SAFETY DATA SHEET

1. Identification

Product Name 1-Butanol

Cat No. AC610250000, AC610251000

Synonyms n-Butanol; n-Butyl alcohol, Butan-1-ol

Recommended Use Laboratory chemicals.

Uses advised against Not for food, drug, pesticide or biocidal product use

Details of the supplier of the safety data sheet

Company
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

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

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>Label Elements</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flammable liquids</td>
<td>Category 3</td>
</tr>
<tr>
<td>Acute oral toxicity</td>
<td>Category 4</td>
</tr>
<tr>
<td>Skin Corrosion/irritation</td>
<td>Category 2</td>
</tr>
<tr>
<td>Serious Eye Damage/Eye Irritation</td>
<td>Category 1</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).</td>
<td></td>
</tr>
</tbody>
</table>

Signal Word
Danger

Hazard Statements
Flammable liquid and vapor
Harmful if swallowed
Causes skin irritation
Causes serious eye damage
May cause respiratory irritation
May cause drowsiness or dizziness
Precautionary Statements

Prevention
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Wear protective gloves/protective clothing/eye protection/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
Get medical attention/advice if you feel unwell

Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor/physician if you feel unwell

Skin
If skin irritation occurs: Get medical advice/attention
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
Wash contaminated clothing before reuse

Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
Immediately call a POISON CENTER or doctor/physician

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

Rinse mouth

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

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

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

Hazards not otherwise classified (HNOC)
None identified

3. Composition / information on ingredients

<table>
<thead>
<tr>
<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>
</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
Breathing difficulties. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting

Notes to Physician
Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Unsuitable Extinguishing Media
No information available

Flash Point
35 °C / 95 °F

Method -
Closed cup

Autoignition Temperature
340 °C / 644 °F

Explosion Limits
Upper
11.2 vol %
Lower
1.4 vol %

Sensitivity to Mechanical Impact
No information available

Sensitivity to Static Discharge
No information available

Specific Hazards Arising from the Chemical
Flammable. Risk of ignition. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Containers may explode when heated. 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 (CO₂)

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>0</td>
<td>N/A</td>
</tr>
</tbody>
</table>

6. Accidental release measures

Personal Precautions
Use personal protective equipment. Ensure adequate ventilation.

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.

7. Handling and storage

Handling
Wear personal protective equipment. Ensure adequate ventilation. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation.

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

Exposure Guidelines

<table>
<thead>
<tr>
<th>Component</th>
<th>ACGIH TLV</th>
<th>OSHA PEL</th>
<th>NIOSH IDLH</th>
<th>Mexico OEL (TWA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>n-Butyl alcohol</td>
<td>TWA: 20 ppm</td>
<td>Skin (Vacated) Ceiling: 50 ppm (Vacated) Ceiling: 150 mg/m³ TWA: 100 ppm TWA: 300 mg/m³</td>
<td>IDLH: 1400 ppm Ceiling: 50 ppm Ceiling: 150 mg/m³</td>
<td>Ceiling: 50 ppm Ceiling: 150 mg/m³</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

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

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>Physical State</th>
<th>Liquid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Colorless</td>
</tr>
<tr>
<td>Odor</td>
<td>Alcohol-like</td>
</tr>
<tr>
<td>Odor Threshold</td>
<td>No information available</td>
</tr>
<tr>
<td>pH</td>
<td>No information available</td>
</tr>
<tr>
<td>Melting Point/Range</td>
<td>-89 °C / -128.2 °F</td>
</tr>
<tr>
<td>Boiling Point/Range</td>
<td>117.6 °C / 243.7 °F</td>
</tr>
<tr>
<td>Flash Point</td>
<td>35 °C / 95 °F</td>
</tr>
<tr>
<td>Method</td>
<td>Closed cup</td>
</tr>
<tr>
<td>Evaporation Rate</td>
<td>0.46</td>
</tr>
<tr>
<td>Flammability (solid,gas)</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Flammability or explosive limits</td>
<td></td>
</tr>
<tr>
<td>Upper</td>
<td>11.2 vol %</td>
</tr>
<tr>
<td>Lower</td>
<td>1.4 vol %</td>
</tr>
<tr>
<td>Vapor Pressure</td>
<td>6.7 mbar @ 20 °C</td>
</tr>
<tr>
<td>Vapor Density</td>
<td>2.6</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>0.810</td>
</tr>
<tr>
<td>Solubility</td>
<td>Slightly soluble in water</td>
</tr>
<tr>
<td>Partition coefficient; n-octanol/water</td>
<td>No data available</td>
</tr>
<tr>
<td>Autoignition Temperature</td>
<td>340 °C / 644 °F</td>
</tr>
<tr>
<td>Decomposition Temperature</td>
<td>No information available</td>
</tr>
<tr>
<td>Viscosity</td>
<td>2.95 mPa.s (20 °C)</td>
</tr>
</tbody>
</table>
1-Butanol

Revision Date 26-May-2017

Molecular Formula C4 H10 O
Molecular Weight 74.12
Refractive index 1.390 - 1.400

10. Stability and reactivity

Reactive Hazard None known, based on information available
Stability Stable under normal conditions.
Conditions to Avoid Keep away from open flames, hot surfaces and sources of ignition. Incompatible products.
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

Product Information

Component Information

<table>
<thead>
<tr>
<th>Component</th>
<th>LD50 Oral</th>
<th>LD50 Dermal</th>
<th>LC50 Inhalation</th>
</tr>
</thead>
<tbody>
<tr>
<td>n-Butyl alcohol</td>
<td>LD50 = 700 mg/kg ( Rat )</td>
<td>LD50 = 3402 mg/kg ( Rabbit )</td>
<td>LC50 &gt; 8000 ppm ( Rat ) 4 h</td>
</tr>
<tr>
<td></td>
<td>LD50 = 790 mg/kg ( Rat )</td>
<td>LD50 = 3400 mg/kg ( Rabbit )</td>
<td></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 Severe eye irritant; Irritating to respiratory system and skin

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

<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>n-Butyl alcohol</td>
<td>71-36-3</td>
<td>Not listed</td>
<td>Not listed</td>
<td>Not listed</td>
<td>Not listed</td>
<td>Not listed</td>
</tr>
</tbody>
</table>

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 None known

Aspiration hazard No information available

Symptoms / effects, both acute and delayed Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting

Endocrine Disruptor Information No information available
Other Adverse Effects

The toxicological properties have not been fully investigated.

### 12. Ecological information

#### Ecotoxicity

Do not flush into surface water or sanitary sewer system.

<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>EC50: &gt; 500 mg/L, 72h (Desmodesmus subspicatus)</td>
<td>LC50: = 1910000 µg/L, 96h static (Pimephales promelas)</td>
<td>EC50 = 2041.4 mg/L 5 min</td>
<td>EC50: 1897 - 2072 mg/L, 48h Static (Daphnia magna)</td>
</tr>
<tr>
<td></td>
<td>EC50: &gt; 500 mg/L, 96h (Desmodesmus subspicatus)</td>
<td>LC50: = 500000 µg/L, 96h static (Lepomis macrochirus)</td>
<td>EC50 = 2186 mg/L 30 min</td>
<td>EC50: = 1983 mg/L, 48h (Daphnia magna)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LC50: = 1740 mg/L, 96h flow-through (Pimephales promelas)</td>
<td>EC50 = 3980 mg/L 24 h</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>LC50: = 1730 - 1910 mg/L, 96h static (Pimephales promelas)</td>
<td>EC50 = 4400 mg/L 17 h</td>
<td></td>
</tr>
<tr>
<td></td>
<td>EC50 = 2041.4 mg/L 5 min</td>
<td>EC50 = 1983 mg/L, 48h Static (Daphnia magna)</td>
<td></td>
<td></td>
</tr>
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<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>EC50 = 4400 mg/L 17 h</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Persistence and Degradability

Soluble in water. Persistence is unlikely based on information available.

#### Bioaccumulation/ Accumulation

No information available.

#### Mobility

Will likely be mobile in the environment due to its water solubility.

<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>
<th>Hazard Class</th>
<th>Packing Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>UN1120</td>
<td>BUTANOLS</td>
<td>3</td>
<td>III</td>
</tr>
</tbody>
</table>

#### TDG

<table>
<thead>
<tr>
<th>UN-No</th>
<th>Proper Shipping Name</th>
<th>Hazard Class</th>
<th>Packing Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>UN1120</td>
<td>BUTANOLS</td>
<td>3</td>
<td>III</td>
</tr>
</tbody>
</table>

#### IATA

<table>
<thead>
<tr>
<th>UN-No</th>
<th>Proper Shipping Name</th>
<th>Hazard Class</th>
<th>Packing Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>UN1120</td>
<td>BUTANOLS</td>
<td>3</td>
<td>III</td>
</tr>
</tbody>
</table>

#### IMDG/IMO

<table>
<thead>
<tr>
<th>UN-No</th>
<th>Proper Shipping Name</th>
<th>Hazard Class</th>
<th>Packing Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>UN1120</td>
<td>BUTANOLS</td>
<td>3</td>
<td>III</td>
</tr>
</tbody>
</table>

### 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>n-Butyl alcohol</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>200-751-6</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></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 Hazard Categories**
- Acute Health Hazard: Yes
- Chronic Health Hazard: Yes
- Fire Hazard: Yes
- Sudden Release of Pressure Hazard: No
- Reactive Hazard: No

**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>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

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

**U.S. Department of Transportation**

Reportable Quantity (RQ): Y
1-Butanol

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

16. Other information

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

Creation Date    21-Jan-2009
Revision Date    26-May-2017
Print Date       26-May-2017
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