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

1.1 Product identifiers

- **Product name**: Tetrahydrofuran
- **Product Number**: 401757
- **Brand**: Sigma-Aldrich
- **Index-No.**: 603-025-00-0
- **CAS-No.**: 109-99-9

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

- **Identified uses**: Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

- **Company**: Sigma-Aldrich Inc.
  3050 SPRUCE ST
  ST. LOUIS MO 63103
  UNITED STATES
- **Telephone**: +1 314 771-5765
- **Fax**: +1 800 325-5052

1.4 Emergency telephone

- **Emergency Phone #**: 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24
  Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

**GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

- Flammable liquids (Category 2), H225
- Acute toxicity, Oral (Category 4), H302
- Eye irritation (Category 2A), H319
- Carcinogenicity (Category 2), H351
- Specific target organ toxicity - single exposure (Category 3), Respiratory system, Central nervous system, H335, H336

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

2.2 GHS Label elements, including precautionary statements

- **Pictogram**

Sigma-Aldrich - 401757
The life science business of Merck KGaA, Darmstadt, Germany
operates as MilliporeSigma in the US and Canada
The life science business of Merck KGaA, Darmstadt, Germany operates as MilliporeSigma in the US and Canada

Formula : C₄H₈O
Molecular weight : 72.11 g/mol
CAS-No. : 109-99-9
EC-No. : 203-726-8
Index-No. : 603-025-00-0

<table>
<thead>
<tr>
<th>Component</th>
<th>Classification</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrahydrofuran</td>
<td>Flam. Liq. 2; Acute Tox. 4; Eye Irrit. 2A; Carc. 2; STOT SE 3; H225, H302, H319, H351, H335, H336</td>
<td>&lt;= 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
Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air. Call in physician.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.

In case of eye contact
After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

If swallowed
After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Carbon dioxide (CO2) Foam Dry powder
Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture
Carbon oxides
Combustible.
Pay attention to flashback.
Vapors are heavier than air and may spread along floors.
Development of hazardous combustion gases or vapours possible in the event of fire.
Forms explosive mixtures with air at ambient temperatures.

5.3 Advice for firefighters
Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information
Remove container from danger zone and cool with water. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Keep away from heat and sources of ignition. Evacuate the danger area, observe emergency procedures, consult an expert. For personal protection see section 8.

6.2 Environmental precautions
Do not let product enter drains. Risk of explosion.

6.3 Methods and materials for containment and cleaning up
Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up carefully with liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

Advice on protection against fire and explosion
Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static discharge.

Hygiene measures
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance. For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition.

Test for peroxide formation periodically and before distillation.

**Storage class**
Storage class (TRGS 510): 3: Flammable liquids

### 7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

---

**SECTION 8: Exposure controls/personal protection**

### 8.1 Control parameters

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Value</th>
<th>Control parameters</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrahydrofuran</td>
<td>109-99-9</td>
<td>TWA 50 ppm</td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Remarks</td>
<td>Confirmed animal carcinogen with unknown relevance to humans</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Danger of cutaneous absorption</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>STEL 100 ppm</td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Remarks</td>
<td>Confirmed animal carcinogen with unknown relevance to humans</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Danger of cutaneous absorption</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ST 250 ppm</td>
<td>USA. NIOSH Recommended Exposure Limits</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>735 mg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>TWA 200 ppm</td>
<td>USA. NIOSH Recommended Exposure Limits</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>590 mg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>TWA 200 ppm</td>
<td>USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>590 mg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>PEL 200 ppm</td>
<td>California permissible exposure limits for chemical contaminants (Title 8, Article 107)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>590 mg/m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>STEL 250 ppm</td>
<td>California permissible exposure limits for chemical contaminants (Title 8, Article 107)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>735 mg/m³</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Biological occupational exposure limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Component: Tetrahydrofuran</td>
</tr>
<tr>
<td>CAS-No.: 109-99-9</td>
</tr>
<tr>
<td>Parameters: Tetrahydrofuran</td>
</tr>
<tr>
<td>Value: 2 mg/l</td>
</tr>
<tr>
<td>Biological specimen: Urine</td>
</tr>
<tr>
<td>Basis: ACGIH - Biological Exposure Indices (BEI)</td>
</tr>
</tbody>
</table>

Remarks: End of shift (As soon as possible after exposure ceases)
### Derived No Effect Level (DNEL)

<table>
<thead>
<tr>
<th>Application Area</th>
<th>Routes of exposure</th>
<th>Health effect</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workers</td>
<td>Skin contact</td>
<td>Long-term systemic effects</td>
<td>25mg/kg BW/d</td>
</tr>
<tr>
<td>Consumers</td>
<td>Skin contact</td>
<td>Long-term systemic effects</td>
<td>15mg/kg BW/d</td>
</tr>
<tr>
<td>Workers</td>
<td>Inhalation</td>
<td>Long-term local effects</td>
<td>150 mg/m3</td>
</tr>
<tr>
<td>Workers</td>
<td>Inhalation</td>
<td>Long-term systemic effects</td>
<td>150 mg/m3</td>
</tr>
<tr>
<td>Consumers</td>
<td>Inhalation</td>
<td>Long-term systemic effects</td>
<td>62 mg/m3</td>
</tr>
<tr>
<td>Consumers</td>
<td>Inhalation</td>
<td>Acute local effects</td>
<td>150 mg/m3</td>
</tr>
<tr>
<td>Consumers</td>
<td>Inhalation</td>
<td>Acute systemic effects</td>
<td>150 mg/m3</td>
</tr>
</tbody>
</table>

### Predicted No Effect Concentration (PNEC)

<table>
<thead>
<tr>
<th>Compartment</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil</td>
<td>2.13 mg/kg</td>
</tr>
<tr>
<td>Sea water</td>
<td>0.432 mg/l</td>
</tr>
<tr>
<td>Fresh water</td>
<td>4.32 mg/l</td>
</tr>
<tr>
<td>Sea sediment</td>
<td>2.33 mg/kg</td>
</tr>
<tr>
<td>Fresh water sediment</td>
<td>23.3 mg/kg</td>
</tr>
<tr>
<td>Onsite sewage treatment plant</td>
<td>4.6 mg/l</td>
</tr>
</tbody>
</table>

### 8.2 Exposure controls

**Appropriate engineering controls**
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

**Personal protective equipment**

**Eye/face protection**
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses

**Skin protection**
This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Splash contact
Material: butyl-rubber
Minimum layer thickness: 0.7 mm
Break through time: 10 min
Material tested: Butoject® (KCL 898)

**Body Protection**
Flame retardant antistatic protective clothing.

**Respiratory protection**
required when vapours/aerosols are generated. Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

**Control of environmental exposure**
Do not let product enter drains. Risk of explosion.
SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a) Appearance  Form: liquid
b) Odor  No data available
c) Odor Threshold  No data available
d) pH  ca. 7 - 8
e) Melting point/freezing point  Melting point: -108.44 °C (-163.19 °F) - (ECHA)
f) Initial boiling point and boiling range  65 °C 149 °F at 1,013.25 hPa - (ECHA)
g) Flash point  -21.2 °C (-6.2 °F) - closed cup - DIN 51755 Part 1
h) Evaporation rate  No data available
i) Flammability (solid, gas)  No data available
j) Upper/lower flammability or explosive limits  Upper explosion limit: 12.4 % (V) - (THF)
   Lower explosion limit: 1.5 % (V)
k) Vapor pressure  170 hPa at 20 °C (68 °F) - (THF)
l) Vapor density  No data available
m) Density  0.89 g/cm³ at 20 °C (68 °F)
   Relative density  No data available
n) Water solubility  miscible
o) Partition coefficient: n-octanol/water  log Pow: 0.45 at 25 °C (77 °F) - Bioaccumulation is not expected.
p) Autoignition temperature  215 °C (419 °F) at 1,013 hPa - DIN 51794
q) Decomposition temperature  No data available
r) Viscosity  No data available
s) Explosive properties  No data available
t) Oxidizing properties  none

9.2 Other safety information
   No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
   Formation of peroxides possible.
   Vapors may form explosive mixture with air.
10.2 **Chemical stability**
Sensitivity to light
Sensitive to air.
The product is chemically stable under standard ambient conditions (room temperature).
Stable under recommended storage conditions.
Test for peroxide formation before distillation or evaporation. Test for peroxide formation or discard after 1 year.

10.3 **Possibility of hazardous reactions**

Vapors may form explosive mixture with air.

10.4 **Conditions to avoid**
Distillation (Risk of explosion).
Warming.
Moisture.

10.5 **Incompatible materials**
No data available

10.6 **Hazardous decomposition products**
Peroxides
In the event of fire: see section 5

---

**SECTION 11: Toxicological information**

11.1 **Information on toxicological effects**

**Acute toxicity**
LD50 Oral - Rat - male and female - 1,650 mg/kg
Remarks: (ECHA)
Symptoms: Irritation of mucous membranes
LC50 Inhalation - Rat - male and female - 6 h - > 14.7 mg/l - vapor

(US-EPA)
LD50 Dermal - Rat - male and female - > 2,000 mg/kg
(OECD Test Guideline 402)

**Skin corrosion/irritation**
Skin - Rabbit
Result: No skin irritation - 72 h
(Draize Test)
Remarks: Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.

**Serious eye damage/eye irritation**
Eyes - Rabbit
Result: Causes serious eye irritation.
Remarks: (IUCLID)
Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

**Respiratory or skin sensitization**
Local lymph node assay (LLNA) - Mouse
Result: negative  
(OECD Test Guideline 429)

**Germ cell mutagenicity**
Test Type: Ames test  
Test system: S. typhimurium  
Metabolic activation: with and without metabolic activation  
Method: OECD Test Guideline 471  
Result: negative  
Test Type: In vitro mammalian cell gene mutation test  
Test system: Chinese hamster ovary cells  
Metabolic activation: with and without metabolic activation  
Method: OECD Test Guideline 476  
Result: negative  
Test Type: Chromosome aberration test in vitro  
Test system: Chinese hamster ovary cells  
Metabolic activation: with and without metabolic activation  
Method: OECD Test Guideline 473  
Result: negative

Test Type: Micronucleus test  
Species: Mouse  
Cell type: Red blood cells (erythrocytes)  
Application Route: inhalation (vapor)  
Method: OECD Test Guideline 474  
Result: negative

**Carcinogenicity**
Suspected of causing cancer.

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Tetrahydrofuran)  
NTP: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA’s list of regulated carcinogens.

**Reproductive toxicity**
No data available

**Specific target organ toxicity - single exposure**
Inhalation - May cause respiratory irritation. - Central nervous system  
Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)  
May cause drowsiness or dizziness.

**Specific target organ toxicity - repeated exposure**
No data available

**Aspiration hazard**
No data available

**11.2 Additional Information**
Repeated dose toxicity - Rat - male and female - Oral - 4 Weeks

RTECS: LU5950000  
irritant effects, Cough, Shortness of breath, narcosis, somnolence  
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.
In high doses:

- somnolence
- narcosis

Other dangerous properties can not be excluded.

This substance should be handled with particular care.

Stomach - Irregularities - Based on Human Evidence

12.1 Toxicity

<table>
<thead>
<tr>
<th>Toxicity to fish</th>
<th>flow-through test LC50 - Pimephales promelas (fathead minnow) - 2,160 mg/l - 96 h (OECD Test Guideline 203)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toxicity to daphnia and other aquatic invertebrates</td>
<td>static test EC50 - Daphnia magna (Water flea) - 3,485 mg/l - 48 h (OECD Test Guideline 202)</td>
</tr>
<tr>
<td>Toxicity to fish (Chronic toxicity)</td>
<td>flow-through test NOEC - Pimephales promelas (fathead minnow) - 216 mg/l - 33 d Remarks: (ECHA)</td>
</tr>
</tbody>
</table>

12.2 Persistence and degradability

- Biodegradability: aerobic Biochemical oxygen demand - Exposure time 28 d Result: 39% - Not readily biodegradable. (OECD Test Guideline 301D)

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Endocrine disrupting properties

No data available

12.7 Other adverse effects

No data available
SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information

DOT (US)
UN number: 2056  Class: 3  Packing group: II
Proper shipping name: Tetrahydrofuran
Reportable Quantity (RQ): 1000 lbs
Poison Inhalation Hazard: No

IMDG
UN number: 2056  Class: 3  Packing group: II  EMS-No: F-E, S-D
Proper shipping name: TETRAHYDROFURAN

IATA
UN number: 2056  Class: 3  Packing group: II
Proper shipping name: Tetrahydrofuran

SECTION 15: Regulatory information

SARA 302 Components
This material does not contain any components with a section 302 EHS TPQ.

SARA 313 Components
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrahydrofuran</td>
<td>109-99-9</td>
<td>1993-02-16</td>
</tr>
</tbody>
</table>

Pennsylvania Right To Know Components

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
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</thead>
<tbody>
<tr>
<td>Tetrahydrofuran</td>
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<td>1993-02-16</td>
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</tbody>
</table>

California Prop. 65 Components

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrahydrofuran</td>
<td>109-99-9</td>
<td>2021-12-31</td>
</tr>
</tbody>
</table>
SECTION 16: Other information

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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Version: 6.19   Revision Date: 03/29/2023   Print Date: 08/12/2023