1. Identification

Product Name: Tetrahydrofuran

Cat No.: T427-1; T427-4; T427POP-200; T427RS-28; T427RS-115; T427RS-200; T427SK-4; T427SS-28; T427SS-50; T427SS-115; T427SS-200

Synonyms: THF

Recommended Use: Laboratory chemicals.

Uses advised against: No Information available

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

<table>
<thead>
<tr>
<th>Flammable liquids</th>
<th>Category 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute oral toxicity</td>
<td>Category 4</td>
</tr>
<tr>
<td>Serious Eye Damage/Eye Irritation</td>
<td>Category 2</td>
</tr>
<tr>
<td>Carcinogenicity</td>
<td>Category 2</td>
</tr>
<tr>
<td>Specific target organ toxicity (single exposure)</td>
<td>Category 3</td>
</tr>
<tr>
<td>Target Organs - Respiratory system, Central nervous system (CNS), Heart, Liver, Kidney, spleen, Blood.</td>
<td></td>
</tr>
</tbody>
</table>

Label Elements

Signal Word: Danger

Hazard Statements
Highly flammable liquid and vapor
Harmful if swallowed
Causes serious eye irritation
May cause respiratory irritation
May cause drowsiness or dizziness
Suspected of causing cancer
Precautionary Statements

**Prevention**
- Obtain special instructions before use
- Do not handle until all safety precautions have been read and understood
- Use personal protective equipment as required
- Wash face, hands and any exposed skin thoroughly after handling
- Do not eat, drink or smoke when using this product
- Wear eye/face protection
- Do not breathe dust/fume/gas/mist/vapors/spray
- Use only outdoors or in a well-ventilated area
- Keep away from heat/sparks/open flames/hot surfaces. - No smoking
- Keep container tightly closed
- Ground/bond container and receiving equipment
- Use explosion-proof electrical/ventilating/lighting/equipment
- Use only non-sparking tools
- Take precautionary measures against static discharge
- Keep cool

**Response**
- IF exposed or concerned: Get medical attention/advice

**Inhalation**
- IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing

**Skin**
- IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower

**Eyes**
- IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

**Ingestion**
- IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell

**Fire**
- In case of fire: Use CO2, dry chemical, or foam for extinction

**Storage**
- Store locked up
- Store in a well-ventilated place. Keep container tightly closed

**Disposal**
- Dispose of contents/container to an approved waste disposal plant

**Hazards not otherwise classified (HNOC)**
May form explosive peroxides

---

### 3. Composition / information on ingredients

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>Weight %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrahydrofuran</td>
<td>109-99-9</td>
<td>&gt;95</td>
</tr>
</tbody>
</table>

### 4. 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.
Obtain medical attention.

**Skin Contact**
Wash off immediately with plenty of water for at least 15 minutes. If skin irritation persists, call a physician.

**Inhalation**
Move to fresh air. If not breathing, give artificial respiration. Get medical attention if symptoms occur.

**Ingestion**
Clean mouth with water and drink afterwards plenty of water.

**Most important symptoms/effects**
- Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting:
  - Causes central nervous system depression

**Notes to Physician**
Treat symptomatically

### 5. Fire-fighting measures

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

**Unsuitable Extinguishing Media**
Water may be ineffective

**Flash Point**
-21 °C / -5.8 °F

**Method**
No information available

**Autoignition Temperature**
215 °C / 419 °F

**Explosion Limits**
- Upper 11.8%
- Lower 2.0%

**Sensitivity to Mechanical Impact**
No information available

**Sensitivity to Static Discharge**
No information available

**Specific Hazards Arising from the Chemical**
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.

**Hazardous Combustion Products**
Carbon monoxide (CO) Carbon dioxide (CO₂) peroxides

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

**NFPA**

<table>
<thead>
<tr>
<th>Health</th>
<th>Flammability</th>
<th>Instability</th>
<th>Physical hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>3</td>
<td>1</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### 6. Accidental release measures

**Personal Precautions**
Use personal protective equipment. Ensure adequate ventilation. Remove all sources of ignition. Take precautionary measures against static discharges.

**Environmental Precautions**
Should not be released into the environment.

**Methods for Containment and Clean 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.

### 7. Handling and storage

**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.
Storage

Shelf life: 6 months after opening. 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.

8. Exposure controls / personal protection

Exposure Guidelines

<table>
<thead>
<tr>
<th>Component</th>
<th>ACGIH TLV</th>
<th>OSHA PEL</th>
<th>NIOSH IDLH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrahydrofuran</td>
<td>TWA: 50 ppm STEL: 100 ppm Skin (Vacated) TWA: 200 ppm (Vacated) STEL: 250 ppm (Vacated) STEL: 735 mg/m³ TWA: 200 ppm TWA: 590 mg/m³</td>
<td>IDLH: 2000 ppm TWA: 200 ppm TWA: 590 mg/m³ STEL: 250 ppm STEL: 735 mg/m³</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Component</th>
<th>Quebec</th>
<th>Mexico OEL (TWA)</th>
<th>Ontario TWAEV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrahydrofuran</td>
<td>TWA: 100 ppm TWA: 300 mg/m³</td>
<td>TWA: 200 ppm TWA: 590 mg/m³ STEL: 250 ppm STEL: 735 mg/m³</td>
<td>TWA: 50 ppm STEL: 100 ppm Skin</td>
</tr>
</tbody>
</table>

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

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.

Personal Protective Equipment

Eye/face Protection

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA’s eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection

Long sleeved clothing.

Respiratory Protection

Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical State</td>
<td>Liquid</td>
</tr>
<tr>
<td>Appearance</td>
<td>Colorless</td>
</tr>
<tr>
<td>Odor</td>
<td>Petroleum distillates</td>
</tr>
<tr>
<td>Odor Threshold</td>
<td>No information available</td>
</tr>
<tr>
<td>pH</td>
<td>7.8 20% aq. solution</td>
</tr>
<tr>
<td>Melting Point/Range</td>
<td>-108.4 °C / -163.1 °F</td>
</tr>
<tr>
<td>Boiling Point/Range</td>
<td>66 °C / 150.8 °F</td>
</tr>
<tr>
<td>Flash Point</td>
<td>-21 °C / -5.8 °F</td>
</tr>
<tr>
<td>Evaporation Rate</td>
<td>&gt; 1 (Ether = 1.0)</td>
</tr>
<tr>
<td>Flammability (solid,gas)</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>
Flammability or explosive limits

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper</td>
<td>11.8%</td>
</tr>
<tr>
<td>Lower</td>
<td>2.0%</td>
</tr>
</tbody>
</table>

Vapor Pressure

200 mbar @ 20 °C

Vapor Density

2.5 (Ether = 1.0)

Specific Gravity

0.880

Solubility

miscible

Partition coefficient; n-octanol/water

No data available

Autoignition Temperature

215 °C / 419 °F

Decomposition Temperature

No information available

Viscosity

0.55 cP @ 20 °C

Molecular Formula

C₄H₈O

Molecular Weight

72.11

10. Stability and reactivity

Reactive Hazard

Yes.

Stability

May form explosive peroxides. Hygroscopic.

Conditions to Avoid

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

Incompatible Materials

Strong oxidizing agents, Acids

Hazardous Decomposition Products

Carbon monoxide (CO), Carbon dioxide (CO₂), peroxides

Hazardous Polymerization

Hazardous polymerization may occur.

Hazardous Reactions

None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

<table>
<thead>
<tr>
<th>Component</th>
<th>LD50 Oral ( Rat )</th>
<th>LD50 Dermal ( Rabbit )</th>
<th>LC50 Inhalation ( Rat ) 1 h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrahydrofuran</td>
<td>1650 mg/kg</td>
<td>&gt; 2000 mg/kg</td>
<td>180 mg/L 53.9 mg/L</td>
</tr>
</tbody>
</table>

Toxicologically Synergistic Products

No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation

Irritating to eyes. May cause irritation of respiratory tract

Sensitization

No information available

Carcinogenicity

Limited evidence of a carcinogenic effect.

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>IARC</th>
<th>NTP</th>
<th>ACGIH</th>
<th>OSHA</th>
<th>Mexico</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrahydrofuran</td>
<td>109-99-9</td>
<td>Not listed</td>
<td>Not listed</td>
<td>A3</td>
<td>Not listed</td>
<td>Not listed</td>
</tr>
</tbody>
</table>

ACGIH: (American Conference of Governmental Industrial Hygienists)

A1 - Known Human Carcinogen
A2 - Suspected Human Carcinogen
A3 - Animal Carcinogen

Mutagenic Effects

No information available

Reproductive Effects

No information available

Developmental Effects

No information available.
Teratogenicity
No information available.

STOT - single exposure
Respiratory system Central nervous system (CNS)
STOT - repeated exposure
Heart Liver Kidney spleen Blood

Aspiration hazard
No information available

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

Endocrine Disruptor Information

<table>
<thead>
<tr>
<th>Component</th>
<th>EU - Endocrine Disrupters Candidate List</th>
<th>EU - Endocrine Disruptors - Evaluated Substances</th>
<th>Japan - Endocrine Disruptor Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrahydrofuran</td>
<td>Group III Chemical</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

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

12. Ecological information

Ecotoxicity
Do not empty into drains.

<table>
<thead>
<tr>
<th>Component</th>
<th>Freshwater Algae</th>
<th>Freshwater Fish</th>
<th>Microtox</th>
<th>Water Flea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrahydrofuran</td>
<td>Not listed</td>
<td>2160 mg/L LC50 = 96 h Pimephales promelas Leuciscus idus: LC50: 2820 mg/L/48h</td>
<td>Not listed</td>
<td>EC50: &gt;10000 mg/L/24h</td>
</tr>
</tbody>
</table>

Persistence and Degradability
Persistence is unlikely based on information available.

Bioaccumulation / Accumulation
No information available.

Mobility
Will likely be mobile in the environment due to its volatility.

<table>
<thead>
<tr>
<th>Component</th>
<th>log Pow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrahydrofuran</td>
<td>0.45</td>
</tr>
</tbody>
</table>

13. Disposal considerations

Waste Disposal Methods
Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

<table>
<thead>
<tr>
<th>Component</th>
<th>RCRA - U Series Wastes</th>
<th>RCRA - P Series Wastes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrahydrofuran - 109-99-9</td>
<td>U213</td>
<td>-</td>
</tr>
</tbody>
</table>

14. Transport information

DOT
UN-No: UN2056
Proper Shipping Name: TETRAHYDROFURAN
Hazard Class: 3
Packing Group: II

TDG
UN-No: UN2056
Proper Shipping Name: TETRAHYDROFURAN
Hazard Class: 3
Packing Group: II

IATA
UN-No: UN2056
Proper Shipping Name: TETRAHYDROFURAN
Hazard Class: 3
Packing Group: II

IMDG/IMO
15. Regulatory information

All of the components in the product are on the following Inventory lists: X = listed

International Inventories

<table>
<thead>
<tr>
<th>Component</th>
<th>TSCA</th>
<th>DSL</th>
<th>NDSL</th>
<th>EINECS</th>
<th>ELINCS</th>
<th>NLP</th>
<th>PICCS</th>
<th>ENCS</th>
<th>AICS</th>
<th>IECSC</th>
<th>KECL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrahydrofuran</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>203-726-8</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b)

<table>
<thead>
<tr>
<th>Component</th>
<th>TSCA 12(b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrahydrofuran</td>
<td>Section 4, 1 % de minimus concentration</td>
</tr>
</tbody>
</table>

SARA 313 Not applicable

SARA 311/312 Hazard Categories
- Acute Health Hazard Yes
- Chronic Health Hazard Yes
- Fire Hazard Yes
- Sudden Release of Pressure Hazard No
- Reactive Hazard Yes.

CWA (Clean Water Act) Not applicable

Clean Air Act Not applicable

OSHA Occupational Safety and Health Administration Not applicable

CERCLA
This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

<table>
<thead>
<tr>
<th>Component</th>
<th>Hazardous Substances RQs</th>
<th>CERCLA EHS RQs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrahydrofuran</td>
<td>1000 lb</td>
<td></td>
</tr>
</tbody>
</table>

California Proposition 65 This product does not contain any Proposition 65 chemicals

U.S. State Right-to-Know Regulations

<table>
<thead>
<tr>
<th>Component</th>
<th>Massachusetts</th>
<th>New Jersey</th>
<th>Pennsylvania</th>
<th>Illinois</th>
<th>Rhode Island</th>
</tr>
</thead>
</table>

Page 7 / 8
Tetrahydrofuran

U.S. Department of Transportation

Reportable Quantity (RQ): Y
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade Serious risk, Grade 3

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR

WHMIS Hazard Class B2  Flammable liquid
D2B  Toxic materials
D1B  Toxic materials

16. Other information

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 11-Jun-2009
Revision Date 09-Feb-2016
Print Date 09-Feb-2016
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

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 SDS