1. PRODUCT AND COMPANY IDENTIFICATION

Product Name 1-Butanol
Cat No. A399-1; A399-4; A399-20; A399-500; A399J-4; A399S-4
Synonyms n-Butanol; n-Butyl alcohol
Recommended Use Laboratory chemicals

2. HAZARDS IDENTIFICATION

WARNING!
Flammable liquid and vapor. Harmful if swallowed. Risk of serious damage to eyes. Irritating to eyes, respiratory system and skin. Vapors may cause drowsiness and dizziness.

Emergency Overview
Appearance Colorless
Physical State Liquid
odor Alcohol-like

Target Organs Skin, Respiratory system, Eyes
Potential Health Effects
Acute Effects
Principle Routes of Exposure

<table>
<thead>
<tr>
<th>Eyes</th>
<th>Risk of serious damage to eyes. Irritating to eyes.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin</td>
<td>Irritating to skin. May be harmful in contact with skin.</td>
</tr>
<tr>
<td>Inhalation</td>
<td>Irritating to respiratory system. May be harmful if inhaled.</td>
</tr>
<tr>
<td>Ingestion</td>
<td>Harmful if swallowed. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.</td>
</tr>
</tbody>
</table>

Chronic Effects May cause adverse liver effects. Experiments have shown reproductive toxicity effects on laboratory animals.

See Section 11 for additional Toxicological information.

Aggravated Medical Conditions Central nervous system disorders. Preexisting eye disorders. Skin disorders.
3. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Haz/Non-haz</th>
<th>Component</th>
<th>CAS-No</th>
<th>Weight %</th>
</tr>
</thead>
<tbody>
<tr>
<td>n-Butyl alcohol</td>
<td>71-36-3</td>
<td>99</td>
<td></td>
</tr>
</tbody>
</table>

4. FIRST AID MEASURES

**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. Obtain medical attention.

**Inhalation**
- Move to fresh air. If breathing is difficult, give oxygen. Do not use mouth-to-mouth resuscitation if victim ingested or inhaled the substance; induce artificial respiration with a respiratory medical device. Obtain medical attention.

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

**Notes to Physician**
- Treat symptomatically.

5. FIRE-FIGHTING MEASURES

**Flash Point**
- 35°C / 95°F

**Method**
- No information available.

**Autoignition Temperature**
- 340°C / 644°F

**Explosion Limits**
- Upper: 11.2 vol %
- Lower: 1.4 vol %

**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**
- No information available.

**Hazardous Combustion Products**
- No information available.

**Sensitivity to mechanical impact**
- No information available.

**Sensitivity to static discharge**
- No information available.

**Specific Hazards Arising from the Chemical**
- Flammable. Risk of ignition. Containers may explode when heated. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back.

**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. Thermal decomposition can lead to release of irritating gases and vapors.

**NFPA**
- Health: 2
- Flammability: 3
- Instability: 0
- Physical hazards: N/A
6. ACCIDENTAL RELEASE MEASURES

Personal Precautions  
Use personal protective equipment. 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. Do not breathe vapors or spray mist. Keep away from open flames, hot surfaces and sources of ignition. Use only non-sparking tools. Use explosion-proof equipment. Take precautionary measures against static discharges.

Storage  
Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat and sources of ignition. Flammables area.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Measures  
Ensure that eyewash stations and safety showers are close to the workstation location. Ensure adequate ventilation, especially in confined areas. Use explosion-proof electrical/ventilating/lighting/equipment.

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></td>
<td>TWA: 20 ppm</td>
<td>Skin</td>
<td>IDLH: 1400 ppm</td>
</tr>
<tr>
<td></td>
<td>(Vacated) Ceiling: 50 ppm</td>
<td>(Vacated) Ceiling: 50 ppm</td>
<td>Ceiling: 50 ppm</td>
</tr>
<tr>
<td>n-Butyl alcohol</td>
<td></td>
<td>TWA: 100 ppm</td>
<td>Ceiling: 150 mg/m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TWA: 300 mg/m³</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Component</th>
<th>Quebec</th>
<th>Mexico OEL (TWA)</th>
<th>Ontario TWA EV</th>
</tr>
</thead>
<tbody>
<tr>
<td>n-Butyl alcohol</td>
<td>Ceiling: 50 ppm</td>
<td>Peak: 50 ppm</td>
<td>TWA: 20 ppm</td>
</tr>
<tr>
<td></td>
<td>Ceiling: 152 mg/m³</td>
<td>Peak: 150 mg/m³</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Skin</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NIOSH IDLH: Immediately Dangerous to Life or Health

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  
Wear appropriate protective gloves and clothing to prevent skin exposure.

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.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State  
Liquid
9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Colorless
Odor: Alcohol-like
Odor Threshold: No information available.
PH: No information available.
Vapor Pressure: 6.7 mbar @ 20 °C
Vapor Density: (Air = 1.0)
Viscosity: 2.95 mPa.s (20 °C)
Boiling Point/Range: 117.6°C / 243.7°F
Melting Point/Range: -89°C / -128.2°F
Decomposition temperature: No information available.
Flash Point: 35°C / 95°F
Evaporation Rate: (Butyl Acetate = 1.0)
Specific Gravity: 0.810
Solubility: Slightly soluble in water
log Pow: No data available
Molecular Weight: 74.12
Molecular Formula: C4 H10 O

10. STABILITY AND REACTIVITY

Stability: Stable under normal conditions.
Conditions to Avoid: Incompatible products. Heat, flames and sparks.
Incompatible Materials: Strong oxidizing agents, Reducing agents, Acid chlorides, copper, Copper alloys, Acid anhydrides
Hazardous Decomposition Products: Carbon monoxide (CO), Carbon dioxide (CO₂)
Hazardous Polymerization: Hazardous polymerization does not occur.
Hazardous Reactions: None under normal processing.

11. TOXICOLOGICAL INFORMATION

Acute Toxicity

Component Information

<table>
<thead>
<tr>
<th>Component</th>
<th>LD50 Oral</th>
<th>LD50 Dermal</th>
<th>LC50 Inhalation (Dust)</th>
</tr>
</thead>
<tbody>
<tr>
<td>n-Butyl alcohol</td>
<td>790 mg/kg (Rat)</td>
<td>3400 mg/kg (Rabbit)</td>
<td>8000 ppm (Rat) 4 h</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>17.7 mg/L (Rat) 4 h</td>
</tr>
</tbody>
</table>

Irritation: Severe eye irritant Irritating to respiratory system and skin
Toxicologically Synergistic Products: No information available.

Chronic Toxicity
Carcinogenicity
There are no known carcinogenic chemicals in this product.

Sensitization
No information available.

Mutagenic Effects
Mutagenic effects have occurred in experimental animals.

Reproductive Effects
Experiments have shown reproductive toxicity effects on laboratory animals.

Developmental Effects
Developmental effects have occurred in experimental animals.

Teratogenicity
Teratogenic effects have occurred in experimental animals.

Other Adverse Effects
See actual entry in RTECS for complete information.

Endocrine Disruptor Information
No information available.

12. ECOLOGICAL INFORMATION

Ecotoxicity

<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>n-Butyl alcohol</td>
<td>500 mg/L EC50 &gt; 96 h</td>
<td>1740 mg/L LC50 96 h</td>
<td>EC50 = 2041.4 mg/L 5 min</td>
<td>1983 mg/L EC50 = 48 h</td>
</tr>
<tr>
<td></td>
<td>500 mg/L EC50 &gt; 72 h</td>
<td>191 000 µg/L LC50 96 h</td>
<td>EC50 = 2186 mg/L 30 min</td>
<td>1897 - 2072 mg/L EC50 48 h</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 000-50 000 µg/L LC50 96 h</td>
<td>EC50 = 3980 mg/L 24 h</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1730-1910 mg/L LC50 96 h</td>
<td>EC50 = 4400 mg/L 17 h</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>EC50 = 2041.4 mg/L 5 min</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>EC50 = 2186 mg/L 30 min</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>EC50 = 3980 mg/L 24 h</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>EC50 = 4400 mg/L 17 h</td>
<td></td>
</tr>
</tbody>
</table>

Persistence and Degradability
No information available.

Bioaccumulation/Accumulation
No information available.

Mobility

<table>
<thead>
<tr>
<th>Component</th>
<th>log Pow</th>
</tr>
</thead>
<tbody>
<tr>
<td>n-Butyl alcohol</td>
<td>0.785</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>n-Butyl alcohol - 71-36-3</td>
<td>U031</td>
<td>-</td>
</tr>
</tbody>
</table>

14. TRANSPORT INFORMATION

DOT

<table>
<thead>
<tr>
<th>UN-No</th>
<th>Proper Shipping Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>UN1120</td>
<td>BUTANOLS</td>
</tr>
</tbody>
</table>
14. TRANSPORT INFORMATION

Hazard Class 3
Packing Group III

TDG
UN-No UN1120
Proper Shipping Name BUTANOLS
Hazard Class 3
Packing Group III

IATA
UN-No UN1120
Proper Shipping Name BUTANOLS
Hazard Class 3
Packing Group III

IMDG/IMO
UN-No UN1120
Proper Shipping Name BUTANOLS
Hazard Class 3
Packing Group III

15. REGULATORY INFORMATION

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>CHINA</th>
<th>KECL</th>
</tr>
</thead>
<tbody>
<tr>
<td>n-Butyl alcohol</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>200-751-6</td>
<td>-</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></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) Not applicable
SARA 313

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>Weight %</th>
<th>SARA 313 - Threshold Values %</th>
</tr>
</thead>
<tbody>
<tr>
<td>n-Butyl alcohol</td>
<td>71-36-3</td>
<td>99</td>
<td>1.0</td>
</tr>
</tbody>
</table>

SARA 311/312 Hazardous Categorization

- **Acute Health Hazard**: No
- **Chronic Health Hazard**: No
- **Fire Hazard**: Yes
- **Sudden Release of Pressure Hazard**: No
- **Reactive Hazard**: No

Clean Water Act

Not applicable

Clean Air Act

Not applicable

OSHA

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>n-Butyl alcohol</td>
<td>5000 lb</td>
<td></td>
</tr>
</tbody>
</table>

California Proposition 65

This product does not contain any Proposition 65 chemicals.

State Right-to-Know

<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>
<tbody>
<tr>
<td>n-Butyl alcohol</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>X</td>
</tr>
</tbody>
</table>

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

16. OTHER INFORMATION

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

Creation Date
21-Jan-2009

Print Date
28-Nov-2012

Revision Summary
(M)SDS sections updated 3

Disclaimer
The information provided on 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 guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as 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 material or in any process, unless specified in the text.

End of MSDS