluation
- Wear chemically resistant gloves (tested to EN374) in combination with specific activity training.

### 2.2 Contributing scenario controlling worker exposure for: PROC8b, PROC9: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities, Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

<table>
<thead>
<tr>
<th>Product characteristics</th>
<th>Remarks</th>
<th>Liquid, vapour pressure &lt; 0.5 kPa at STP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount used</td>
<td>Remarks</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Frequency and duration of use</td>
<td>Remarks</td>
<td>Covers daily exposures up to 8 hours (unless stated differently)</td>
</tr>
<tr>
<td>Other operational conditions affecting workers exposure</td>
<td>Remarks</td>
<td>Assumes a good basic standard of occupational hygiene is implemented.; Assumes use at not more than 20°C above ambient temperature, unless stated differently.</td>
</tr>
</tbody>
</table>

### Technical conditions and measures
- Provide enhanced general ventilation by mechanical means.

### Conditions and measures related to personal protection, hygiene and health evaluation
- Wear chemically resistant gloves (tested to EN374) in combination with specific activity training.

### 2.2 Contributing scenario controlling worker exposure for: PROC15: Use as laboratory reagent
2-Mercaptoethanol (BME)

Version 4.1

Revision Date 2019-08-21

Product characteristics
Remarks: Liquid, vapour pressure < 0.5 kPa at STP

Amount used
Remarks: Not applicable

Frequency and duration of use
Remarks: Covers daily exposures up to 8 hours (unless stated differently)

Other operational conditions affecting workers exposure
Remarks: Assumes a good basic standard of occupational hygiene is implemented, Assumes use at not more than 20°C above ambient temperature, unless stated differently.

Technical conditions and measures
Provide enhanced general ventilation by mechanical means.

Conditions and measures related to personal protection, hygiene and health evaluation
Wear suitable gloves tested to EN374.

3. Exposure estimation and reference to its source

Workers/Consumers

<table>
<thead>
<tr>
<th>Contributing Scenario</th>
<th>Exposure Assessment Method</th>
<th>Specific conditions</th>
<th>Value type</th>
<th>Level of Exposure</th>
<th>Risk characterization ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROC1, CS15</td>
<td>ECETOC TRA Modified</td>
<td>Worker – inhalation, long-term – systemic</td>
<td>0.01 ppm</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – dermal, long-term – systemic</td>
<td>0.34 mg/kg/d</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – long-term – systemic Combined routes</td>
<td>0.57</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PROC2, CS2</td>
<td>ECETOC TRA Modified</td>
<td>Worker – inhalation, long-term – systemic</td>
<td>0.70 ppm</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – dermal, long-term – systemic</td>
<td>0.27 mg/kg/d</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – long-term – systemic Combined routes</td>
<td>0.63</td>
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</tr>
<tr>
<td>PROC3, CS37</td>
<td>ECETOC TRA Modified</td>
<td>Worker – inhalation, long-term – systemic</td>
<td>1.47 ppm</td>
<td>0.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – dermal, long-term – systemic</td>
<td>0.34 mg/kg/d</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – long-term – systemic Combined routes</td>
<td>0.94</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PROC8a, CS14</td>
<td>ECETOC TRA Modified</td>
<td>Outdoor Worker – inhalation, long-term – systemic</td>
<td>2.10 ppm</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – dermal, long-term – systemic</td>
<td>0.27 mg/kg/d</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – long-term – systemic Combined routes</td>
<td>0.98</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PROC8a, CS14</td>
<td>ECETOC TRA Modified</td>
<td>Indoor Worker – inhalation, long-term – systemic</td>
<td>2.00 ppm</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – dermal, long-term – systemic</td>
<td>0.27 mg/kg/d</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – long-term – systemic Combined</td>
<td>0.96</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2-Mercaptoethanol (BME)

Version 4.1
Revision Date 2019-08-21

<table>
<thead>
<tr>
<th>PROC8b, PROC9, CS6, CS14</th>
<th>ECETOC TRA Modified</th>
<th>Outdoor</th>
<th>Worker – inhalation, long-term – systemic</th>
<th>1.05 ppm</th>
<th>0.3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Worker – dermal, long-term – systemic</td>
<td>0.34 mg/kg/d</td>
<td>0.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Worker – long-term – systemic Combined</td>
<td></td>
<td>0.83</td>
</tr>
<tr>
<td>PROC8b, PROC9, CS6, CS14</td>
<td>ECETOC TRA Modified</td>
<td>Indoor</td>
<td>Worker – inhalation, long-term – systemic</td>
<td>1.50 ppm</td>
<td>0.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Worker – dermal, long-term – systemic</td>
<td>0.34 mg/kg/d</td>
<td>0.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Worker – long-term – systemic Combined</td>
<td></td>
<td>0.95</td>
</tr>
<tr>
<td>PROC15, CS36</td>
<td>ECETOC TRA Modified</td>
<td></td>
<td>Worker – inhalation, long-term – systemic</td>
<td>3.50 ppm</td>
<td>0.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Worker – dermal, long-term – systemic</td>
<td>0.07 mg/kg/d</td>
<td>0.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Worker – long-term – systemic Combined</td>
<td></td>
<td>0.99</td>
</tr>
</tbody>
</table>

PROC1: Use in closed process, no likelihood of exposure
CS15: General exposures (closed systems)

PROC2: Use in closed, continuous process with occasional controlled exposure
CS2: Process sampling

PROC3: Use in closed batch process (synthesis or formulation)
CS37: Use in contained batch processes

PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities
CS14: Bulk transfers

PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities
CS14: Bulk transfers

PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
CS6: Drum and small package filling
CS14: Bulk transfers

PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
CS6: Drum and small package filling
CS14: Bulk transfers

PROC15: Use as laboratory reagent
CS36: Laboratory activities

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario
When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposures are not expected to exceed the predicted DNELs and the resulting risk characterisation ratios are expected to be less than 1.

When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposures are not expected to exceed the predicted PNECs and the resulting risk characterisation ratios are expected to be less than 1.

Confirm that RMMs and OCs are as described or of equivalent efficiency.

1. Short title of Exposure Scenario: Use as an intermediate

Main User Groups: SU 3: Industrial uses: Uses of substances as such or in preparations at industrial sites
Sector of use: SU3, SU8, SU9: Industrial Manufacturing (all), Manufacture of bulk, large scale chemicals (including petroleum products), Manufacture of fine chemicals
Process category: PROC1: Use in closed process, no likelihood of exposure
PROC2: Use in closed, continuous process with occasional controlled exposure
PROC3: Use in closed batch process (synthesis or formulation)
PROC15: Use as laboratory reagent
PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities
PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Environmental release category: ERC6a: Industrial use resulting in manufacture of another substance (use of intermediates)

Further information: Manufacture of the substance or use as an intermediate or process chemical or extraction agent. Includes recycling/recovery, material transfers, storage, sampling, associated laboratory activities, maintenance and loading (including marine vessel/barge, road/rail car and bulk container).

2.1 Contributing scenario controlling environmental exposure for: ERC6a: Industrial use resulting in manufacture of another substance (use of intermediates)

(Msafe) = 0,0215 tonnes/day

Environment factors not influenced by risk management
Flow rate = 18,000 m3/d
Dilution Factor (River) = 10
Dilution Factor (Coastal Areas) = 100

Other given operational conditions affecting environmental exposure
Number of emission days per year = 300
Emission or Release Factor: Air = 0,02 %
Emission or Release Factor: Water = 0,03 %
Emission or Release Factor: Soil = 0,1 %

Technical conditions and measures / Organizational measures
SDS Number: 100000013444
2-Mercaptoethanol (BME)

Air: Treat air emission to provide a typical removal efficiency of (%): (Effectiveness: > 80 %)
Water: Typical onsite wastewater treatment technology provides removal efficiency of (%): (Effectiveness: 90 %)
Remarks: Prevent discharge of undissolved substance to or recover from onsite wastewater.
Remarks: Do not apply industrial sludge to natural soils.
Remarks: Sludge should be incinerated, contained or reclaimed.

Conditions and measures related to municipal sewage treatment plant
Type of Sewage Treatment Plant: Municipal sewage treatment plant
Flow rate of sewage treatment plant effluent: 2.000 m³/d
Effectiveness (of a measure): 0.2 %

Conditions and measures related to external treatment of waste for disposal
Waste treatment: This substance is consumed during use and no waste of the substance is generated.

Conditions and measures related to external recovery of waste
Recovery Methods: This substance is consumed during use and no waste of the substance is generated.

2.2 Contributing scenario controlling worker exposure for: PROC1: Use in closed process, no likelihood of exposure

Product characteristics
Remarks: Liquid, vapour pressure < 0.5 kPa at STP

Amount used
Remarks: Not applicable

Frequency and duration of use
Remarks: Covers daily exposures up to 8 hours (unless stated differently)

Other operational conditions affecting workers exposure
Remarks: Assumes use at not more than 20°C above ambient temperature, unless stated differently. Assumes a good basic standard of occupational hygiene is implemented.

Technical conditions and measures
Ensure operation is undertaken outdoors.

2.2 Contributing scenario controlling worker exposure for: PROC2: Use in closed, continuous process with occasional controlled exposure

Product characteristics
Remarks: Liquid, vapour pressure < 0.5 kPa at STP

Amount used
Remarks: Not applicable

Frequency and duration of use
Remarks: Covers daily exposures up to 8 hours (unless stated differently)

Other operational conditions affecting workers exposure
2-Mercaptoethanol (BME)

**Remarks**
- Assumes use at not more than 20°C above ambient temperature, unless stated differently.
- Assumes a good basic standard of occupational hygiene is implemented.

**Technical conditions and measures**
- Ensure operation is undertaken outdoors.

**Conditions and measures related to personal protection, hygiene and health evaluation**
- Wear suitable gloves tested to EN374.

### 2.2 Contributing scenario controlling worker exposure for: PROC3: Use in closed batch process (synthesis or formulation)

<table>
<thead>
<tr>
<th>Product characteristics</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Liquid, vapour pressure &lt; 0.5 kPa at STP</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Amount used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remarks</td>
</tr>
<tr>
<td>Not applicable</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Frequency and duration of use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remarks</td>
</tr>
<tr>
<td>Covers daily exposures up to 8 hours (unless stated differently)</td>
</tr>
</tbody>
</table>

**Other operational conditions affecting workers exposure**
- Assumes use at not more than 20°C above ambient temperature, unless stated differently.
- Assumes a good basic standard of occupational hygiene is implemented.

**Technical conditions and measures**
- Provide enhanced general ventilation by mechanical means.

### 2.2 Contributing scenario controlling worker exposure for: PROC8a, PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities, Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities

<table>
<thead>
<tr>
<th>Product characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remarks</td>
</tr>
<tr>
<td>Liquid, vapour pressure &lt; 0.5 kPa at STP</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Amount used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remarks</td>
</tr>
<tr>
<td>Not applicable</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Frequency and duration of use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remarks</td>
</tr>
<tr>
<td>Covers daily exposures up to 8 hours (unless stated differently)</td>
</tr>
</tbody>
</table>

**Other operational conditions affecting workers exposure**
- Assumes use at not more than 20°C above ambient temperature, unless stated differently.
- Assumes a good basic standard of occupational hygiene is implemented.

**Technical conditions and measures**
- Provide enhanced general ventilation by mechanical means.
- Provide extraction ventilation at points where emissions occur.

**Conditions and measures related to personal protection, hygiene and health evaluation**
2-Mercaptoethanol (BME)

**2.1 Product Characteristics**

**Remarks:** Liquid, vapour pressure < 0.5 kPa at STP

**2.2 Contributing scenario controlling worker exposure for: PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)**

<table>
<thead>
<tr>
<th><strong>Product characteristics</strong></th>
<th><strong>Remarks</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Amount used</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Remarks</strong></td>
<td>Not applicable</td>
</tr>
<tr>
<td><strong>Frequency and duration of use</strong></td>
<td>Covers daily exposures up to 8 hours (unless stated differently)</td>
</tr>
<tr>
<td><strong>Other operational conditions affecting workers exposure</strong></td>
<td>Assumes use at not more than 20°C above ambient temperature, unless stated differently., Assumes a good basic standard of occupational hygiene is implemented.</td>
</tr>
<tr>
<td><strong>Technical conditions and measures</strong></td>
<td>Ensure operation is undertaken outdoors.</td>
</tr>
<tr>
<td><strong>Conditions and measures related to personal protection, hygiene and health evaluation</strong></td>
<td>Wear chemically resistant gloves (tested to EN374) in combination with specific activity training.</td>
</tr>
</tbody>
</table>

**2.2 Contributing scenario controlling worker exposure for: PROC15: Use as laboratory reagent**

<table>
<thead>
<tr>
<th><strong>Product characteristics</strong></th>
<th><strong>Remarks</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Amount used</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Remarks</strong></td>
<td>Not applicable</td>
</tr>
<tr>
<td><strong>Frequency and duration of use</strong></td>
<td>Covers daily exposures up to 8 hours (unless stated differently)</td>
</tr>
<tr>
<td><strong>Other operational conditions affecting workers exposure</strong></td>
<td>Assumes use at not more than 20°C above ambient temperature, unless stated differently., Assumes a good basic standard of occupational hygiene is implemented.</td>
</tr>
<tr>
<td><strong>Technical conditions and measures</strong></td>
<td>Provide enhanced general ventilation by mechanical means.</td>
</tr>
<tr>
<td><strong>Conditions and measures related to personal protection, hygiene and health evaluation</strong></td>
<td>Wear suitable gloves tested to EN374.</td>
</tr>
</tbody>
</table>

3. Exposure estimation and reference to its source
# 2-Mercaptoethanol (BME)

**SAFETY DATA SHEET**

**Version 4.1**

**Revision Date 2019-08-21**

## Environment

<table>
<thead>
<tr>
<th>Contributing Scenario</th>
<th>Exposure Assessment Method</th>
<th>Specific conditions</th>
<th>Compartments</th>
<th>Value type</th>
<th>Level of Exposure</th>
<th>Risk characterization ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERC6a</td>
<td>EUSES</td>
<td>Freshwater</td>
<td></td>
<td>0.316 µg/L</td>
<td>0.789</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Marine water</td>
<td></td>
<td>0.0317 µg/L</td>
<td>0.792</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Freshwater sediment</td>
<td></td>
<td>0.314 µg/kg</td>
<td>0.964</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Marine sediment</td>
<td></td>
<td>0.0315 µg/kg</td>
<td>0.967</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Soil</td>
<td></td>
<td>0.0017 µg/kg</td>
<td>0.0298</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Air</td>
<td></td>
<td>0.0010 µg/m³</td>
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<td></td>
</tr>
</tbody>
</table>

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

## Workers/Consumers

<table>
<thead>
<tr>
<th>Contributing Scenario</th>
<th>Exposure Assessment Method</th>
<th>Specific conditions</th>
<th>Value type</th>
<th>Level of Exposure</th>
<th>Risk characterization ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROC1, CS15</td>
<td>ECETOC TRA Modified</td>
<td>Worker – inhalation, long-term – systemic</td>
<td>0.01 ppm</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – dermal, long-term – systemic</td>
<td>0.34 mg/kg/d</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – long-term – systemic Combined routes</td>
<td>0.70 ppm</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td>PROC2, CS2</td>
<td>ECETOC TRA Modified</td>
<td>Worker – inhalation, long-term – systemic</td>
<td>0.70 ppm</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – dermal, long-term – systemic</td>
<td>0.27 mg/kg/d</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – long-term – systemic Combined routes</td>
<td>0.70 ppm</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td>PROC3, CS37</td>
<td>ECETOC TRA Modified</td>
<td>Worker – inhalation, long-term – systemic</td>
<td>1.47 ppm</td>
<td>0.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – dermal, long-term – systemic</td>
<td>0.34 mg/kg/d</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – long-term – systemic Combined routes</td>
<td>0.34 mg/kg/d</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td>PROC8a, CS14</td>
<td>ECETOC TRA Modified</td>
<td>Worker – inhalation, long-term – systemic</td>
<td>2.10 ppm</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – dermal, long-term – systemic</td>
<td>0.27 mg/kg/d</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – long-term – systemic Combined routes</td>
<td>0.27 mg/kg/d</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>PROC8a, CS14</td>
<td>ECETOC TRA Modified</td>
<td>Indoor Worker – inhalation, long-term – systemic</td>
<td>2.00 ppm</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – dermal, long-term – systemic</td>
<td>0.27 mg/kg/d</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – long-term – systemic Combined routes</td>
<td>0.27 mg/kg/d</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>PROC8b, CS14</td>
<td>ECETOC TRA Modified</td>
<td>Outdoor Worker – inhalation, long-term – systemic</td>
<td>1.05 ppm</td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – dermal, long-term – systemic</td>
<td>0.34 mg/kg/d</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – long-term – systemic Combined routes</td>
<td>0.34 mg/kg/d</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td>PROC8b, CS14</td>
<td>ECETOC TRA Modified</td>
<td>Indoor Worker – inhalation, long-term – systemic</td>
<td>1.50 ppm</td>
<td>0.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – dermal, long-term – systemic</td>
<td>0.34 mg/kg/d</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – long-term – systemic Combined routes</td>
<td>0.34 mg/kg/d</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td>PROC9, CS6</td>
<td>ECETOC TRA</td>
<td>Outdoor Worker – inhalation, long-term – systemic</td>
<td>1.05 ppm</td>
<td>0.3</td>
<td></td>
</tr>
</tbody>
</table>

SDS Number: 100000013444
**2-Mercaptoethanol (BME)**

<table>
<thead>
<tr>
<th>Procedure</th>
<th>ECETOC TRA</th>
<th>Indoor</th>
<th>Worker – inhalation, long-term – systemic</th>
<th>1.50 ppm</th>
<th>0.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROC9, CS6</td>
<td>Modified</td>
<td>Indoor</td>
<td>Worker – dermal, long-term – systemic</td>
<td>0.34 mg/kg/d</td>
<td>0.6</td>
</tr>
<tr>
<td>PROC15, CS36</td>
<td>Modified</td>
<td>Indoor</td>
<td>Worker – inhalation, long-term – systemic</td>
<td>3.50 ppm</td>
<td>0.9</td>
</tr>
</tbody>
</table>

**Modified** long-term – systemic

- Worker – dermal, long-term – systemic: 0.34 mg/kg/d, 0.6 ppm
- Worker – long-term – systemic Combined routes: 0.34 mg/kg/d, 0.83 ppm
- Worker – long-term – systemic Combined routes: 0.07 mg/kg/d, 0.1 ppm
- Worker – long-term – systemic Combined routes: 0.95 ppm, 0.99 ppm

**PROC1**: Use in closed process, no likelihood of exposure

**CS15**: General exposures (closed systems)

**PROC2**: Use in closed, continuous process with occasional controlled exposure

**CS2**: Process sampling

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

**CS37**: Use in contained batch processes

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

**CS14**: Bulk transfers

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

**CS14**: Bulk transfers

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

**CS14**: Bulk transfers

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

**CS14**: Bulk transfers

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

**CS6**: Drum and small package filling

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

**CS6**: Drum and small package filling

**PROC15**: Use as laboratory reagent

**CS36**: Laboratory activities

---

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

SDS Number: 100000013444

33/50
When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposures are not expected to exceed the predicted DNELs and the resulting risk characterisation ratios are expected to be less than 1.

When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposures are not expected to exceed the predicted PNECs and the resulting risk characterisation ratios are expected to be less than 1.

Confirm that RMMs and OCs are as described or of equivalent efficiency.

1. Short title of Exposure Scenario: **Use in polymer production – industrial**

**Main User Groups**: SU 3: Industrial uses: Uses of substances as such or in preparations at industrial sites

**Sector of use**: SU3, SU 10: Industrial Manufacturing (all), Formulation [mixing] of preparations and/or re-packaging (excluding alloys)

**Process category**
- PROC1: Use in closed process, no likelihood of exposure
- PROC2: Use in closed, continuous process with occasional controlled exposure
- PROC3: Use in closed batch process (synthesis or formulation)
- PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises
- PROC5: Mixing or blending in batch processes for formulation of mixtures and articles (multistage and/or significant contact) Industrial setting;
- PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities
- PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
- PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
- PROC14: Production of mixtures or articles by tabletting, compression, extrusion, pelletization; Industrial setting;

**Environmental release category**: ERC4, ERC6c: Industrial use of processing aids in processes and products, not becoming part of articles, Industrial use of monomers for manufacture of thermoplastics

**Further information**: Manufacture of the substance or use as a process chemical or extraction agent. Includes recycling/recovery, material transfers, storage, maintenance and loading (including marine vessel/barge, road/rail car and bulk container), sampling and associated laboratory activities

2.1 Contributing scenario controlling environmental exposure for: ERC4, ERC6c: Industrial use of processing aids in processes and products, not becoming part of articles, Industrial use of monomers for manufacture of thermoplastics

**Daily amount per site (Msafe)**: 21.4 kg

**Environment factors not influenced by risk management**
- Flow rate: 18,000 m³/d
- Dilution Factor (River): 10
- Dilution Factor (Coastal Areas): 100

**SDS Number**: 100000013444 34/50
### Other given operational conditions affecting environmental exposure

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of emission days per year</td>
<td>300</td>
</tr>
<tr>
<td>Emission or Release Factor: Air</td>
<td>0.2 %</td>
</tr>
<tr>
<td>Emission or Release Factor: Water</td>
<td>0.03 %</td>
</tr>
<tr>
<td>Emission or Release Factor: Soil</td>
<td>0.01 %</td>
</tr>
</tbody>
</table>

### Technical conditions and measures / Organizational measures

- **Air**: Treat air emission to provide a typical removal efficiency of (%): (Effectiveness: > 80 %)
- **Remarks**: Prevent discharge of undissolved substance to or recover from onsite wastewater.
- **Remarks**: Do not apply industrial sludge to natural soils.
- **Remarks**: Sludge should be incinerated, contained or reclaimed.

### Conditions and measures related to municipal sewage treatment plant

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow rate of sewage treatment plant effluent</td>
<td>2.000 m3/d</td>
</tr>
<tr>
<td>Effectiveness (of a measure)</td>
<td>0.2 %</td>
</tr>
</tbody>
</table>

### Conditions and measures related to external treatment of waste for disposal

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste treatment</td>
<td>This substance is consumed during use and no waste of the substance is generated.</td>
</tr>
</tbody>
</table>

### Conditions and measures related to external recovery of waste

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recovery Methods</td>
<td>This substance is consumed during use and no waste of the substance is generated.</td>
</tr>
</tbody>
</table>

### 2.2 Contributing scenario controlling worker exposure for: PROC1: Use in closed process, no likelihood of exposure

#### Product characteristics

<table>
<thead>
<tr>
<th>Remarks</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remarks</td>
<td>Liquid, vapour pressure &lt; 0.5 kPa at STP</td>
</tr>
</tbody>
</table>

#### Amount used

<table>
<thead>
<tr>
<th>Remarks</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remarks</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

#### Frequency and duration of use

<table>
<thead>
<tr>
<th>Remarks</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remarks</td>
<td>Covers daily exposures up to 8 hours (unless stated differently)</td>
</tr>
</tbody>
</table>

#### Other operational conditions affecting workers exposure

<table>
<thead>
<tr>
<th>Remarks</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remarks</td>
<td>Assumes use at not more than 20°C above ambient temperature, unless stated differently. Assumes a good basic standard of occupational hygiene is implemented.</td>
</tr>
</tbody>
</table>

### Technical conditions and measures

Ensure operation is undertaken outdoors.

### 2.2 Contributing scenario controlling worker exposure for: PROC2, PROC3: Use in closed, continuous process with occasional controlled exposure, Use in closed batch process (synthesis or formulation)

#### Product characteristics

<table>
<thead>
<tr>
<th>Remarks</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remarks</td>
<td>Liquid, vapour pressure &lt; 0.5 kPa at STP</td>
</tr>
</tbody>
</table>

#### Amount used
# 2-Mercaptoethanol (BME)

**Remarks:** Not applicable

## Frequency and duration of use
**Remarks:** Covers daily exposures up to 8 hours (unless stated differently)

## Other operational conditions affecting workers exposure
**Remarks:** Assumes use at not more than 20°C above ambient temperature, unless stated differently. Assumes a good basic standard of occupational hygiene is implemented.

## Technical conditions and measures
Ensure operation is undertaken outdoors.

## Conditions and measures related to personal protection, hygiene and health evaluation
Wear suitable gloves tested to EN374.

### 2.2 Contributing scenario controlling worker exposure for: PROC4, PROC14
Use in batch and other process (synthesis) where opportunity for exposure arises, Production of mixtures or articles by tableting, compression, extrusion, pelletization; Industrial setting;

## Product characteristics
**Remarks:** Liquid, vapour pressure < 0.5 kPa at STP

## Amount used
**Remarks:** Not applicable

## Frequency and duration of use
**Remarks:** Covers daily exposures up to 8 hours (unless stated differently)

## Other operational conditions affecting workers exposure
**Remarks:** Assumes use at not more than 20°C above ambient temperature, unless stated differently. Assumes a good basic standard of occupational hygiene is implemented.

## Technical conditions and measures
Provide enhanced general ventilation by mechanical means.

## Conditions and measures related to personal protection, hygiene and health evaluation
Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wear chemically resistant gloves (tested to EN374) in combination with specific activity training.

### 2.2 Contributing scenario controlling worker exposure for: PROC5
Mixing or blending in batch processes for formulation of mixtures and articles (multistage and/or significant contact) Industrial setting;

## Product characteristics
**Remarks:** Liquid, vapour pressure < 0.5 kPa at STP

## Amount used
**Remarks:** Not applicable

## Frequency and duration of use
**Remarks:** Covers daily exposures up to 8 hours (unless stated differently)
### 2-Mercaptoethanol (BME)

<table>
<thead>
<tr>
<th>Version 4.1</th>
<th></th>
<th>SDS Number: 100000013444</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>37/50</td>
</tr>
</tbody>
</table>

#### Other operational conditions affecting workers exposure

**Remarks**: Assumes use at not more than 20°C above ambient temperature, unless stated differently. Assumes a good basic standard of occupational hygiene is implemented.

#### Technical conditions and measures

Provide enhanced general ventilation by mechanical means.

#### Conditions and measures related to personal protection, hygiene and health evaluation

Wear chemically resistant gloves (tested to EN374) in combination with intensive management supervision controls.

#### 2.2 Contributing scenario controlling worker exposure for: PROC6: Calendering operations

<table>
<thead>
<tr>
<th>Product characteristics</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>: Liquid, vapour pressure &lt; 0.5 kPa at STP</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Amount used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remarks</td>
</tr>
<tr>
<td>: Not applicable</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Frequency and duration of use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remarks</td>
</tr>
<tr>
<td>: Covers daily exposures up to 8 hours (unless stated differently)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other operational conditions affecting workers exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remarks</td>
</tr>
<tr>
<td>: Assumes use at not more than 20°C above ambient temperature, unless stated differently. Assumes a good basic standard of occupational hygiene is implemented.</td>
</tr>
</tbody>
</table>

#### Technical conditions and measures

Provide extraction ventilation at points where emissions occur.

#### Conditions and measures related to personal protection, hygiene and health evaluation

Wear chemically resistant gloves (tested to EN374) in combination with intensive management supervision controls.

#### 2.2 Contributing scenario controlling worker exposure for: PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities

<table>
<thead>
<tr>
<th>Product characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remarks</td>
</tr>
<tr>
<td>: Liquid, vapour pressure &lt; 0.5 kPa at STP</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Amount used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remarks</td>
</tr>
<tr>
<td>: Not applicable</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Frequency and duration of use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remarks</td>
</tr>
<tr>
<td>: Covers daily exposures up to 8 hours (unless stated differently)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other operational conditions affecting workers exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remarks</td>
</tr>
<tr>
<td>: Assumes use at not more than 20°C above ambient temperature, unless stated differently. Assumes a good basic standard of occupational hygiene is implemented.</td>
</tr>
</tbody>
</table>
SAFETY DATA SHEET

2-Mercaptoethanol (BME)

Version 4.1
Revision Date 2019-08-21

standard of occupational hygiene is implemented.

Technical conditions and measures
Provide enhanced general ventilation by mechanical means.

Conditions and measures related to personal protection, hygiene and health evaluation
Wear chemically resistant gloves (tested to EN374) in combination with intensive management supervision controls.

2.2 Contributing scenario controlling worker exposure for: PROC8b, PROC9: Transfer of substance or preparation (charging/ discharging) from/to vessels/ large containers at dedicated facilities, Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

Product characteristics
Remarks: Liquid, vapour pressure < 0.5 kPa at STP

Amount used
Remarks: Not applicable

Frequency and duration of use
Remarks: Covers daily exposures up to 8 hours (unless stated differently)

Other operational conditions affecting workers exposure
Remarks: Assumes use at not more than 20°C above ambient temperature, unless stated differently. Assumes a good basic standard of occupational hygiene is implemented.

Technical conditions and measures
Provide enhanced general ventilation by mechanical means.

Conditions and measures related to personal protection, hygiene and health evaluation
Wear chemically resistant gloves (tested to EN374) in combination with specific activity training.

3. Exposure estimation and reference to its source

Environment

<table>
<thead>
<tr>
<th>Contributing Scenario</th>
<th>Exposure Assessment Method</th>
<th>Specific conditions</th>
<th>Compartment</th>
<th>Value type</th>
<th>Level of Exposure</th>
<th>Risk characterization ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERC4, ERC6c</td>
<td>EUSES</td>
<td></td>
<td>Air</td>
<td>0.0077 µg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Freshwater</td>
<td>0.253 µg/L</td>
<td>0.633</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Marine water</td>
<td>0.0254 µg/L</td>
<td>0.636</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Freshwater sediment</td>
<td>0.252 µg/kg</td>
<td>0.773</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Marine sediment</td>
<td>0.0253 µg/kg</td>
<td>0.777</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Soil</td>
<td>0.0048 µg/kg</td>
<td>0.0858</td>
<td></td>
</tr>
</tbody>
</table>

ERC4: Industrial use of processing aids in processes and products, not becoming part of articles
ERC6c: Industrial use of monomers for manufacture of thermoplastics

Workers/Consumers

<table>
<thead>
<tr>
<th>Contributing Scenario</th>
<th>Exposure Assessment</th>
<th>Specific conditions</th>
<th>Value type</th>
<th>Level of Exposure</th>
<th>Risk characterization ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SDS Number:100000013444  38/50
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PROC1, CS15</td>
<td>0.01 ppm</td>
<td>0.34 mg/kg/d</td>
<td>0.57</td>
</tr>
<tr>
<td>PROC2, CS15</td>
<td>0.70 ppm</td>
<td>0.27 mg/kg/d</td>
<td>0.63</td>
</tr>
<tr>
<td>PROC3, CS15</td>
<td>2.10 ppm</td>
<td>0.07 mg/kg/d</td>
<td>0.64</td>
</tr>
<tr>
<td>PROC4, CS65</td>
<td>1.05 ppm</td>
<td>0.34 mg/kg/d</td>
<td>0.83</td>
</tr>
<tr>
<td>PROC14, CS65</td>
<td>1.50 ppm</td>
<td>0.34 mg/kg/d</td>
<td>0.95</td>
</tr>
<tr>
<td>PROC5, CS30</td>
<td>1.05 ppm</td>
<td>0.27 mg/kg/d</td>
<td>0.72</td>
</tr>
<tr>
<td>PROC6, CS64</td>
<td>1.00 ppm</td>
<td>0.27 mg/kg/d</td>
<td>0.71</td>
</tr>
<tr>
<td>PROC8a, CS14</td>
<td>2.10 ppm</td>
<td>0.27 mg/kg/d</td>
<td>0.98</td>
</tr>
<tr>
<td>PROC8b, CS14</td>
<td>1.05 ppm</td>
<td>0.34 mg/kg/d</td>
<td>0.83</td>
</tr>
<tr>
<td>PROC9, CS7</td>
<td>1.05 ppm</td>
<td>0.34 mg/kg/d</td>
<td>0.83</td>
</tr>
</tbody>
</table>

**PROC1**: Use in closed process, no likelihood of exposure

**SDS Number**: 100000013444
2-Mercaptoethanol (BME)

CS15: General exposures (closed systems)
PROC2: Use in closed, continuous process with occasional controlled exposure
CS15: General exposures (closed systems)
PROC3: Use in closed batch process (synthesis or formulation)
CS15: General exposures (closed systems)
PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises
CS65: Polymerization (bulk and batch)
PROC14: Production of mixtures or articles by tableting, compression, extrusion, pelletization; Industrial setting;
CS65: Polymerization (bulk and batch)
PROC5: Mixing or blending in batch processes for formulation of mixtures and articles (multistage and/or significant contact) Industrial setting;
CS30: Mixing operations (open systems)
PROC6: Calendering operations
CS64: Calendering (including Banburys)
PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities
CS14: Bulk transfers
PROC8b: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities
CS14: Bulk transfers
PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
CS7: Small package filling

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

When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposures are not expected to exceed the predicted DNELs and the resulting risk characterisation ratios are expected to be less than 1.

When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposures are not expected to exceed the predicted PNECs and the resulting risk characterization ratios are expected to be less than 1.

Confirm that RMMs and OCs are as described or of equivalent efficiency.

1. Short title of Exposure Scenario: **Use in Oil and Gas field drilling and production operations**

- **Industrial**

<table>
<thead>
<tr>
<th>Main User Groups</th>
<th>SU 3: Industrial uses: Uses of substances as such or in preparations at industrial sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sector of use</td>
<td>SU3: Industrial Manufacturing (all)</td>
</tr>
<tr>
<td>Process category</td>
<td>PROC1: Use in closed process, no likelihood of exposure</td>
</tr>
<tr>
<td></td>
<td>PROC2: Use in closed, continuous process with occasional controlled exposure</td>
</tr>
<tr>
<td></td>
<td>PROC3: Use in closed batch process (synthesis or formulation)</td>
</tr>
<tr>
<td></td>
<td>PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises</td>
</tr>
</tbody>
</table>

SDS Number: 100000013444 40/50
## PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities

### Environmental release category
There are no expected releases to the environment from this use, so no exposure assessment is made.

### Further information
Oil field well drilling and production operations (including drilling muds and well cleaning) including material transfers, on-site formulation, well head operations, shaker room activities and related maintenance.

### 2.2 Contributing scenario controlling worker exposure for: PROC1: Use in closed process, no likelihood of exposure

#### Product characteristics
- **Remarks**: Liquid, vapour pressure < 0.5 kPa at STP

#### Amount used
- **Remarks**: Not applicable

#### Frequency and duration of use
- **Remarks**: Covers daily exposures up to 8 hours (unless stated differently)

#### Other operational conditions affecting workers exposure
- **Remarks**: Assumes use at not more than 20°C above ambient temperature, unless stated differently, Assumes a good basic standard of occupational hygiene is implemented.

#### Technical conditions and measures
Ensure operation is undertaken outdoors.

### 2.2 Contributing scenario controlling worker exposure for: PROC2: Use in closed, continuous process with occasional controlled exposure

#### Product characteristics
- **Remarks**: Liquid, vapour pressure < 0.5 kPa at STP

#### Amount used
- **Remarks**: Not applicable

#### Frequency and duration of use
- **Remarks**: Covers daily exposures up to 8 hours (unless stated differently)

#### Other operational conditions affecting workers exposure
- **Remarks**: Assumes use at not more than 20°C above ambient temperature, unless stated differently, Assumes a good basic
2-Mercaptoethanol (BME)

Technical conditions and measures
Ensure operation is undertaken outdoors.

Conditions and measures related to personal protection, hygiene and health evaluation
Wear suitable gloves tested to EN374.

2.2 Contributing scenario controlling worker exposure for: PROC3: Use in closed batch process (synthesis or formulation)

Product characteristics
Remarks: Liquid, vapour pressure < 0.5 kPa at STP

Amount used
Remarks: Not applicable

Frequency and duration of use
Remarks: Covers daily exposures up to 8 hours (unless stated differently)

Other operational conditions affecting workers exposure
Remarks: Assumes use at not more than 20°C above ambient temperature, unless stated differently. Assumes a good basic standard of occupational hygiene is implemented.

Technical conditions and measures
Ensure operation is undertaken outdoors.

Conditions and measures related to personal protection, hygiene and health evaluation
Wear suitable gloves tested to EN374.

2.2 Contributing scenario controlling worker exposure for: PROC4, PROC8b: Use in batch and other process (synthesis) where opportunity for exposure arises, Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities

Product characteristics
Remarks: Liquid, vapour pressure < 0.5 kPa at STP

Amount used
Remarks: Not applicable

Frequency and duration of use
Remarks: Covers daily exposures up to 8 hours (unless stated differently)

Other operational conditions affecting workers exposure
Remarks: Assumes use at not more than 20°C above ambient temperature, unless stated differently. Assumes a good basic standard of occupational hygiene is implemented.

Technical conditions and measures
Provide enhanced general ventilation by mechanical means.

Conditions and measures related to personal protection, hygiene and health evaluation
2-Mercaptoethanol (BME)

Wear chemically resistant gloves (tested to EN374) in combination with specific activity training.

2.2 Contributing scenario controlling worker exposure for: PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities

Product characteristics

| Remarks | : Liquid, vapour pressure < 0.5 kPa at STP |

Amount used

| Remarks | : Not applicable |

Frequency and duration of use

| Remarks | : Covers daily exposures up to 8 hours (unless stated differently) |

Other operational conditions affecting workers exposure

| Remarks | : Assumes use at not more than 20°C above ambient temperature, unless stated differently. Assumes a good basic standard of occupational hygiene is implemented. |

Technical conditions and measures

Provide enhanced general ventilation by mechanical means.

Conditions and measures related to personal protection, hygiene and health evaluation

Wear chemically resistant gloves (tested to EN374) in combination with intensive management supervision controls.

3. Exposure estimation and reference to its source

<table>
<thead>
<tr>
<th>Workers/Consumers</th>
<th>Contributing Scenario</th>
<th>Exposure Assessment Method</th>
<th>Specific conditions</th>
<th>Value type</th>
<th>Level of Exposure</th>
<th>Risk characterization ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROC1, CS15</td>
<td>ECETOC TRA Modified</td>
<td>Worker – inhalation, long-term – systemic</td>
<td>0.01 ppm</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – dermal, long-term – systemic</td>
<td>0.34 mg/kg/d</td>
<td>0.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PROC2, CS2</td>
<td>ECETOC TRA Modified</td>
<td>Worker – inhalation, long-term – systemic</td>
<td>0.70 ppm</td>
<td>0.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – dermal, long-term – systemic</td>
<td>0.27 mg/kg/d</td>
<td>0.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PROC3, CS37</td>
<td>ECETOC TRA Modified</td>
<td>Worker – inhalation, long-term – systemic</td>
<td>2.10 ppm</td>
<td>0.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – dermal, long-term – systemic</td>
<td>0.07 mg/kg/d</td>
<td>0.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PROC4, CS116, PROC8b, CS14</td>
<td>ECETOC TRA Modified</td>
<td>Worker – inhalation, long-term – systemic</td>
<td>1.05 ppm</td>
<td>0.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – dermal, long-term – systemic</td>
<td>0.34 mg/kg/d</td>
<td>0.6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SDS Number: 100000013444
## 2-Mercaptoethanol (BME)

**Version 4.1**  
**Revision Date 2019-08-21**

<table>
<thead>
<tr>
<th>Exposure Scenario</th>
<th>TD guidance</th>
<th>Implausible Acute Hazard</th>
<th>Implausible Chronic Hazard</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROC8a, CS14</td>
<td>ECETOC TRA</td>
<td>Worker – inhalation,</td>
<td>Worker – long-term –</td>
</tr>
<tr>
<td></td>
<td>Modified</td>
<td>long-term – systemic</td>
<td>systemic Combined</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2,10 ppm</td>
<td>routes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – dermal,</td>
<td>0,27 mg/kg/d</td>
</tr>
<tr>
<td></td>
<td></td>
<td>long-term – systemic</td>
<td>0,5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker – long-term –</td>
<td>0,98</td>
</tr>
<tr>
<td></td>
<td></td>
<td>systemic Combined</td>
<td>routes</td>
</tr>
</tbody>
</table>

**PROC1:** Use in closed process, no likelihood of exposure  
**CS15:** General exposures (closed systems)

**PROC2:** Use in closed, continuous process with occasional controlled exposure  
**CS2:** Process sampling

**PROC3:** Use in closed batch process (synthesis or formulation)  
**CS37:** Use in contained batch processes

**PROC4:** Use in batch and other process (synthesis) where opportunity for exposure arises  
**CS116:** Drill floor operations

**PROC8b:** Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities  
**CS14:** Bulk transfers

**PROC8a:** Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities  
**CS14:** Bulk transfers

### 4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposures are not expected to exceed the predicted DNELs and the resulting risk characterisation ratios are expected to be less than 1.  
When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposures are not expected to exceed the predicted PNECs and the resulting risk characterisation ratios are expected to be less than 1.  
Confirm that RMMs and OCs are as described or of equivalent efficiency.

1. **Short title of Exposure Scenario:** Use in Water Treatment Chemicals

**Main User Groups:**  
**SU 3:** Industrial uses: Uses of substances as such or in preparations at industrial sites  
**SU3, SU 10:** Industrial Manufacturing (all), Formulation [mixing] of preparations and/or re-packaging (excluding alloys)

**Sector of use:**  
**PROC1:** Use in closed process, no likelihood of exposure  
**PROC2:** Use in closed, continuous process with occasional controlled exposure  
**PROC3:** Use in closed batch process (synthesis or formulation)  
**PROC4:** Use in batch and other process (synthesis) where opportunity for exposure arises  
**PROC8a:** Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities  
**PROC8b:** Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

**SDS Number:** 100000013444
2-Mercaptoethanol (BME)

Environmental release category: ERC3, ERC4: Formulation in materials, Industrial use of processing aids in processes and products, not becoming part of articles

Further information: Use in Water Treatment Chemicals

2.1 Contributing scenario controlling environmental exposure for: ERC3, ERC4: Formulation in materials, Industrial use of processing aids in processes and products, not becoming part of articles

Daily amount per site (Msafe): 10 kg

Environment factors not influenced by risk management

Flow rate: 18,000 m³/d
Dilution Factor (River): 10
Dilution Factor (Coastal Areas): 100

Other given operational conditions affecting environmental exposure

Number of emission days per year: 300
Emission or Release Factor: Air: 5 %
Emission or Release Factor: Water: 0.2 %
Emission or Release Factor: Soil: 0 %

Technical conditions and measures / Organizational measures

Air: Treat air emission to provide a typical removal efficiency of (%): (Effectiveness: 0 %)
Remarks: Soil emission controls are not applicable as there is no direct release to soil.

Conditions and measures related to municipal sewage treatment plant

Flow rate of sewage treatment plant effluent: 1,000 m³/d
Effectiveness (of a measure): 0.2 %

Conditions and measures related to external treatment of waste for disposal

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

Conditions and measures related to external recovery of waste

Recovery Methods: External recovery and recycling of waste should comply with applicable local and/or national regulations.

2.2 Contributing scenario controlling worker exposure for: PROC1: Use in closed process, no likelihood of exposure

Product characteristics

Remarks: Liquid, vapour pressure < 0.5 kPa at STP

Amount used

Remarks: Not applicable
## 2-Mercaptoethanol (BME)

### Frequency and duration of use

**Remarks**: Covers daily exposures up to 8 hours (unless stated differently)

### Other operational conditions affecting workers exposure

**Remarks**: Assumes use at not more than 20°C above ambient temperature, unless stated differently. Assumes a good basic standard of occupational hygiene is implemented.

### Technical conditions and measures

Ensure operation is undertaken outdoors.

### 2.2 Contributing scenario controlling worker exposure for: PROC2, PROC3: Use in closed, continuous process with occasional controlled exposure, Use in closed batch process (synthesis or formulation)

#### Product characteristics

**Remarks**: Liquid, vapour pressure < 0.5 kPa at STP

#### Amount used

**Remarks**: Not applicable

#### Frequency and duration of use

**Remarks**: Covers daily exposures up to 8 hours (unless stated differently)

#### Other operational conditions affecting workers exposure

**Remarks**: Assumes use at not more than 20°C above ambient temperature, unless stated differently. Assumes a good basic standard of occupational hygiene is implemented.

#### Technical conditions and measures

Ensure operation is undertaken outdoors.

#### Conditions and measures related to personal protection, hygiene and health evaluation

Wear suitable gloves tested to EN374.

### 2.2 Contributing scenario controlling worker exposure for: PROC4, PROC8a: Use in batch and other process (synthesis) where opportunity for exposure arises, Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities

#### Product characteristics

**Remarks**: Liquid, vapour pressure < 0.5 kPa at STP

#### Amount used

**Remarks**: Not applicable

#### Frequency and duration of use

**Remarks**: Covers daily exposures up to 8 hours (unless stated differently)

#### Other operational conditions affecting workers exposure

**Remarks**: Assumes use at not more than 20°C above ambient temperature, unless stated differently. Assumes a good basic standard of occupational hygiene is implemented.
Technical conditions and measures
Provide enhanced general ventilation by mechanical means.

Conditions and measures related to personal protection, hygiene and health evaluation
Wear chemically resistant gloves (tested to EN374) in combination with intensive management supervision controls.

2.2 Contributing scenario controlling worker exposure for: PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

<table>
<thead>
<tr>
<th>Product characteristics</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Liquid, vapour pressure &lt; 0.5 kPa at STP</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Amount used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remarks</td>
</tr>
<tr>
<td>Not applicable</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>Frequency and duration of use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remarks</td>
</tr>
<tr>
<td>Covers daily exposures up to 8 hours (unless stated differently)</td>
</tr>
</tbody>
</table>

Other operational conditions affecting workers exposure
Remarks
Assumes use at not more than 20°C above ambient temperature, unless stated differently.
Assumes a good basic standard of occupational hygiene is implemented.

Technical conditions and measures
Provide enhanced general ventilation by mechanical means.

Conditions and measures related to personal protection, hygiene and health evaluation
Wear chemically resistant gloves (tested to EN374) in combination with specific activity training.

2.2 Contributing scenario controlling worker exposure for: PROC13: Treatment of articles by dipping and pouring

<table>
<thead>
<tr>
<th>Product characteristics</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Liquid, vapour pressure &lt; 0.5 kPa at STP</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Amount used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remarks</td>
</tr>
<tr>
<td>Not applicable</td>
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</tbody>
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<tr>
<th>Frequency and duration of use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remarks</td>
</tr>
<tr>
<td>Covers daily exposures up to 8 hours (unless stated differently)</td>
</tr>
</tbody>
</table>

Other operational conditions affecting workers exposure
Remarks
Assumes use at not more than 20°C above ambient temperature, unless stated differently.
Assumes a good basic standard of occupational hygiene is implemented.

Technical conditions and measures
Provide enhanced general ventilation by mechanical means.

Conditions and measures related to personal protection, hygiene and health evaluation
Wear chemically resistant gloves (tested to EN374) in combination with intensive management supervision controls.
supervision controls.

3. Exposure estimation and reference to its source

### Environment

<table>
<thead>
<tr>
<th>Contributing Scenario</th>
<th>Exposure Assessment Method</th>
<th>Specific conditions</th>
<th>Compartment</th>
<th>Value type</th>
<th>Level of Exposure</th>
<th>Risk characterization ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERC3, ERC4</td>
<td>EUSES</td>
<td></td>
<td>Air</td>
<td>0.0953 µg/m³</td>
<td>0.426</td>
<td></td>
</tr>
<tr>
<td>ERC3, ERC4</td>
<td>EUSES</td>
<td></td>
<td>Freshwater</td>
<td>0.17 µg/L</td>
<td>0.428</td>
<td></td>
</tr>
<tr>
<td>ERC3, ERC4</td>
<td>EUSES</td>
<td></td>
<td>Marine water</td>
<td>0.017 µg/L</td>
<td>0.428</td>
<td></td>
</tr>
<tr>
<td>ERC3, ERC4</td>
<td>EUSES</td>
<td></td>
<td>Freshwater sediment</td>
<td>0.169 µg/kg</td>
<td>0.52</td>
<td></td>
</tr>
<tr>
<td>ERC3, ERC4</td>
<td>EUSES</td>
<td></td>
<td>Marine sediment</td>
<td>0.017 µg/kg</td>
<td>0.522</td>
<td></td>
</tr>
<tr>
<td>ERC3, ERC4</td>
<td>EUSES</td>
<td></td>
<td>Soil</td>
<td>0.0462 µg/kg</td>
<td>0.822</td>
<td></td>
</tr>
</tbody>
</table>

ERC3: Formulation in materials  
ERC4: Industrial use of processing aids in processes and products, not becoming part of articles

### Workers/Consumers

<table>
<thead>
<tr>
<th>Contributing Scenario</th>
<th>Exposure Assessment Method</th>
<th>Specific conditions</th>
<th>Value type</th>
<th>Level of Exposure</th>
<th>Risk characterization ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROC1, CS15</td>
<td>ECETOC TRA Modified</td>
<td></td>
<td>Worker – inhalation, long-term – systemic</td>
<td>0.01 ppm</td>
<td>0.0</td>
</tr>
<tr>
<td>PROC1, CS15</td>
<td>ECETOC TRA Modified</td>
<td></td>
<td>Worker – dermal, long-term – systemic</td>
<td>0.34 mg/kg/d</td>
<td>0.6</td>
</tr>
<tr>
<td>PROC1, CS15</td>
<td>ECETOC TRA Modified</td>
<td></td>
<td>Worker – long-term – systemic Combined routes</td>
<td>0.57</td>
<td></td>
</tr>
<tr>
<td>PROC2, CS15</td>
<td>ECETOC TRA Modified</td>
<td></td>
<td>Worker – inhalation, long-term – systemic</td>
<td>0.70 ppm</td>
<td>0.2</td>
</tr>
<tr>
<td>PROC2, CS15</td>
<td>ECETOC TRA Modified</td>
<td></td>
<td>Worker – dermal, long-term – systemic</td>
<td>0.27 mg/kg/d</td>
<td>0.5</td>
</tr>
<tr>
<td>PROC2, CS15</td>
<td>ECETOC TRA Modified</td>
<td></td>
<td>Worker – long-term – systemic Combined routes</td>
<td>0.63</td>
<td></td>
</tr>
<tr>
<td>PROC3, CS37</td>
<td>ECETOC TRA Modified</td>
<td></td>
<td>Worker – inhalation, long-term – systemic</td>
<td>2.10 ppm</td>
<td>0.5</td>
</tr>
<tr>
<td>PROC3, CS37</td>
<td>ECETOC TRA Modified</td>
<td></td>
<td>Worker – dermal, long-term – systemic</td>
<td>0.07 mg/kg/d</td>
<td>0.1</td>
</tr>
<tr>
<td>PROC3, CS37</td>
<td>ECETOC TRA Modified</td>
<td></td>
<td>Worker – long-term – systemic Combined routes</td>
<td>0.64</td>
<td></td>
</tr>
<tr>
<td>PROC4, CS16</td>
<td>ECETOC TRA Modified</td>
<td></td>
<td>Worker – inhalation, long-term – systemic</td>
<td>2.45 ppm</td>
<td>0.6</td>
</tr>
<tr>
<td>PROC4, CS16</td>
<td>ECETOC TRA Modified</td>
<td></td>
<td>Worker – dermal, long-term – systemic</td>
<td>0.14 mg/kg/d</td>
<td>0.2</td>
</tr>
<tr>
<td>PROC4, CS16</td>
<td>ECETOC TRA Modified</td>
<td></td>
<td>Worker – long-term – systemic Combined routes</td>
<td>0.84</td>
<td></td>
</tr>
<tr>
<td>PROC8a, CS114</td>
<td>ECETOC TRA Modified</td>
<td>Outdoor</td>
<td>Worker – inhalation, long-term – systemic</td>
<td>2.10 ppm</td>
<td>0.5</td>
</tr>
<tr>
<td>PROC8a, CS114</td>
<td>ECETOC TRA Modified</td>
<td>Outdoor</td>
<td>Worker – dermal, long-term – systemic</td>
<td>0.27 mg/kg/d</td>
<td>0.5</td>
</tr>
<tr>
<td>PROC8a, CS114</td>
<td>ECETOC TRA Modified</td>
<td>Outdoor</td>
<td>Worker – long-term – systemic Combined routes</td>
<td>0.98</td>
<td></td>
</tr>
<tr>
<td>PROC8a, CS114</td>
<td>ECETOC TRA Modified</td>
<td>Indoor</td>
<td>Worker – inhalation, long-term – systemic</td>
<td>2.00 ppm</td>
<td>0.5</td>
</tr>
<tr>
<td>PROC8a, CS114</td>
<td>ECETOC TRA Modified</td>
<td>Indoor</td>
<td>Worker – dermal, long-term – systemic</td>
<td>0.27 mg/kg/d</td>
<td>0.5</td>
</tr>
<tr>
<td>PROC8a, CS114</td>
<td>ECETOC TRA Modified</td>
<td>Indoor</td>
<td>Worker – long-term – systemic Combined routes</td>
<td>0.96</td>
<td></td>
</tr>
</tbody>
</table>
# 2-Mercaptoethanol (BME)

## SAFETY DATA SHEET

<table>
<thead>
<tr>
<th>PROC, CS</th>
<th>ECETOC TRA</th>
<th>Outdoor</th>
<th>Worker – inhalation, long-term – systemic</th>
<th>1.05 ppm</th>
<th>0.3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Worker – dermal, long-term – systemic</td>
<td>0.34 mg/kg/d</td>
<td>0.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Worker – long-term – systemic Combined</td>
<td></td>
<td>0.83</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Worker – inhalation, long-term – systemic</td>
<td>1.50 ppm</td>
<td>0.4</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>Worker – dermal, long-term – systemic</td>
<td>0.34 mg/kg/d</td>
<td>0.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Worker – long-term – systemic Combined</td>
<td></td>
<td>0.95</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Worker – inhalation, long-term – systemic</td>
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<td>0.5</td>
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<td></td>
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<td>0.5</td>
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<td>Worker – dermal, long-term – systemic</td>
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<tr>
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<td></td>
<td></td>
<td>Worker – long-term – systemic Combined</td>
<td></td>
<td>0.96</td>
</tr>
</tbody>
</table>

**PROC1:** Use in closed process, no likelihood of exposure  
**CS15:** General exposures (closed systems)

**PROC2:** Use in closed, continuous process with occasional controlled exposure  
**CS15:** General exposures (closed systems)

**PROC3:** Use in closed batch process (synthesis or formulation)  
**CS37:** Use in contained batch processes

**PROC4:** Use in batch and other process (synthesis) where opportunity for exposure arises  
**CS16:** General exposures (open systems)

**PROC8a:** Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities  
**CS114:** Bulk transfers from tote tanks and supply vessels

**PROC8a:** Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities  
**CS114:** Bulk transfers from tote tanks and supply vessels

**PROC8b:** Transfer of substance or preparation (charging/ discharging) from/to vessels/ large containers at dedicated facilities  
**CS114:** Bulk transfers from tote tanks and supply vessels

**PROC8b:** Transfer of substance or preparation (charging/ discharging) from/to vessels/ large containers at dedicated facilities  
**CS114:** Bulk transfers from tote tanks and supply vessels

**PROC13:** Treatment of articles by dipping and pouring  
**CS4:** Dipping, immersion and pouring

**PROC13:** Treatment of articles by dipping and pouring  
**CS4:** Dipping, immersion and pouring

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**SDS Number:** 100000013444  | 49/50

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

When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposures are not expected to exceed the predicted DNELs and the resulting risk characterisation ratios are expected to be less than 1.

When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposures are not expected to exceed the predicted PNECs and the resulting risk characterization ratios are expected to be less than 1.

Confirm that RMMs and OCs are as described or of equivalent efficiency.