# SAFETY DATA SHEET

**Creation Date** 11-Jun-2009 **Revision Date** 30-May-2019 **Revision Number** 12

## SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

### 1.1. Product identification

| | |
|---|---|
| **Product Description:** | **Tetrahydrofuran** |
| **Cat No. :** | **164240000; 164240010; 164240025; 164240050; 164240250** |
| **Synonyms** | THF |
| **CAS-No** | 109-99-9 |
| **EC-No.** | 203-726-8 |
| **Molecular Formula** | C4 H8 O |
| **Reach Registration Number** | 01-2119444314-46-0079 |

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

| | |
|---|---|
| **Recommended Use** | Laboratory chemicals. See Annex for full list. |
| **Sector of use** | SU3 - Industrial uses: Uses of substances as such or in preparations at industrial sites |
| **Product category** | PC21 - Laboratory chemicals |
| **Process categories** | PROC15 - Use as a laboratory reagent |
| **Environmental release category** | ERC6a - Industrial use resulting in manufacture of another substance (use of intermediates) |
| **Uses advised against** | No Information available |

### 1.3. Details of the supplier of the safety data sheet

**Company**

**UK entity/business name**
Fisher Scientific UK
Bishop Meadow Road, Loughborough,
Leicestershire LE11 5RG, United Kingdom

**EU entity/business name**
Acros Organics BVBA
Janssen Pharmaceuticalaan 3a
2440 Geel, Belgium

**E-mail address** begel.sdsdesk@thermofisher.com

### 1.4. Emergency telephone number

For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
**CHEMTREC** Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

## SECTION 2: HAZARDS IDENTIFICATION

### 2.1. Classification of the substance or mixture

**CLP Classification - Regulation (EC) No 1272/2008**

**Physical hazards**

| | |
|---|---|
| Flammable liquids | Category 2 (H225) |

**Health hazards**

| | |
|---|---|
| Acute oral toxicity | Category 4 (H302) |
| Serious Eye Damage/Eye Irritation | Category 2 (H319) |
| Carcinogenicity | Category 2 (H351) |
| Specific target organ toxicity - (single exposure) | Category 3 (H335) (H336) |

**Environmental hazards**
Based on available data, the classification criteria are not met

### 2.2. Label elements

**Signal Word** **Danger**

**Hazard Statements**
- H225 - Highly flammable liquid and vapor
- H302 - Harmful if swallowed
- H319 - Causes serious eye irritation
- H335 - May cause respiratory irritation
- H336 - May cause drowsiness or dizziness
- H351 - Suspected of causing cancer
- EUH019 - May form explosive peroxides

**Precautionary Statements**
- P210 - Keep away from heat/sparks/open flames/hot surfaces. - No smoking
- P280 - Wear protective gloves/ protective clothing/ eye protection/ face protection
- P301 + P330 + P331 - IF SWALLOWED: rinse mouth. Do NOT induce vomiting
- P303 + P361 + P353 - IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower
- P304 + P340 - IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing
- P312 - Call a POISON CENTER or doctor/ physician if you feel unwell

### 2.3. Other hazards

Substance is not considered persistent, bioaccumulative and toxic (PBT) / very persistent and very bioaccumulative (vPvB)

## SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

### 3.1. Substances

| Component | CAS-No | EC-No. | Weight % | CLP Classification - Regulation (EC) No 1272/2008 |
|---|---|---|---|---|
| Tetrahydrofuran | 109-99-9 | EEC No. 203-726-8 | >95 | Flam. Liq. 2 (H225) |

| | | | | |
|---|---|---|---|---|
| | | | | Acute Tox. 4 (H302)<br>Eye Irrit. 2 (H319)<br>STOT SE 3 (H335)<br>STOT SE 3 (H336)<br>Carc. 2 (H351)<br>(EUH019) |
| 2,6-Di-tert-butyl-p-cresol | 128-37-0 | EEC No. 204-881-4 | 0.025 | Aquatic Acute 1 (H400)<br>Aquatic Chronic 1 (H410) |

| Reach Registration Number | 01-2119444314-46-0079 |
|---|---|

*Full text of Hazard Statements: see section 16*

## SECTION 4: FIRST AID MEASURES

### 4.1. Description of first aid measures

**General Advice** If symptoms persist, call a physician.

**Eye Contact** Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.

**Skin Contact** Wash off immediately with plenty of water for at least 15 minutes. Get medical attention immediately if symptoms occur.

**Ingestion** Do not induce vomiting. Call a physician or Poison Control Center immediately.

**Inhalation** Move to fresh air. If breathing is difficult, give oxygen. Obtain medical attention.

**Self-Protection of the First Aider** Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.

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

Breathing difficulties. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting: Causes central nervous system depression

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

**Notes to Physician** Treat symptomatically. Symptoms may be delayed.

## SECTION 5: FIREFIGHTING MEASURES

### 5.1. Extinguishing media

**Suitable Extinguishing Media**
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide. Cool closed containers exposed to fire with water spray.

**Extinguishing media which must not be used for safety reasons**
Do not use a solid water stream as it may scatter and spread fire.

### 5.2. Special hazards arising from the substance or mixture

Flammable. Containers may explode when heated. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. May form explosive peroxides. Thermal decomposition can lead to release of irritating gases and vapors. Keep product and empty container away from heat and sources of ignition.

**Hazardous Combustion Products**

Carbon monoxide (CO), Carbon dioxide ($CO_2$), peroxides.

### 5.3. Advice for firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

## SECTION 6: ACCIDENTAL RELEASE MEASURES

### 6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Ensure adequate ventilation. Remove all sources of ignition. Take precautionary measures against static discharges. Avoid contact with the skin and the eyes. Keep people away from and upwind of spill/leak.

### 6.2. Environmental precautions

Should not be released into the environment.

### 6.3. Methods and material for containment and cleaning up

Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment.

### 6.4. Reference to other sections

Refer to protective measures listed in Sections 8 and 13.

## SECTION 7: HANDLING AND STORAGE

### 7.1. Precautions for safe handling

Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Ensure adequate ventilation. Avoid ingestion and inhalation. If peroxide formation is suspected, do not open or move container. Keep away from open flames, hot surfaces and sources of ignition. Use only non-sparking tools. To avoid ignition of vapors by static electricity discharge, all metal parts of the equipment must be grounded. Take precautionary measures against static discharges. Handle under an inert atmosphere.

**Hygiene Measures**
Handle in accordance with good industrial hygiene and safety practice. Keep away from food, drink and animal feeding stuffs. Do not eat, drink or smoke when using this product. Remove and wash contaminated clothing before re-use. Wash hands before breaks and at the end of workday.

### 7.2. Conditions for safe storage, including any incompatibilities

Shelf life 12 months. May form explosive peroxides on prolonged storage. Containers should be dated when opened and tested periodically for the presence of peroxides. Should crystals form in a peroxidizable liquid, peroxidation may have occurred and the product should be considered extremely dangerous. In this instance, the container should only be opened remotely by professionals. Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat and sources of ignition. Flammables area. Store under an inert atmosphere.

### 7.3. Specific end use(s)

Use in laboratories

## SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1. Control parameters

**Exposure limits**
List source(s): **EU** - Commission Directive 2006/15/EC of 7 February 2006 establishing a second list of indicative occupational exposure limit values in implementation of Council Directive 98/24/EC and amending Directives 91/322/EEC and 2000/39/EC on the protection of the health and safety of workers from the risks related to chemical agents at work. **UK** - EH40/2005 Containing the workplace exposure limits (WELs) for use with the Control of Substances Hazardous to Health Regulations (COSHH) 2002 (as amended). Updated by September 2006 official press release and October 2007 Supplement. **IRE -** 2010 Code of Practice for the Safety, Health and Welfare at Work (Chemical Agents) Regulations 2001. Published by the Health and Safety Authority.

| Component | The United Kingdom | European Union | Ireland |
|---|---|---|---|
| Tetrahydrofuran | STEL: 100 ppm 15 min<br>STEL: 300 mg/m³ 15 min<br>TWA: 50 ppm 8 hr<br>TWA: 150 mg/m³ 8 hr<br>Skin | TWA: 50 ppm 8 hr<br>TWA: 150 mg/m³ 8 hr<br>STEL: 100 ppm 15 min<br>STEL: 300 mg/m³ 15 min<br>Possibility of significant uptake through the skin | TWA: 50 ppm 8 hr.<br>TWA: 150 mg/m³ 8 hr.<br>STEL: 100 ppm 15 min<br>STEL: 300 mg/m³ 15 min<br>Skin |
| 2,6-Di-tert-butyl-p-cresol | STEL: 30 mg/m³ 15 min<br>TWA: 10 mg/m³ 8 hr | | TWA: 2 mg/m³ 8 hr.<br>STEL: 6 mg/m³ 15 min |

**Biological limit values**
List source(s):

**Monitoring methods**
BS EN 14042:2003 Title Identifier: Workplace atmospheres. Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents.
MDHS70 General methods for sampling airborne gases and vapours
MDHS 88 Volatile organic compounds in air. Laboratory method using diffusive samplers, solvent desorption and gas chromatography
MDHS 96 Volatile organic compounds in air - Laboratory method using pumped solid sorbent tubes, solvent desorption and gas chromatography

**Derived No Effect Level (DNEL)** See table for values

| Route of exposure | Acute effects (local) | Acute effects (systemic) | Chronic effects (local) | Chronic effects (systemic) |
|---|---|---|---|---|
| **Oral** | | | | |
| **Dermal** | | | | 25 mg/kg bw/day |
| **Inhalation** | 150 mg/m³ | 300 mg/m³ | 150 mg/m³ | 300 mg/m³ |

**Predicted No Effect Concentration (PNEC)** See values below.

| | |
|---|---|
| **Fresh water** | 4.32 mg/l |
| **Fresh water sediment** | 23.3 mg/kg |
| **Marine water** | 0.432 mg/l |
| **Marine water sediment** | 2.3 mg/kg |
| **Water Intermittent** | 21.6 mg/l |
| **Microorganisms in sewage treatment** | 4.6 mg/l |
| **Soil (Agriculture)** | 2.1 mg/kg |

**8.2. Exposure controls**

**Engineering Measures**
Use explosion-proof electrical/ventilating/lighting/equipment. Ensure that eyewash stations and safety showers are close to the workstation location. Ensure adequate ventilation, especially in confined areas.
Wherever possible, engineering control measures such as the isolation or enclosure of the process, the introduction of process or equipment changes to minimise release or contact, and the use of properly designed ventilation systems, should be adopted to control hazardous materials at source

**Personal protective equipment**

**Eye Protection** Goggles (European standard - EN 166)

**Hand Protection** Protective gloves

| Glove material | Breakthrough time | Glove thickness | EU standard | Glove comments |
|---|---|---|---|---|
| Butyl rubber | < 25 minutes | 0.6 mm | Level 1<br>EN 374 | Permeation rate 106 µg/cm2/min<br>As tested under EN374-3 Determination of Resistance to Permeation by Chemicals |
| Neoprene gloves | < 15 minutes | 0.45 mm | | |

**Skin and body protection** Long sleeved clothing

Inspect gloves before use.
Please observe the instructions regarding permeability and breakthrough time which are provided by the supplier of the gloves. (Refer to manufacturer/supplier for information)
Ensure gloves are suitable for the task: Chemical compatability, Dexterity, Operational conditions, User susceptibility, e.g. sensitisation effects, also take into consideration the specific local conditions under which the product is used, such as the danger of cuts, abrasion.
Remove gloves with care avoiding skin contamination.

**Respiratory Protection** When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.
To protect the wearer, respiratory protective equipment must be the correct fit and be used and maintained properly

**Large scale/emergency use** Use a NIOSH/MSHA or European Standard EN 136 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced
**Recommended Filter type:** Organic gases and vapours filter Type A Brown conforming to EN14387

**Small scale/Laboratory use** Use a NIOSH/MSHA or European Standard EN 149:2001 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.
**Recommended half mask:-** Valve filtering: EN405; or; Half mask: EN140; plus filter, EN 141
When RPE is used a face piece Fit Test should be conducted

**Environmental exposure controls** No information available.

## SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

### 9.1. Information on basic physical and chemical properties

| | | |
|---|---|---|
| **Appearance** | Colorless | |
| **Physical State** | Liquid | |
| **Odor** | Petroleum distillates | |
| **Odor Threshold** | No data available | |
| **pH** | 7-8 | 20% aq. solution |
| **Melting Point/Range** | -108.4 °C / -163.1 °F | |
| **Softening Point** | No data available | |
| **Boiling Point/Range** | 66 °C / 150.8 °F | |
| **Flash Point** | -21 °C / -5.8 °F | **Method -** No information available |
| **Evaporation Rate** | > 1 (Ether = 1.0) | (Butyl Acetate = 1.0) |
| **Flammability (solid,gas)** | Not applicable | Liquid |
| **Explosion Limits** | **Lower** 1.5 vol%<br>**Upper** 12 vol% | |
| **Vapor Pressure** | 170 mbar @ 20 °C | |
| **Vapor Density** | 2.5 (Ether = 1.0) | (Air = 1.0) |
| **Specific Gravity / Density** | 0.880 | |
| **Bulk Density** | Not applicable | Liquid |

| | | |
|---|---|---|
| **Water Solubility** | Miscible | |
| **Solubility in other solvents** | No information available | |
| **Partition Coefficient (n-octanol/water)** | | |
| **Component** | **log Pow** | |
| Tetrahydrofuran | 0.45 | |
| 2,6-Di-tert-butyl-p-cresol | 4.17 | |
| **Autoignition Temperature** | 215 - °C / 419 - °F | |
| **Decomposition Temperature** | No data available | |
| **Viscosity** | 0.456 mPas @ 20°C Dynamic | |
| **Explosive Properties** | No information available | Vapors may form explosive mixtures with air |
| **Oxidizing Properties** | No information available | |

**9.2. Other information**

| | |
|---|---|
| **Molecular Formula** | C4 H8 O |
| **Molecular Weight** | 72.11 |

## SECTION 10: STABILITY AND REACTIVITY

**10.1. Reactivity**

Yes. May form explosive peroxides

**10.2. Chemical stability**

May form explosive peroxides, Hygroscopic.

**10.3. Possibility of hazardous reactions**

| | |
|---|---|
| **Hazardous Polymerization** | Hazardous polymerization may occur. |
| **Hazardous Reactions** | None under normal processing. |

**10.4. Conditions to avoid**

Incompatible products. Excess heat. Keep away from open flames, hot surfaces and sources of ignition. Exposure to moist air or water.

**10.5. Incompatible materials**

Strong oxidizing agents. Acids.

**10.6. Hazardous decomposition products**

Carbon monoxide (CO). Carbon dioxide ($CO_2$). peroxides.

## SECTION 11: TOXICOLOGICAL INFORMATION

**11.1. Information on toxicological effects**

**Product Information**

**(a) acute toxicity;**

| | |
|---|---|
| **Oral** | Category 4 |
| **Dermal** | Based on available data, the classification criteria are not met |
| **Inhalation** | Based on available data, the classification criteria are not met |

| Component | LD50 Oral | LD50 Dermal | LC50 Inhalation |
|---|---|---|---|
| Tetrahydrofuran | 1650 mg/kg ( Rat ) | > 2000 mg/kg (Rabbit) | 180 mg/L ( Rat ) 1 h<br>53.9 mg/L ( Rat ) 4 h |
| 2,6-Di-tert-butyl-p-cresol | >2000 mg/kg ( Rat ) | >2000 mg/kg ( Rat ) | |

**(b) skin corrosion/irritation;** Based on available data, the classification criteria are not met

**(c) serious eye damage/irritation;** Category 2

**(d) respiratory or skin sensitization;**

**Respiratory** Based on available data, the classification criteria are not met

**Skin** Based on available data, the classification criteria are not met

**(e) germ cell mutagenicity;** Based on available data, the classification criteria are not met

**(f) carcinogenicity;** Category 2

Limited evidence of a carcinogenic effect

| Component | EU | UK | Germany | IARC |
|---|---|---|---|---|
| Tetrahydrofuran | | | | Group 2B |

**(g) reproductive toxicity;** Based on available data, the classification criteria are not met

**(h) STOT-single exposure;** Category 3

**Results / Target organs** Respiratory system, Central nervous system (CNS).

**(i) STOT-repeated exposure;** Based on available data, the classification criteria are not met

**Target Organs** None known.

**(j) aspiration hazard;** Based on available data, the classification criteria are not met

**Other Adverse Effects** Tumorigenic effects have been reported in experimental animals.

**Symptoms / effects,both acute and delayed** Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting: Causes central nervous system depression

## SECTION 12: ECOLOGICAL INFORMATION

**12.1. Toxicity**

**Ecotoxicity effects** Do not empty into drains. .

| Component | Freshwater Fish | Water Flea | Freshwater Algae | Microtox |
|---|---|---|---|---|
| Tetrahydrofuran | 2160 mg/l LC50 = 96 h Pimephales promelas Leuciscus idus: LC50: 2820 mg/L/48h | EC50 48 h 3485 mg/l EC50: >10000 mg/L/24h | | |
| 2,6-Di-tert-butyl-p-cresol | LC50 = 0.199 mg/L 96h | EC50 >0.31 mg/L 48h | EC50 = 0.758 mg/L 96h EC50 = 6 mg/L 72 h | EC50 = 7.82 mg/L 5 min EC50 = 8.57 mg/L 15 min EC50 = 8.98 mg/L 30 min |

**12.2. Persistence and degradability**

**Persistence** Persistence is unlikely, based on information available.

**12.3. Bioaccumulative potential** Bioaccumulation is unlikely

| Component | log Pow | Bioconcentration factor (BCF) |
|---|---|---|
| Tetrahydrofuran | 0.45 | No data available |
| 2,6-Di-tert-butyl-p-cresol | 4.17 | 230 - 2500 OECD 305C |

**12.4. Mobility in soil** The product contains volatile organic compounds (VOC) which will evaporate easily from all surfaces Will likely be mobile in the environment due to its volatility. Disperses rapidly in air

**12.5. Results of PBT and vPvB assessment** Substance is not considered persistent, bioaccumulative and toxic (PBT) / very persistent and very bioaccumulative (vPvB).

**12.6. Other adverse effects**

**Endocrine Disruptor Information**

| Component | EU - Endocrine Disrupters Candidate List | EU - Endocrine Disruptors - Evaluated Substances | Japan - Endocrine Disruptor Information |
|---|---|---|---|
| Tetrahydrofuran | Group III Chemical | | |

**Persistent Organic Pollutant** This product does not contain any known or suspected substance

**Ozone Depletion Potential** This product does not contain any known or suspected substance

## SECTION 13: DISPOSAL CONSIDERATIONS

**13.1. Waste treatment methods**

**Waste from Residues / Unused Products** Waste is classified as hazardous. Dispose of in accordance with the European Directives on waste and hazardous waste. Dispose of in accordance with local regulations.

**Contaminated Packaging** Dispose of this container to hazardous or special waste collection point. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep product and empty container away from heat and sources of ignition.

**European Waste Catalogue (EWC)** According to the European Waste Catalogue, Waste Codes are not product specific, but application specific.

**Other Information** Do not dispose of waste into sewer. Waste codes should be assigned by the user based on the application for which the product was used. Can be incinerated, when in compliance with local regulations.

## SECTION 14: TRANSPORT INFORMATION

**IMDG/IMO**

**14.1. UN number** UN2056
**14.2. UN proper shipping name** TETRAHYDROFURAN
**14.3. Transport hazard class(es)** 3
**14.4. Packing group** II

**ADR**

**14.1. UN number** UN2056
**14.2. UN proper shipping name** TETRAHYDROFURAN
**14.3. Transport hazard class(es)** 3
**14.4. Packing group** II

**IATA**

**14.1. UN number** UN2056
**14.2. UN proper shipping name** TETRAHYDROFURAN
**14.3. Transport hazard class(es)** 3
**14.4. Packing group** II

**14.5. Environmental hazards** No hazards identified

**14.6. Special precautions for user** No special precautions required

**14.7. Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code** Not applicable, packaged goods

## SECTION 15: REGULATORY INFORMATION

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

**International Inventories**

X = listed, Europe (EINECS/ELINCS/NLP), U.S.A. (TSCA), Canada (DSL/NDSL), Philippines (PICCS), China (IECSC), Japan (ENCS), Australia (AICS), Korea (ECL).

| Component | EINECS | ELINCS | NLP | TSCA | DSL | NDSL | PICCS | ENCS | IECSC | AICS | KECL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Tetrahydrofuran | 203-726-8 | - | | X | X | - | X | X | X | X | KE-33454 |
| 2,6-Di-tert-butyl-p-cresol | 204-881-4 | - | | X | X | - | X | X | X | X | KE-03079 |

**National Regulations**

| Component | Germany - Water Classification (VwVwS) | Germany - TA-Luft Class |
|---|---|---|
| Tetrahydrofuran | WGK 1 | |
| 2,6-Di-tert-butyl-p-cresol | WGK 2 | |

| Component | France - INRS (Tables of occupational diseases) |
|---|---|
| Tetrahydrofuran | Tableaux des maladies professionnelles (TMP) - RG 84 |

Take note of Control of Substances Hazardous to Health Regulations (COSHH) 2002 and 2005 Amendment.

**15.2. Chemical safety assessment**

A Chemical Safety Assessment/Report (CSA/CSR) has been conducted by the manufacturer/importer

## SECTION 16: OTHER INFORMATION

**Full text of H-Statements referred to under sections 2 and 3**

H302 - Harmful if swallowed
H319 - Causes serious eye irritation
H335 - May cause respiratory irritation
H336 - May cause drowsiness or dizziness
H351 - Suspected of causing cancer
EUH019 - May form explosive peroxides
H225 - Highly flammable liquid and vapor

**Legend**

**CAS** - Chemical Abstracts Service

**EINECS/ELINCS** - European Inventory of Existing Commercial Chemical Substances/EU List of Notified Chemical Substances

**PICCS** - Philippines Inventory of Chemicals and Chemical Substances

**IECSC** - Chinese Inventory of Existing Chemical Substances

**KECL** - Korean Existing and Evaluated Chemical Substances

**TSCA** - United States Toxic Substances Control Act Section 8(b) Inventory

**DSL/NDSL** - Canadian Domestic Substances List/Non-Domestic Substances List

**ENCS** - Japanese Existing and New Chemical Substances

**AICS** - Australian Inventory of Chemical Substances

**NZIoC** - New Zealand Inventory of Chemicals

**WEL** - Workplace Exposure Limit
**ACGIH** - American Conference of Governmental Industrial Hygienists
**DNEL** - Derived No Effect Level
**RPE** - Respiratory Protective Equipment
**LC50** - Lethal Concentration 50%
**NOEC** - No Observed Effect Concentration
**PBT** - Persistent, Bioaccumulative, Toxic
**TWA** - Time Weighted Average
**IARC** - International Agency for Research on Cancer
**PNEC** - Predicted No Effect Concentration
**LD50** - Lethal Dose 50%
**EC50** - Effective Concentration 50%
**POW** - Partition coefficient Octanol:Water
**vPvB** - very Persistent, very Bioaccumulative

**ADR** - European Agreement Concerning the International Carriage of Dangerous Goods by Road
**IMO/IMDG** - International Maritime Organization/International Maritime Dangerous Goods Code
**OECD** - Organisation for Economic Co-operation and Development
**BCF** - Bioconcentration factor
**ICAO/IATA** - International Civil Aviation Organization/International Air Transport Association
**MARPOL** - International Convention for the Prevention of Pollution from Ships
**ATE** - Acute Toxicity Estimate
**VOC** - Volatile Organic Compounds

**Key literature references and sources for data**
Suppliers safety data sheet, Chemadvisor - LOLI, Merck index, RTECS

**Training Advice**
Chemical hazard awareness training, incorporating labelling, Safety Data Sheets (SDS), Personal Protective Equipment (PPE) and hygiene.
Use of personal protective equipment, covering appropriate selection, compatibility, breakthrough thresholds, care, maintenance, fit and standards.
First aid for chemical exposure, including the use of eye wash and safety showers.
Fire prevention and fighting, identifying hazards and risks, static electricity, explosive atmospheres posed by vapours and dusts.
Chemical incident response training.

| | |
|---|---|
| **Creation Date** | 11-Jun-2009 |
| **Revision Date** | 30-May-2019 |
| **Revision Summary** | Update to Format. |

## This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006

**Disclaimer**

**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**

# End of Safety Data Sheet

## Annex to the Safety Data Sheet according to Regulation (EC) No 1907/2006 [REACH]

# Tetrahydrofuran - Exposure Scenarios

| CAS-No | Reach Registration Number | EC-No. |
|---|---|---|
| 109-99-9 | 01-2119444314-46-xxxx | 203-726-8 |

**Exposure Scenarios Overview**

| Title | Sector of use | Process category(ies) | Environmental release category | ES Identifier |
|---|---|---|---|---|
| Manufacture or use as an intermediate or process chemical or extraction agent | SU3 - Industrial uses: Uses of substances as such or in preparations at industrial sites | 1, 2, 3, 4, 8a, 8b, 15 | ERC1 - Manufacture of substances | ES1-M1 THF |
| Formulation of preparations and/or re-packaging | SU3 - Industrial uses: Uses of substances as such or in preparations at industrial sites | 1, 2, 3, 4, 5, 8a, 8b, 9, 14, 15 | ERC2 - Formulation of preparations | ES2-F1 THF |
| Laboratory use | SU3 - Industrial uses: Uses of substances as such or in preparations at industrial sites | 9, 10, 15 | ERC4 - Industrial use of processing aids in processes and products, not becoming part of articles | ES3-L1 THF |
| Laboratory use | SU22 - Professional uses: Public domain (administration, education, entertainment, services, craftsmen) | 9, 10, 15 | ERC8a - Wide dispersive indoor use of processing aids in open systems | ES4-L2 THF |

## Exposure scenario

### ES1 Manufacture of THF - ES1-M1 THF

## Section 1 - Identification of the use

**Main user group** Industrial uses: Uses of substances as such or in preparations at industrial sites

**Type** Worker

**Processes, tasks, activities covered** Manufacture or use as an intermediate or process chemical or extraction agent. 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

**Sector(s) of use**

SU3 - Industrial uses: Uses of substances as such or in preparations at industrial sites
SU22 - Professional uses: Public domain (administration, education, entertainment, services, craftsmen)

**Process category(ies)**

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
PROC15 - Use as laboratory reagent

**Environmental release category(ies)** ERC1 - Manufacture of substances
As a result of the hazard assessment carried out in accordance to Article 14.3 of REACH, the registrant concludes that the substance does not meet the criteria for classification as hazardous to the environment, therefore exposure assessments and risk characterisation for environmental endpoints were not developed. PNECs have been developed for completeness in the registration dossier.

**Further information**
Under certain circumstances, stabilisers in THF (e.g. Butylated hydroxytoluene) which prevent peroxide formation can be depleted and a risk of explosion may be present to industrial or professional workers. Activities which involve processing, concentration or distillation steps may significantly reduce the amount of stabiliser in THF. In order to control the risk of explosion from elevated peroxide levels which may occur when performing the activities, risk Management Measures will need to be implemented by the Downstream Users of such activities:
Use the minimum amount of product required to complete activity
Do not store distilled THF for long periods
Store in a cool, dark, well ventilated place
Perform periodic testing to determine peroxide levels in stored THF and document
Test peroxide levels in THF always before carrying out distillation or concentration steps Applicable peroxide methods would be:
1) Peroxide test strips: e.g. EMQuant® Peroxide test strips (0-100ppm range)
2) ASTM E 299-08 Standard Test Method for Trace Amounts of Peroxide in Organic Solvents.
If peroxide level is above 25ppm, not recommended for distillation activities.
If peroxide level is above 100 ppm DO NOT use, consult Health and Safety Manager and contact manufacturer/supplier to discuss disposal. If the Risk Management Measures above are applied then the risk of explosion due to elevated peroxide levels is negligible. Downstream Users should satisfy themselves that they are implementing the Risk Management Measures and take the necessary actions to ensure risk is controlled.

## Section 2 - Operational Conditions and Risk Management Measures

**Product characteristics**

| | |
|---|---|
| **Physical State** | Liquid |
| **pH** | 7-8 |
| **Water Solubility** | Miscible |
| **Vapor Pressure** | 170 hPa @ 20 °C |

Covers concentrations up to 100 %

## Section 2.1 - Control of environmental exposure

**Environmental release category(ies)**
ERC1 - Manufacture of substances
As a result of the hazard assessment carried out in accordance to Article 14.3 of REACH, the registrant concludes that the substance does not meet the criteria for classification as hazardous to the environment, therefore exposure assessments and risk characterisation for environmental endpoints were not developed. PNECs have been developed for completeness in the registration dossier.

**Control of environmental exposure**
Inherently biodegradable
Annual amount used in the EU 140000 t/a

## Section 2.2 - Control of worker exposure

**General information on risk management related to physicochemical hazard**
Remove all sources of ignition. Take precautionary measures against static charges. Use only non-sparking tools. Control entry to work area. Suitable fire detection system. Keep equipment under negative pressure. Check atmosphere for explosiveness and oxygen deficiencies. Segregate work area and mark with appropriate signs in accordance with local/regional/national legislation.

**Control of worker exposure**

| | |
|---|---|
| Process category(ies) | PROC1 - Use in closed process, no likelihood of exposure |
| Covers concentrations up to | 100% |
| Exposure duration | Avoid carrying out operation for more than 8h |
| Indoor/Outdoor use | Indoor use |

| | |
|---|---|
| Assumes process temperature up to | <=40°C |
| Minimum room ventilation rate for handling/application (air changes per hour) | 1-3 |
| Covers skin contact area up to | 240 cm2 |
| Organisational measures to prevent /limit releases, dispersion and exposure | Use of closed production equipment, with no extraction, except when opening vessels for additions/sampling |
| Technical conditions and measures to control dispersion from source towards the worker | Undertake operation under enclosed conditions |
| Conditions and measures related to personal protection, hygiene and health evaluation | Use eye protection according to EN 166, designed to protect against liquid splashes |
| | --- |
| Process category(ies) | PROC2 - Use in closed, continuous process with occasional controlled exposure |
| Covers concentrations up to | 100% |
| Exposure duration | Avoid carrying out operation for more than 8h |
| Indoor/Outdoor use | Outdoor |
| Assumes process temperature up to | <=40°C |
| Covers skin contact area up to | 480 cm2 |
| Organisational measures to prevent /limit releases, dispersion and exposure | Ensure samples are obtained under containment or extract ventilation |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear a respirator providing a minimum efficiency of 90% (APF 10) Use eye protection according to EN 166, designed to protect against liquid splashes |
| | --- |
| Process category(ies) | PROC3 - Use in closed batch process (synthesis or formulation) |
| Covers concentrations up to | 100% |
| Exposure duration | < 1 hour(s) |
| Indoor/Outdoor use | Indoor |
| Assumes process temperature up to | <=40°C |
| Minimum room ventilation rate for handling/application (air changes per hour) | 1-3 |
| Covers skin contact area up to | 240 cm2 |
| Organisational measures to prevent /limit releases, dispersion and exposure | Local exhaust ventilation - efficiency of at least 90% |
| Technical conditions and measures to control dispersion from source towards the worker | Ensure samples are obtained under containment or extract ventilation |
| Conditions and measures related to personal protection, hygiene and health evaluation | Use eye protection according to EN 166, designed to protect against liquid splashes |
| | --- |
| Process category(ies) | PROC4 - Use in batch and other process (synthesis) where opportunity for exposure arises |
| Covers concentrations up to | 100% |
| Exposure duration | Avoid carrying out activities involving exposure for more than 1 hour |
| Indoor/Outdoor use | Indoor |
| Assumes process temperature up to | <=40°C |
| Minimum room ventilation rate for handling/application (air changes per hour) | 1-3 |
| Covers skin contact area up to | 480 cm2 |
| Organisational measures to prevent /limit releases, dispersion and exposure | Handle substance within a predominantly closed system provided with extract ventilation<br>Local exhaust ventilation - efficiency of at least 90% |
| Technical conditions and measures to control dispersion from source towards the worker | Ensure samples are obtained under containment or extract ventilation |

| | |
|---|---|
| Conditions and measures related to personal protection, hygiene and health evaluation | Use eye protection according to EN 166, designed to protect against liquid splashes Wear a respirator providing a minimum efficiency of 90% (APF 10) |
| | --- |
| Process category(ies) | PROC8a - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities |
| Covers concentrations up to | 100% |
| Exposure duration | < 1 hour(s) |
| Indoor/Outdoor use | Outdoor |
| Assumes process temperature up to | <=40°C |
| Covers skin contact area up to | 960 cm2 |
| Organisational measures to prevent /limit releases, dispersion and exposure | Avoid carrying out operation for more than 1 hour<br>Ensure operation is undertaken outdoors |
| Conditions and measures related to personal protection, hygiene and health evaluation | Use eye protection according to EN 166, designed to protect against liquid splashes<br>Wear a respirator providing a minimum efficiency of 95% (APF 20) |
| | --- |
| Process category(ies) | PROC8b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities |
| Covers concentrations up to | 100% |
| Exposure duration | Avoid carrying out activities involving exposure for more than 1 hour |
| Indoor/Outdoor use | Indoor |
| Assumes process temperature up to | <=40°C |
| Minimum room ventilation rate for handling/application (air changes per hour) | 1-3 |
| Covers skin contact area up to | 960 cm2 |
| Organisational measures to prevent /limit releases, dispersion and exposure | Fill containers/cans at dedicated fill points supplied with local extract ventilation Local exhaust ventilation - efficiency of at least 95% |
| Conditions and measures related to personal protection, hygiene and health evaluation | Use eye protection according to EN 166, designed to protect against liquid splashes |
| | --- |
| Process category(ies) | PROC15 - Use as laboratory reagent |
| Covers concentrations up to | 100% |
| Exposure duration | Avoid carrying out operation for more than 8h |
| Indoor/Outdoor use | Indoor use |
| Assumes process temperature up to | <=40°C |
| Minimum room ventilation rate for handling/application (air changes per hour) | 1-3 |
| Covers skin contact area up to | 240 cm2 |
| Organisational measures to prevent /limit releases, dispersion and exposure | Handle in a fume cupboard or under extract ventilation Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimize exposures and to report any skin problems that may develop |
| Conditions and measures related to personal protection, hygiene and health evaluation | Use eye protection according to EN 166, designed to protect against liquid splashes Wear chemically resistant gloves (tested to EN374) in combination with specific activity training<br>Wear a respirator providing a minimum efficiency of 90% |
| | --- |
| **Control of consumer exposure** | Not intended for consumer use |

## Section 3 - Exposure estimation

**Environment**
**Environmental release category(ies)**

ERC1 - Manufacture of substances
As a result of the hazard assessment carried out in accordance to Article 14.3 of REACH, the registrant concludes that the substance does not meet the criteria for classification as hazardous to the environment, therefore exposure assessments and risk characterisation for environmental endpoints were not developed. PNECs have been developed for completeness in the registration dossier.

**Predicted No Effect Concentration (PNEC)** - See values below

| | | | |
|---|---|---|---|
| **Fresh water** | 4.32 mg/l | **Marine water** | 0.432 mg/l |
| **Fresh water sediment** | 23.3 mg/kg | **Marine water sediment** | 2.3 mg/kg |
| **Water Intermittent** | 21.6 mg/l | **Soil (Agriculture)** | 2.1 mg/kg |
| **Microorganisms in sewage treatment** | 4.6 mg/l | | |

**Health**

**Derived No Effect Level (DNEL)** - See table for values

| Route of exposure | Acute effects (local) | Acute effects (systemic) | Chronic effects (local) | Chronic effects (systemic) |
|---|---|---|---|---|
| **Oral** | | | | |
| **Dermal** | | | | 12.6 mg/kg bw/day |
| **Inhalation** | 300 mg/m³ | 96 mg/m³ | 150 mg/m³ | 72.4 mg/m³ |

| Process category(ies) | Exposure route | Predicted exposure level | Risk characterization ratio (RCR) |
|---|---|---|---|
| PROC1 - Use in closed process, no likelihood of exposure | Worker - inhalative, long-term - systemic | 0.03 mg/m³ | <0.01 |
| | Worker - inhalative, short-term - systemic | 0.12 mg/m³ | <0.01 |
| | Worker - inhalative, long-term - local | 0.03 mg/m³ | <0.01 |
| | Worker - inhalative, short-term - local | 0.12 mg/m³ | <0.01 |
| | Worker - dermal, long-term - systemic | 0.034 mg/kg bw/day | <0.01 |
| | Worker - combined, long-term - systemic | | <0.01 |
| | Worker - combined, short-term - systemic | | <0.01 |
| PROC2 - Use in closed, continuous process with occasional controlled exposure | Worker - inhalative, long-term - systemic | 5.258 mg/m³ | 0.073 |
| | Worker - inhalative, short-term - systemic | 21.03 mg/m³ | 0.219 |
| | Worker - inhalative, long-term - local | 5.258 mg/m³ | 0.035 |
| | Worker - inhalative, short-term - local | 21.03 mg/m³ | 0.07 |
| | Worker - dermal, long-term - systemic | 1.37 mg/kg bw/day | 0.109 |
| | Worker - combined, long-term - systemic | | 0.181 |
| | Worker - combined, short-term - systemic | | 0.219 |
| PROC3 - Use in closed batch process (synthesis or formulation) | Worker - inhalative, long-term - systemic | 3.004 mg/m³ | 0.042 |
| | Worker - inhalative, short-term - systemic | 60.09 mg/m³ | 0.626 |
| | Worker - inhalative, long-term - local | 3.004 mg/m³ | 0.02 |
| | Worker - inhalative, short-term - local | 60.09 mg/m³ | 0.2 |
| | Worker - dermal, long-term - systemic | 0.138 mg/kg bw/day | 0.011 |
| | Worker - combined, long-term - systemic | | 0.052 |
| | Worker - combined, short-term - | | 0.626 |

| | | | |
|---|---|---|---|
| | systemic | | |
| PROC4 - Use in batch and other process (synthesis) where opportunity for exposure arises | Worker - inhalative, long-term - systemic | 0.601 mg/m³ | <0.01 |
| | Worker - inhalative, short-term - systemic | 12.02 mg/m³ | 0.125 |
| | Worker - inhalative, long-term - local | 0.601 mg/m³ | <0.01 |
| | Worker - inhalative, short-term - local | 12.02 mg/m³ | 0.04 |
| | Worker - dermal, long-term - systemic | 1.372 mg/kg bw/day | 0.109 |
| | Worker - combined, long-term - systemic | | 0.117 |
| | Worker - combined, short-term - systemic | | 0.125 |
| PROC8a - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities | Worker - inhalative, long-term - systemic | 5.258 mg/m³ | 0.073 |
| | Worker - inhalative, short-term - systemic | 94 mg/m³ (Stoffenmanager 5.0) | 0.979 |
| | Worker - inhalative, long-term - local | 5.258 mg/m³ | 0.035 |
| | Worker - inhalative, short-term - local | 105.2 mg/m³ | 0.351 |
| | Worker - dermal, long-term - systemic | 2.742 mg/kg bw/day | 0.218 |
| | Worker - combined, long-term - systemic | | 0.29 |
| | Worker - combined, short-term - systemic | | 0.979 |
| PROC8b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities | Worker - inhalative, long-term - systemic | 4.507 mg/m³ | 0.062 |
| | Worker - inhalative, short-term - systemic | 90.13 mg/m³ | 0.939 |
| | Worker - inhalative, long-term - local | 4.507 mg/m³ | 0.03 |
| | Worker - inhalative, short-term - local | 90.13 mg/m³ | 0.3 |
| | Worker - dermal, long-term - systemic | 2.742 mg/kg bw/day | 0.218 |
| | Worker - combined, long-term - systemic | | 0.28 |
| | Worker - combined, short-term - systemic | | 0.939 |
| PROC15 - Use as laboratory reagent | Worker - inhalative, long-term - systemic | 15.02 mg/m³ | 0.208 |
| | Worker - inhalative, short-term - systemic | 60.09 mg/m³ | 0.626 |
| | Worker - inhalative, long-term - local | 15.02 mg/m³ | 0.1 |
| | Worker - inhalative, short-term - local | 60.09 mg/m³ | 0.2 |
| | Worker - dermal, long-term - systemic | 0.34 mg/kg bw/day | 0.027 |
| | Worker - combined, long-term - systemic | | 0.235 |
| | Worker - combined, short-term - systemic | | 0.626 |

**Calculation method** - Used ECETOC TRA model
- Used Stoffenmanager model

**Remarks**

Predicted exposures are not expected to exceed the DN(M)EL when the risk management measures/operational conditions outlined in section 2 are implemented

## Section 4 - Guidance to check compliance with the exposure scenario

Used ECETOC TRA model
Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html)
Predicted exposures are not expected to exceed the applicable exposure limits (given in section 8 of the SDS) when the operational conditions/risk management measures given in section 2 are implemented
ECHA guidance for downstream users

## Annex to the Safety Data Sheet according to Regulation (EC) No 1907/2006 [REACH]

# Tetrahydrofuran - Exposure Scenarios

| CAS-No | Reach Registration Number | EC-No. |
|---|---|---|
| 109-99-9 | 01-2119444314-46-xxxx | 203-726-8 |

## Exposure scenario

### ES2 Formulating/re-packing - ES2-F1 THF

## Section 1 - Identification of the use

**Main user group** Industrial uses: Uses of substances as such or in preparations at industrial sites

**Type** Worker

**Processes, tasks, activities covered** Formulation, packing and re-packing of the substance and its mixtures in batch or continuous operations, including storage, materials transfers, mixing, tabletting, compression, pelletisation, extrusion, large and small scale packing, sampling, maintenance and associated laboratory activities.

**Sector(s) of use** SU3 - Industrial uses: Uses of substances as such or in preparations at industrial sites

**Process category(ies)**
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 preparations and articles (multistage and/or significant contact)
PROC8a - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities
PROC8b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
PROC9 - Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
PROC14 - Production of preparations or articles by tableting, compression, extrusion, pelettization
PROC15 - Use as laboratory reagent

**Environmental release category(ies)** ERC2 - Formulation of preparations (mixtures)
As a result of the hazard assessment carried out in accordance to Article 14.3 of REACH, the registrant concludes that the substance does not meet the criteria for classification as hazardous to the environment, therefore exposure assessments and risk characterisation for environmental endpoints were not developed. PNECs have been developed for completeness in the registration dossier.

**Further information**
Under certain circumstances, stabilisers in THF (e.g. Butylated hydroxytoluene) which prevent peroxide formation can be depleted and a risk of explosion may be present to industrial or professional workers. Activities which involve processing, concentration or distillation steps may significantly reduce the amount of stabiliser in THF. In order to control the risk of explosion from elevated peroxide levels which may occur when performing the activities, risk Management Measures will need to be implemented by the Downstream Users of such activities:
Use the minimum amount of product required to complete activity
Do not store distilled THF for long periods
Store in a cool, dark, well ventilated place

Perform periodic testing to determine peroxide levels in stored THF and document
Test peroxide levels in THF always before carrying out distillation or concentration steps Applicable peroxide methods would be:
1) Peroxide test strips: e.g. EMQuant® Peroxide test strips (0-100ppm range)
2) ASTM E 299-08 Standard Test Method for Trace Amounts of Peroxide in Organic Solvents.
If peroxide level is above 25ppm, not recommended for distillation activities.
If peroxide level is above 100 ppm DO NOT use, consult Health and Safety Manager and contact manufacturer/supplier to discuss disposal. If the Risk Management Measures above are applied then the risk of explosion due to elevated peroxide levels is negligible. Downstream Users should satisfy themselves that they are implementing the Risk Management Measures and take the necessary actions to ensure risk is controlled.

## Section 2 - Operational Conditions and Risk Management Measures

**Product characteristics**

| | |
|---|---|
| **Physical State** | Liquid |
| **pH** | 7-8 |
| **Water Solubility** | Miscible |
| **Vapor Pressure** | 170 hPa @ 20 °C |

Covers concentrations up to 100 %

## Section 2.1 - Control of environmental exposure

**Environmental release category(ies)**
ERC2 - Formulation of preparations (mixtures)
As a result of the hazard assessment carried out in accordance to Article 14.3 of REACH, the registrant concludes that the substance does not meet the criteria for classification as hazardous to the environment, therefore exposure assessments and risk characterisation for environmental endpoints were not developed. PNECs have been developed for completeness in the registration dossier.

**Control of environmental exposure**
Inherently biodegradable
Annual amount used in the EU 28500 t/a

## Section 2.2 - Control of worker exposure

**General information on risk management related to physicochemical hazard**
Remove all sources of ignition. Take precautionary measures against static charges. Use only non-sparking tools. Control entry to work area. Suitable fire detection system. Keep equipment under negative pressure. Check atmosphere for explosiveness and oxygen deficiencies. Segregate work area and mark with appropriate signs in accordance with local/regional/national legislation.

**Control of worker exposure**

| | |
|---|---|
| Process category(ies) | PROC1 - Use in closed process, no likelihood of exposure |
| Covers concentrations up to | 100% |
| Exposure duration | Avoid carrying out operation for more than 8h |
| Use frequency | Covers frequency up to 5 days per week |
| Indoor/Outdoor use | Indoor use |
| Assumes process temperature up to | 40°C |
| Minimum room ventilation rate for handling/application (air changes per hour) | 1-3 |
| Covers skin contact area up to | 240 cm2 |
| Organisational measures to prevent /limit releases, dispersion and exposure | Use of closed production equipment, with no extraction, except when opening vessels for additions/sampling |
| Technical conditions and measures to control dispersion from source towards the worker | Undertake operation under enclosed conditions |
| Conditions and measures related to personal protection, hygiene and health evaluation | Use eye protection according to EN 166, designed to protect against liquid splashes |

---

| | |
|---|---|
| Process category(ies) | PROC2 - Use in closed, continuous process with occasional controlled exposure |
| Covers concentrations up to | 100% |
| Exposure duration | Avoid carrying out operation for more than 8h |
| Indoor/Outdoor use | Indoor |
| Assumes process temperature up to | 40°C |
| Minimum room ventilation rate for handling/application (air changes per hour) | 1-3 |
| Covers skin contact area up to | 480 cm2 |
| Organisational measures to prevent /limit releases, dispersion and exposure | Local exhaust ventilation - efficiency of at least 90% |
| Technical conditions and measures to control dispersion from source towards the worker | Ensure samples are obtained under containment or extract ventilation |
| Conditions and measures related to personal protection, hygiene and health evaluation | Use eye protection according to EN 166, designed to protect against liquid splashes |

---

| | |
|---|---|
| Process category(ies) | PROC3 - Use in closed batch process (synthesis or formulation) |
| Covers concentrations up to | 100% |
| Exposure duration | Avoid carrying out activities involving exposure for more than 1 hour |
| Indoor/Outdoor use | Indoor |
| Assumes process temperature up to | 40°C |
| Minimum room ventilation rate for handling/application (air changes per hour) | 1-3 |
| Covers skin contact area up to | 240 cm2 |
| Organisational measures to prevent /limit releases, dispersion and exposure | Local exhaust ventilation - efficiency of at least 90% |
| Technical conditions and measures to control dispersion from source towards the worker | Ensure samples are obtained under containment or extract ventilation |
| Conditions and measures related to personal protection, hygiene and health evaluation | Use eye protection according to EN 166, designed to protect against liquid splashes |

---

| | |
|---|---|
| Process category(ies) | PROC4 - Use in batch and other process (synthesis) where opportunity for exposure arises |
| Covers concentrations up to | 100% |
| Exposure duration | Avoid carrying out operation for more than 8h |
| Indoor/Outdoor use | Indoor |
| Assumes process temperature up to | 40°C |
| Minimum room ventilation rate for handling/application (air changes per hour) | 1-3 |
| Covers skin contact area up to | 480 cm2 |
| Organisational measures to prevent /limit releases, dispersion and exposure | Local exhaust ventilation - efficiency of at least 90% |
| Technical conditions and measures to control dispersion from source towards the worker | Ensure samples are obtained under containment or extract ventilation |
| Conditions and measures related to personal protection, hygiene and health evaluation | Use eye protection according to EN 166, designed to protect against liquid splashes Wear a respirator providing a minimum efficiency of 90% (APF 10) |

---

| | |
|---|---|
| Process category(ies) | PROC5 - Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) |
| Covers concentrations up to | 100% |
| Exposure duration | Avoid carrying out activities involving exposure for more than 1 hour |

| | |
|---|---|
| Indoor/Outdoor use | Indoor |
| Assumes process temperature up to | 40°C |
| Minimum room ventilation rate for handling/application (air changes per hour) | 1-3 |
| Covers skin contact area up to | 480 cm2 |
| Organisational measures to prevent /limit releases, dispersion and exposure | Local exhaust ventilation - efficiency of at least 90% |
| Conditions and measures related to personal protection, hygiene and health evaluation | Use eye protection according to EN 166, designed to protect against liquid splashes Wear a respirator providing a minimum efficiency of 90% (APF 10) |
| | --- |
| Process category(ies) | PROC8a - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities |
| Covers concentrations up to | >25% - <50% |
| Exposure duration | Avoid carrying out operation for more than 1 hour |
| Indoor/Outdoor use | Outdoor |
| Assumes process temperature up to | 40°C |
| Covers skin contact area up to | 960 cm2 |
| Conditions and measures related to personal protection, hygiene and health evaluation | Use eye protection according to EN 166, designed to protect against liquid splashes Wear a respirator providing a minimum efficiency of 95% (APF 20) |
| | --- |
| Process category(ies) | PROC8b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities |
| Covers concentrations up to | 100% |
| Exposure duration | Avoid carrying out activities involving exposure for more than 1 hour |
| Indoor/Outdoor use | Indoor |
| Assumes process temperature up to | 40°C |
| Minimum room ventilation rate for handling/application (air changes per hour) | 1-3 |
| Covers skin contact area up to | 960 cm2 |
| Organisational measures to prevent /limit releases, dispersion and exposure | Fill containers/cans at dedicated fill points supplied with local extract ventilation Local exhaust ventilation - efficiency of at least 95% |
| Conditions and measures related to personal protection, hygiene and health evaluation | Use eye protection according to EN 166, designed to protect against liquid splashes |
| | --- |
| Process category(ies) | PROC9 - Transfer of substance or preparation into small containers (dedicated filling line, including weighing) |
| Covers concentrations up to | 100% |
| Exposure duration | Avoid carrying out operation for more than 8h |
| Indoor/Outdoor use | Indoor |
| Assumes process temperature up to | <=40°C |
| Minimum room ventilation rate for handling/application (air changes per hour) | 1-3 |
| Covers skin contact area up to | 480cm2 |
| Organisational measures to prevent /limit releases, dispersion and exposure | Local exhaust ventilation - efficiency of at least 90% |
| Technical conditions and measures to control dispersion from source towards the worker | Handle substance within a predominantly closed system provided with extract ventilation |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear a respirator providing a minimum efficiency of 90% (APF 10) Use eye protection according to EN 166, designed to protect against liquid splashes |
| | --- |

| | |
|---|---|
| Process category(ies) | PROC14 - Production of preparations or articles by tableting, compression, extrusion, pelettization |
| Covers concentrations up to | 100% |
| Exposure duration | Avoid carrying out activities involving exposure for more than 4 hours |
| Indoor/Outdoor use | Indoor |
| Assumes process temperature up to | <=40°C |
| Minimum room ventilation rate for handling/application (air changes per hour) | 1-3 |
| Covers skin contact area up to | 480cm2 |
| Organisational measures to prevent /limit releases, dispersion and exposure | Local exhaust ventilation - efficiency of at least 90% |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear a respirator providing a minimum efficiency of 90% (APF 10) Use eye protection according to EN 166, designed to protect against liquid splashes<br>---------- |
| Process category(ies) | PROC15 - Use as laboratory reagent |
| Covers concentrations up to | 100% |
| Exposure duration | Avoid carrying out operation for more than 8h |
| Indoor/Outdoor use | Indoor use |
| Assumes process temperature up to | 40°C |
| Minimum room ventilation rate for handling/application (air changes per hour) | 1-3 |
| Covers skin contact area up to | 240 cm2 |
| Organisational measures to prevent /limit releases, dispersion and exposure | Handle in a fume cupboard or under extract ventilation Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimize exposures and to report any skin problems that may develop |
| Conditions and measures related to personal protection, hygiene and health evaluation | Use eye protection according to EN 166, designed to protect against liquid splashes Wear chemically resistant gloves (tested to EN374) in combination with specific activity training Wear a respirator providing a minimum efficiency of 90%<br>---------- |
| **Control of consumer exposure** | Not intended for consumer use |

## Section 3 - Exposure estimation

**Environment**

**Environmental release category(ies)**

ERC2 - Formulation of preparations (mixtures)

As a result of the hazard assessment carried out in accordance to Article 14.3 of REACH, the registrant concludes that the substance does not meet the criteria for classification as hazardous to the environment, therefore exposure assessments and risk characterisation for environmental endpoints were not developed. PNECs have been developed for completeness in the registration dossier.

**Predicted No Effect Concentration (PNEC)** - See values below

| | | | |
|---|---|---|---|
| **Fresh water** | 4.32 mg/l | **Marine water** | 0.432 mg/l |
| **Fresh water sediment** | 23.3 mg/kg | **Marine water sediment** | 2.3 mg/kg |
| **Water Intermittent** | 21.6 mg/l | **Soil (Agriculture)** | 2.1 mg/kg |
| **Microorganisms in sewage treatment** | 4.6 mg/l | | |

**Health**

**Derived No Effect Level (DNEL)** - See table for values

| Route of exposure | Acute effects (local) | Acute effects (systemic) | Chronic effects (local) | Chronic effects (systemic) |
|---|---|---|---|---|
| **Oral** | | | | |
| **Dermal** | | | | 12.6 mg/kg bw/day |
| **Inhalation** | 300 mg/m³ | 96 mg/m³ | 150 mg/m³ | 72.4 mg/m³ |

| Process category(ies) | Exposure route | Predicted exposure level | Risk characterization ratio (RCR) |
|---|---|---|---|
| PROC1 - Use in closed process, no likelihood of exposure | Worker - inhalative, long-term - systemic | 0.03 mg/m³ | <0.01 |
| | Worker - inhalative, short-term - systemic | 0.12 mg/m³ | <0.01 |
| | Worker - inhalative, long-term - local | 0.03 mg/m³ | <0.01 |
| | Worker - inhalative, short-term - local | 0.12 mg/m³ | <0.01 |
| | Worker - dermal, long-term - systemic | 0.034 mg/kg bw/day | <0.01 |
| | Worker - combined, long-term - systemic | | <0.01 |
| | Worker - combined, short-term - systemic | | <0.01 |
| PROC2 - Use in closed, continuous process with occasional controlled exposure | Worker - inhalative, long-term - systemic | 7.511 mg/m³ | 0.104 |
| | Worker - inhalative, short-term - systemic | 30.04 mg/m³ | 0.313 |
| | Worker - inhalative, long-term - local | 7.511 mg/m³ | 0.05 |
| | Worker - inhalative, short-term - local | 30.04 mg/m³ | 0.1 |
| | Worker - dermal, long-term - systemic | 1.37 mg/kg bw/day | 0.109 |
| | Worker - combined, long-term - systemic | | 0.213 |
| | Worker - combined, short-term - systemic | | 0.313 |
| PROC3 - Use in closed batch process (synthesis or formulation) | Worker - inhalative, long-term - systemic | 15.02 mg/m³ | 0.208 |
| | Worker - inhalative, short-term - systemic | 60.09 mg/m³ | 0.626 |
| | Worker - inhalative, long-term - local | 15.02 mg/m³ | 0.1 |
| | Worker - inhalative, short-term - local | 60.09 mg/m³ | 0.2 |
| | Worker - dermal, long-term - systemic | 0.69 mg/kg bw/day | 0.055 |
| | Worker - combined, long-term - systemic | | 0.262 |
| | Worker - combined, short-term - systemic | | 0.626 |
| PROC4 - Use in batch and other process (synthesis) where opportunity for exposure arises | Worker - inhalative, long-term - systemic | 3.004 mg/m³ | 0.042 |
| | Worker - inhalative, short-term - systemic | 12.02 mg/m³ | 0.125 |
| | Worker - inhalative, long-term - local | 3.004 mg/m³ | 0.02 |
| | Worker - inhalative, short-term - local | 12.02 mg/m³ | 0.04 |
| | Worker - dermal, long-term - systemic | 6.86 mg/kg bw/day | 0.544 |
| | Worker - combined, long-term - systemic | | 0.586 |
| | Worker - combined, short-term - systemic | | 0.125 |
| PROC5 - Mixing or blending in batch processes for formulation of preparations | Worker - inhalative, long-term - systemic | 1.502 mg/m³ | 0.021 |

| | | | |
|---|---|---|---|
| and articles (multistage and/or significant contact) | | | |
| | Worker - inhalative, short-term - systemic | 30.04 mg/m³ | 0.313 |
| | Worker - inhalative, long-term - local | 1.502 mg/m³ | 0.01 |
| | Worker - inhalative, short-term - local | 30.04 mg/m³ | 0.1 |
| | Worker - dermal, long-term - systemic | 2.742 mg/kg bw/day | 0.218 |
| | Worker - combined, long-term - systemic | | 0.238 |
| | Worker - combined, short-term - systemic | | 0.313 |
| PROC8a - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities | Worker - inhalative, long-term - systemic | 5.258 mg/m³ | 0.073 |
| | Worker - inhalative, short-term - systemic | 94 mg/m³ (Stoffenmanager 5.0) | 0.979 |
| | Worker - inhalative, long-term - local | 5.258 mg/m³ | 0.035 |
| | Worker - inhalative, short-term - local | 105.2 mg/m³ | 0.351 |
| | Worker - dermal, long-term - systemic | 2.742 mg/kg bw/day | 0.218 |
| | Worker - combined, long-term - systemic | | 0.29 |
| | Worker - combined, short-term - systemic | | 0.979 |
| PROC8b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities | Worker - inhalative, long-term - systemic | 4.507 mg/m³ | 0.062 |
| | Worker - inhalative, short-term - systemic | 90.13 mg/m³ | 0.939 |
| | Worker - inhalative, long-term - local | 4.507 mg/m³ | 0.03 |
| | Worker - inhalative, short-term - local | 90.13 mg/m³ | 0.3 |
| | Worker - dermal, long-term - systemic | 2.742 mg/kg bw/day | 0.218 |
| | Worker - combined, long-term - systemic | | 0.28 |
| | Worker - combined, short-term - systemic | | 0.939 |
| PROC9 - Transfer of substance or preparation into small containers (dedicated filling line, including weighing) | Worker - inhalative, long-term - systemic | 6.009 mg/m³ | 0.083 |
| | Worker - inhalative, short-term - systemic | 24.04 mg/m³ | 0.25 |
| | Worker - inhalative, long-term - local | 6.009 mg/m³ | 0.04 |
| | Worker - inhalative, short-term - local | 24.0 mg/m³ | 0.08 |
| | Worker - dermal, long-term - systemic | 6.86 mg/kg bw/day | 0.544 |
| | Worker - combined, long-term - systemic | | 0.627 |
| | Worker - combined, short-term - systemic | | 0.25 |
| PROC14 - Production of preparations or articles by tableting, compression, extrusion, pelettization | Worker - inhalative, long-term - systemic | 4.507 mg/m³ | 0.062 |
| | Worker - inhalative, short-term - systemic | 30.04 mg/m³ | 0.313 |
| | Worker - inhalative, long-term - local | 4.507 mg/m³ | 0.03 |
| | Worker - inhalative, short-term - | 30.04 mg/m³ | 0.1 |

| | | | |
|---|---|---|---|
| | local | | |
| | Worker - dermal, long-term - systemic | 2.058 mg/kg bw/day | 0.163 |
| | Worker - combined, long-term - systemic | | 0.226 |
| | Worker - combined, short-term - systemic | | 0.313 |
| PROC15 - Use as laboratory reagent | Worker - inhalative, long-term - systemic | 15.02 mg/m³ | 0.208 |
| | Worker - inhalative, short-term - systemic | 60.09 mg/m³ | 0.626 |
| | Worker - inhalative, long-term - local | 15.02 mg/m³ | 0.1 |
| | Worker - inhalative, short-term - local | 60.09 mg/m³ | 0.2 |
| | Worker - dermal, long-term - systemic | 0.34 mg/kg bw/day | 0.027 |
| | Worker - combined, long-term - systemic | | 0.235 |
| | Worker - combined, short-term - systemic | | 0.626 |

**Calculation method** - Used ECETOC TRA model
- Used Stoffenmanager model

**Remarks**
Predicted exposures are not expected to exceed the DN(M)EL when the risk management measures/operational conditions outlined in section 2 are implemented

## Section 4 - Guidance to check compliance with the exposure scenario

Used ECETOC TRA model
Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html)
Predicted exposures are not expected to exceed the applicable exposure limits (given in section 8 of the SDS) when the operational conditions/risk management measures given in section 2 are implemented
ECHA guidance for downstream users

## Annex to the Safety Data Sheet according to Regulation (EC) No 1907/2006 [REACH]

# Tetrahydrofuran - Exposure Scenarios

| CAS-No | Reach Registration Number | EC-No. |
|---|---|---|
| 109-99-9 | 01-2119444314-46-xxxx | 203-726-8 |

## Exposure scenario

### ES3 Laboratory Use (Industrial) - ES3-L1 THF

## Section 1 - Identification of the use

**Main user group** Industrial uses: Uses of substances as such or in preparations at industrial sites

**Type** Worker

**Processes, tasks, activities covered** Laboratory reagent and solvent involving transfer from larger to small containers and vice versa.

**Sector(s) of use** SU3 - Industrial uses: Uses of substances as such or in preparations at industrial sites

**Process category(ies)** PROC9 - Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
PROC10 - Roller application or brushing
PROC15 - Use as laboratory reagent

**Environmental release category(ies)** ERC4 - Industrial use of processing aids in processes and products, not becoming part of articles
As a result of the hazard assessment carried out in accordance to Article 14.3 of REACH, the registrant concludes that the substance does not meet the criteria for classification as hazardous to the environment, therefore exposure assessments and risk characterisation for environmental endpoints were not developed. PNECs have been developed for completeness in the registration dossier.

**Further information**
Under certain circumstances, stabilisers in THF (e.g. Butylated hydroxytoluene) which prevent peroxide formation can be depleted and a risk of explosion may be present to industrial or professional workers. Activities which involve processing, concentration or distillation steps may significantly reduce the amount of stabiliser in THF. In order to control the risk of explosion from elevated peroxide levels which may occur when performing the activities, risk Management Measures will need to be implemented by the Downstream Users of such activities:
Use the minimum amount of product required to complete activity
Do not store distilled THF for long periods
Store in a cool, dark, well ventilated place
Perform periodic testing to determine peroxide levels in stored THF and document
Test peroxide levels in THF always before carrying out distillation or concentration steps Applicable peroxide methods would be:
1) Peroxide test strips: e.g. EMQuant® Peroxide test strips (0-100ppm range)
2) ASTM E 299-08 Standard Test Method for Trace Amounts of Peroxide in Organic Solvents.
If peroxide level is above 25ppm, not recommended for distillation activities.
If peroxide level is above 100 ppm DO NOT use, consult Health and Safety Manager and contact manufacturer/supplier to discuss disposal. If the Risk Management Measures above are applied then the risk of explosion due to elevated peroxide levels is negligible. Downstream Users should satisfy themselves that they are implementing the Risk Management Measures and take the necessary actions to ensure risk is controlled.

## Section 2 - Operational Conditions and Risk Management Measures

**Product characteristics**

| | |
|---|---|
| **Physical State** | Liquid |
| **pH** | 7-8 |
| **Water Solubility** | Miscible |
| **Vapor Pressure** | 170 hPa @ 20 °C |

Covers concentrations up to 100 %

## Section 2.1 - Control of environmental exposure

**Environmental release category(ies)**
ERC4 - Industrial use of processing aids in processes and products, not becoming part of articles
As a result of the hazard assessment carried out in accordance to Article 14.3 of REACH, the registrant concludes that the substance does not meet the criteria for classification as hazardous to the environment, therefore exposure assessments and risk characterisation for environmental endpoints were not developed. PNECs have been developed for completeness in the registration dossier.

**Control of environmental exposure**
Inherently biodegradable
Annual amount used in the EU 400 t/a

## Section 2.2 - Control of worker exposure

**General information on risk management related to physicochemical hazard**
Remove all sources of ignition. Take precautionary measures against static charges. Use only non-sparking tools. Control entry to work area. Suitable fire detection system. Keep equipment under negative pressure. Check atmosphere for explosiveness and oxygen deficiencies. Segregate work area and mark with appropriate signs in accordance with local/regional/national legislation.

**Control of worker exposure**

| | |
|---|---|
| Process category(ies) | PROC9 - Transfer of substance or preparation into small containers (dedicated filling line, including weighing) |
| Covers concentrations up to | 100% |
| Exposure duration | < 1 hour(s) |
| Indoor/Outdoor use | Indoor |
| Assumes process temperature up to | <=40°C |
| Minimum room ventilation rate for handling/application (air changes per hour) | 5-10 |
| Covers skin contact area up to | 480cm2 |
| Organisational measures to prevent /limit releases, dispersion and exposure | Local exhaust ventilation - efficiency of at least 90% |
| Technical conditions and measures to control dispersion from source towards the worker | Handle substance within a predominantly closed system provided with extract ventilation |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with specific activity training<br>Use eye protection according to EN 166, designed to protect against liquid splashes<br>---------- |
| Process category(ies) | PROC10 - Roller application or brushing |
| Covers concentrations up to | 100% |
| Exposure duration | < 1 hour(s) |
| Indoor/Outdoor use | Indoor |
| Assumes process temperature up to | <=40°C |
| Minimum room ventilation rate for handling/application (air changes per hour) | 1-3 |
| Covers skin contact area up to | 480cm2 |
| Organisational measures to prevent | Local exhaust ventilation - efficiency of at least 90% |

| | |
|---|---|
| /limit releases, dispersion and exposure | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear a respirator providing a minimum efficiency of 90% (APF 10)<br>Use eye protection according to EN 166, designed to protect against liquid splashes<br>Wear chemically resistant gloves (tested to EN374) in combination with specific activity training<br>---------- |
| Process category(ies) | PROC15 - Use as laboratory reagent |
| Covers concentrations up to | 100% |
| Exposure duration | < 1 hour(s) |
| Indoor/Outdoor use | Indoor use |
| Assumes process temperature up to | <=40°C |
| Minimum room ventilation rate for handling/application (air changes per hour) | 1-3 |
| Covers skin contact area up to | 240 cm2 |
| Organisational measures to prevent /limit releases, dispersion and exposure | Local exhaust ventilation - efficiency of at least 90% |
| Conditions and measures related to personal protection, hygiene and health evaluation | Use eye protection according to EN 166, designed to protect against liquid splashes<br>Wear chemically resistant gloves (tested to EN374) in combination with specific activity training<br>---------- |

**Control of consumer exposure** Not intended for consumer use

## Section 3 - Exposure estimation

**Environment**

**Environmental release category(ies)**

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

As a result of the hazard assessment carried out in accordance to Article 14.3 of REACH, the registrant concludes that the substance does not meet the criteria for classification as hazardous to the environment, therefore exposure assessments and risk characterisation for environmental endpoints were not developed. PNECs have been developed for completeness in the registration dossier.

**Predicted No Effect Concentration (PNEC)** - See values below

| | | | |
|---|---|---|---|
| **Fresh water** | 4.32 mg/l | **Marine water** | 0.432 mg/l |
| **Fresh water sediment** | 23.3 mg/kg | **Marine water sediment** | 2.3 mg/kg |
| **Water Intermittent** | 21.6 mg/l | **Soil (Agriculture)** | 2.1 mg/kg |
| **Microorganisms in sewage treatment** | 4.6 mg/l | | |

**Health**

**Derived No Effect Level (DNEL)** - See table for values

| Route of exposure | Acute effects (local) | Acute effects (systemic) | Chronic effects (local) | Chronic effects (systemic) |
|---|---|---|---|---|
| **Oral** | | | | |
| **Dermal** | | | | 12.6 mg/kg bw/day |
| **Inhalation** | 300 mg/m³ | 96 mg/m³ | 150 mg/m³ | 72.4 mg/m³ |

| Process category(ies) | Exposure route | Predicted exposure level | Risk characterization ratio (RCR) |
|---|---|---|---|
| PROC9 - Transfer of substance or preparation into small containers (dedicated filling line, including weighing) | Worker - inhalative, long-term - systemic | 3.605 mg/m³ | 0.05 |
| | Worker - inhalative, short-term - systemic | 72.11 mg/m³ | 0.751 |
| | Worker - inhalative, long-term - | 3.605 mg/m³ | 0.024 |

| | | | |
|---|---|---|---|
| | local | | |
| | Worker - inhalative, short-term - local | 72.11 mg/m³ | 0.24 |
| | Worker - dermal, long-term - systemic | 0.274 mg/kg bw/day | 0.022 |
| | Worker - combined, long-term - systemic | | 0.072 |
| | Worker - combined, short-term - systemic | | 0.751 |
| PROC10 - Roller application or brushing | Worker - inhalative, long-term - systemic | 1.502 mg/m³ | 0.021 |
| | Worker - inhalative, short-term - systemic | 30.04 mg/m³ | 0.313 |
| | Worker - inhalative, long-term - local | 1.502 mg/m³ | 0.01 |
| | Worker - inhalative, short-term - local | 30.04 mg/m³ | 0.1 |
| | Worker - dermal, long-term - systemic | 5.486 mg/kg bw/day | 0.435 |
| | Worker - combined, long-term - systemic | | 0.456 |
| | Worker - combined, short-term - systemic | | 0.313 |
| PROC15 - Use as laboratory reagent | Worker - inhalative, long-term - systemic | 3.004 mg/m³ | 0.042 |
| | Worker - inhalative, short-term - systemic | 60.09 mg/m³ | 0.626 |
| | Worker - inhalative, long-term - local | 3.004 mg/m³ | 0.02 |
| | Worker - inhalative, short-term - local | 60.09 mg/m³ | 0.2 |
| | Worker - dermal, long-term - systemic | 0.068 mg/kg bw/d | <0.01 |
| | Worker - combined, long-term - systemic | | 0.047 |
| | Worker - combined, short-term - systemic | | 0.626 |

**Calculation method** - Used ECETOC TRA model

**Remarks**
Predicted exposures are not expected to exceed the DN(M)EL when the risk management measures/operational conditions outlined in section 2 are implemented

## Section 4 - Guidance to check compliance with the exposure scenario

Used ECETOC TRA model
Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html)
Predicted exposures are not expected to exceed the applicable exposure limits (given in section 8 of the SDS) when the operational conditions/risk management measures given in section 2 are implemented
ECHA guidance for downstream users

## Annex to the Safety Data Sheet according to Regulation (EC) No 1907/2006 [REACH]

# Tetrahydrofuran - Exposure Scenarios

| CAS-No | Reach Registration Number | EC-No. |
|---|---|---|
| 109-99-9 | 01-2119444314-46-xxxx | 203-726-8 |

## Exposure scenario

### ES4 Laboratory Use (Professional) - ES4-L2 THF

## Section 1 - Identification of the use

**Main user group** Professional uses: Public domain (administration, education, entertainment, services, craftsmen)

**Type** Worker

**Processes, tasks, activities covered** Laboratory reagent and solvent involving transfer from larger to small containers and vice versa.

**Sector(s) of use** SU22 - Professional uses: Public domain (administration, education, entertainment, services, craftsmen)

**Process category(ies)** PROC9 - Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
PROC10 - Roller application or brushing
PROC15 - Use as laboratory reagent

**Environmental release category(ies)** ERC8a - Wide dispersive indoor use of processing aids in open systems
As a result of the hazard assessment carried out in accordance to Article 14.3 of REACH, the registrant concludes that the substance does not meet the criteria for classification as hazardous to the environment, therefore exposure assessments and risk characterisation for environmental endpoints were not developed. PNECs have been developed for completeness in the registration dossier.

**Further information**
Under certain circumstances, stabilisers in THF (e.g. Butylated hydroxytoluene) which prevent peroxide formation can be depleted and a risk of explosion may be present to industrial or professional workers. Activities which involve processing, concentration or distillation steps may significantly reduce the amount of stabiliser in THF. In order to control the risk of explosion from elevated peroxide levels which may occur when performing the activities, risk Management Measures will need to be implemented by the Downstream Users of such activities:
Use the minimum amount of product required to complete activity
Do not store distilled THF for long periods
Store in a cool, dark, well ventilated place
Perform periodic testing to determine peroxide levels in stored THF and document
Test peroxide levels in THF always before carrying out distillation or concentration steps Applicable peroxide methods would be:
1) Peroxide test strips: e.g. EMQuant® Peroxide test strips (0-100ppm range)
2) ASTM E 299-08 Standard Test Method for Trace Amounts of Peroxide in Organic Solvents.
If peroxide level is above 25ppm, not recommended for distillation activities.
If peroxide level is above 100 ppm DO NOT use, consult Health and Safety Manager and contact manufacturer/supplier to discuss disposal. If the Risk Management Measures above are applied then the risk of explosion due to elevated peroxide levels is negligible. Downstream Users should satisfy themselves that they are implementing the Risk Management Measures and take the necessary actions to ensure risk is controlled.

## Section 2 - Operational Conditions and Risk Management Measures

**Product characteristics**

| | |
|---|---|
| **Physical State** | Liquid |
| **pH** | 7-8 |
| **Water Solubility** | Miscible |
| **Vapor Pressure** | 170 hPa @ 20 °C |

Covers concentrations up to 100 %

## Section 2.1 - Control of environmental exposure

**Environmental release category(ies)**

ERC8a - Wide dispersive indoor use of processing aids in open systems

As a result of the hazard assessment carried out in accordance to Article 14.3 of REACH, the registrant concludes that the substance does not meet the criteria for classification as hazardous to the environment, therefore exposure assessments and risk characterisation for environmental endpoints were not developed. PNECs have been developed for completeness in the registration dossier.

**Control of environmental exposure**

Inherently biodegradable

Annual amount used in the EU 350 t/a

## Section 2.2 - Control of worker exposure

**General information on risk management related to physicochemical hazard**

Remove all sources of ignition. Take precautionary measures against static charges. Use only non-sparking tools. Control entry to work area. Suitable fire detection system. Keep equipment under negative pressure. Check atmosphere for explosiveness and oxygen deficiencies. Segregate work area and mark with appropriate signs in accordance with local/regional/national legislation.

**Control of worker exposure**

| | |
|---|---|
| Process category(ies) | PROC9 - Transfer of substance or preparation into small containers (dedicated filling line, including weighing) |
| Covers concentrations up to | 100% |
| Exposure duration | < 1 hour(s) |
| Indoor/Outdoor use | Indoor |
| Assumes process temperature up to | <=40°C |
| Minimum room ventilation rate for handling/application (air changes per hour) | 3-5 |
| Covers skin contact area up to | 480cm2 |
| Organisational measures to prevent /limit releases, dispersion and exposure | Local exhaust ventilation - efficiency of at least 80% |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear chemically resistant gloves (tested to EN374) in combination with specific activity training<br>Use eye protection according to EN 166, designed to protect against liquid splashes<br>Wear a respirator providing a minimum efficiency of 90% (APF 10)<br>---------- |

| | |
|---|---|
| Process category(ies) | PROC10 - Roller application or brushing |
| Covers concentrations up to | 100% |
| Exposure duration | < 1 hour(s) |
| Indoor/Outdoor use | Indoor |
| Assumes process temperature up to | <=40°C |
| Minimum room ventilation rate for handling/application (air changes per hour) | 3-5 |
| Covers skin contact area up to | 960cm2 |
| Organisational measures to prevent /limit releases, dispersion and | Local exhaust ventilation - efficiency of at least 80% |

| | |
|---|---|
| exposure | |
| Conditions and measures related to personal protection, hygiene and health evaluation | Wear a respirator providing a minimum efficiency of 90% (APF 10)<br>Use eye protection according to EN 166, designed to protect against liquid splashes<br>Wear chemically resistant gloves (tested to EN374) in combination with specific activity training<br>---------- |
| Process category(ies) | PROC15 - Use as laboratory reagent |
| Covers concentrations up to | 100% |
| Exposure duration | < 1 hour(s) |
| Indoor/Outdoor use | Indoor use |
| Assumes process temperature up to | <=40°C |
| Minimum room ventilation rate for handling/application (air changes per hour) | 3-5 |
| Covers skin contact area up to | 240 cm2 |
| Organisational measures to prevent /limit releases, dispersion and exposure | Local exhaust ventilation - efficiency of at least 80% |
| Conditions and measures related to personal protection, hygiene and health evaluation | Use eye protection according to EN 166, designed to protect against liquid splashes<br>Wear chemically resistant gloves (tested to EN374) in combination with specific activity training<br>---------- |
| **Control of consumer exposure** | Not intended for consumer use |

## Section 3 - Exposure estimation

**Environment**

**Environmental release category(ies)**

ERC8a - Wide dispersive indoor use of processing aids in open systems

As a result of the hazard assessment carried out in accordance to Article 14.3 of REACH, the registrant concludes that the substance does not meet the criteria for classification as hazardous to the environment, therefore exposure assessments and risk characterisation for environmental endpoints were not developed. PNECs have been developed for completeness in the registration dossier.

**Predicted No Effect Concentration (PNEC)** - See values below

| | | | |
|---|---|---|---|
| **Fresh water** | 4.32 mg/l | **Marine water** | 0.432 mg/l |
| **Fresh water sediment** | 23.3 mg/kg | **Marine water sediment** | 2.3 mg/kg |
| **Water Intermittent** | 21.6 mg/l | **Soil (Agriculture)** | 2.1 mg/kg |
| **Microorganisms in sewage treatment** | 4.6 mg/l | | |

**Health**

**Derived No Effect Level (DNEL)** - See table for values

| Route of exposure | Acute effects (local) | Acute effects (systemic) | Chronic effects (local) | Chronic effects (systemic) |
|---|---|---|---|---|
| **Oral** | | | | |
| **Dermal** | | | | 12.6 mg/kg bw/day |
| **Inhalation** | 300 mg/m³ | 96 mg/m³ | 150 mg/m³ | 72.4 mg/m³ |

| Process category(ies) | Exposure route | Predicted exposure level | Risk characterization ratio (RCR) |
|---|---|---|---|
| PROC9 - Transfer of substance or preparation into small containers (dedicated filling line, including weighing) | Worker - inhalative, long-term - systemic | 2.103 mg/m³ | 0.029 |
| | Worker - inhalative, short-term - systemic | 42.06 mg/m³ | 0.438 |
| | Worker - inhalative, long-term - local | 2.103 mg/m³ | 0.014 |

| | | | |
|---|---|---|---|
| | Worker - inhalative, short-term - local | 42.06 mg/m³ | 0.14 |
| | Worker - dermal, long-term - systemic | 1.372 mg/kg/bw/day | 0.109 |
| | Worker - combined, long-term - systemic | | 0.138 |
| | Worker - combined, short-term - systemic | | 0.438 |
| PROC10 - Roller application or brushing | Worker - inhalative, long-term - systemic | 4.206 mg/m³ | 0.058 |
| | Worker - inhalative, short-term - systemic | 84.12 mg/m³ | 0.876 |
| | Worker - inhalative, long-term - local | 4.206 mg/m³ | 0.028 |
| | Worker - inhalative, short-term - local | 84.12 mg/m³ | 0.28 |
| | Worker - dermal, long-term - systemic | 1.097 mg/kg bw/day | 0.087 |
| | Worker - combined, long-term - systemic | | 0.145 |
| | Worker - combined, short-term - systemic | | 0.876 |
| PROC15 - Use as laboratory reagent | Worker - inhalative, long-term - systemic | 4.206 mg/m³ | 0.058 |
| | Worker - inhalative, short-term - systemic | 84.12 mg/m³ | 0.876 |
| | Worker - inhalative, long-term - local | 4.206 mg/m³ | 0.028 |
| | Worker - inhalative, short-term - local | 84.12 mg/m³ | 0.28 |
| | Worker - dermal, long-term - systemic | 0.014 mg/kg bw/day | <0.01 |
| | Worker - combined, long-term - systemic | | 0.059 |
| | Worker - combined, short-term - systemic | | 0.876 |

**Calculation method** - Used ECETOC TRA model

**Remarks**
Predicted exposures are not expected to exceed the DN(M)EL when the risk management measures/operational conditions outlined in section 2 are implemented

## Section 4 - Guidance to check compliance with the exposure scenario

Used ECETOC TRA model
Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html)
Predicted exposures are not expected to exceed the applicable exposure limits (given in section 8 of the SDS) when the operational conditions/risk management measures given in section 2 are implemented
ECHA guidance for downstream users