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

1.1 Product identifier

Identification of the substance: 2-Butanol

Article number: KK02

Registration number (REACH): 01-2119475146-36-xxxx

Index No: 603-127-00-5

EC number: 201-158-5

CAS number: 78-92-2

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

Identified uses: laboratory chemical

1.3 Details of the supplier of the safety data sheet

Carl Roth GmbH + Co KG
Schoemperlenstr. 3-5
D-76185 Karlsruhe
Germany

Telephone: +49 (0) 721 - 56 06 0
Telefax: +49 (0) 721 - 56 06 149
e-mail: sicherheit@carlroth.de
Website: www.carlroth.de

Competent person responsible for the safety data sheet: Department Health, Safety and Environment

1.4 Emergency telephone number

Emergency information service: Poison Centre Munich: +49/(0)89 19240

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008 (CLP)

<table>
<thead>
<tr>
<th>Section</th>
<th>Hazard class</th>
<th>Hazard class and category</th>
<th>Hazard statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.6</td>
<td>flammable liquid</td>
<td>(Flam. Liq. 3)</td>
<td>H226</td>
</tr>
<tr>
<td>3.3</td>
<td>serious eye damage/eye irritation</td>
<td>(Eye Irrit. 2)</td>
<td>H319</td>
</tr>
<tr>
<td>3.8R</td>
<td>specific target organ toxicity - single exposure (respiratory tract irritation)</td>
<td>(STOT SE 3)</td>
<td>H335</td>
</tr>
<tr>
<td>3.8D</td>
<td>specific target organ toxicity - single exposure (narcotic effects, drowsiness)</td>
<td>(STOT SE 3)</td>
<td>H336</td>
</tr>
</tbody>
</table>
For full text of Hazard- and EU Hazard-statements: see SECTION 16.

The most important adverse physicochemical, human health and environmental effects
Narcotic effects.

2.2 Label elements

Labelling according to Regulation (EC) No 1272/2008 (CLP)

Signal word  Warning

Pictograms

Hazard statements

H226  Flammable liquid and vapour.
H319  Causes serious eye irritation.
H335  May cause respiratory irritation.
H336  May cause drowsiness or dizziness.

Precautionary statements

Precautionary statements - prevention

P210  Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

Precautionary statements - response

P304+P340  IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P305+P351+P338  IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Labelling of packages where the contents do not exceed 125 ml
Signal word: Warning
Symbol(s)

2.3 Other hazards

There is no additional information.
Take off contaminated clothing.
Provide fresh air. In all cases of doubt, or when symptoms persist, seek medical advice.
Rinse skin with water/shower.
Irrigate copiously with clean, fresh water for at least 10 minutes, holding the eyelids apart. In case of eye irritation consult an ophthalmologist.
Do NOT induce vomiting. Aspiration hazard. Call a physician immediately.

### SECTION 3: Composition/information on ingredients

#### 3.1 Substances

<table>
<thead>
<tr>
<th>Name of substance</th>
<th>sec-Butanol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Index No</td>
<td>603-127-00-5</td>
</tr>
<tr>
<td>Registration number (REACH)</td>
<td>01-2119475146-36-xxxx</td>
</tr>
<tr>
<td>EC number</td>
<td>201-158-5</td>
</tr>
<tr>
<td>CAS number</td>
<td>78-92-2</td>
</tr>
<tr>
<td>Molecular formula</td>
<td>C₄H₁₀O</td>
</tr>
<tr>
<td>Molar mass</td>
<td>74,12 g/mol</td>
</tr>
</tbody>
</table>

### SECTION 4: First aid measures

#### 4.1 Description of first aid measures

**General notes**
Take off contaminated clothing.

**Following inhalation**
Provide fresh air. In all cases of doubt, or when symptoms persist, seek medical advice.

**Following skin contact**
Rinse skin with water/shower.

**Following eye contact**
Irrigate copiously with clean, fresh water for at least 10 minutes, holding the eyelids apart. In case of eye irritation consult an ophthalmologist.

**Following ingestion**
Do NOT induce vomiting. Aspiration hazard. Call a physician immediately.

#### 4.2 Most important symptoms and effects, both acute and delayed
Irritation, Cough, Drowsiness, Headache, Dizziness, Dyspnoea, Vertigo, Nausea, Vomiting, Narcosis

#### 4.3 Indication of any immediate medical attention and special treatment needed
none
SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Co-ordinate fire-fighting measures to the fire surroundings
water spray, foam, alcohol resistant foam, dry extinguishing powder, carbon dioxide (CO2)

Unsuitable extinguishing media
water jet

5.2 Special hazards arising from the substance or mixture
Combustible. Vapours can form explosive mixtures with air.

Hazardous combustion products
In case of fire may be liberated: carbon monoxide (CO), carbon dioxide (CO2)

5.3 Advice for firefighters
Vapours are heavier than air. Fight fire with normal precautions from a reasonable distance. Wear self-contained breathing apparatus.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel
Do not breathe vapour/spray. Avoid contact with skin and eyes. Avoidance of ignition sources.

6.2 Environmental precautions
Keep away from drains, surface and ground water. Explosive properties.

6.3 Methods and material for containment and cleaning up

Advises on how to contain a spill
Covering of drains.

Advises on how to clean up a spill
Absorb with liquid-binding material (e.g. sand, diatomaceous earth, acid- or universal binding agents).

Other information relating to spills and releases
Place in appropriate containers for disposal. Ventilate affected area.

Reference to other sections
2-Butanol ≥98.5%, for synthesis  

article number: KK02

SECTION 7: Handling and storage

7.1 Precautions for safe handling  
Provide adequate ventilation. When not in use, keep containers tightly closed.  
- Measures to prevent fire as well as aerosol and dust generation

Keep away from sources of ignition - No smoking.

Take precautionary measures against static discharge.

Advice on general occupational hygiene  
Do not eat, drink or smoke when using this product. Wash hands before breaks and after work.

7.2 Conditions for safe storage, including any incompatibilities  
Store in a well-ventilated place. Keep container tightly closed.  
Incompatible substances or mixtures  
Observe hints for combined storage.

Consideration of other advice  
- Ventilation requirements  
Use local and general ventilation.

- Specific designs for storage rooms or vessels  
Recommended storage temperature: 15 - 25 °C.

7.3 Specific end use(s)  
No information available.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters  
National limit values

Occupational exposure limit values (Workplace Exposure Limits)  
No data available.

<table>
<thead>
<tr>
<th>Country</th>
<th>Name of agent</th>
<th>CAS No</th>
<th>Notation</th>
<th>TWA [ppm]</th>
<th>TWA [mg/m³]</th>
<th>STEL [ppm]</th>
<th>STEL [mg/m³]</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>GB</td>
<td>butan-2-ol</td>
<td>78-92-2</td>
<td>WEL</td>
<td>100</td>
<td>308</td>
<td>150</td>
<td>462</td>
<td>EH40/2005</td>
</tr>
</tbody>
</table>

Notation  
STEL Short-term exposure limit: a limit value above which exposure should not occur and which is related to a 15-minute period unless otherwise specified.  
TWA Time-weighted average (long-term exposure limit): measured or calculated in relation to a reference period of 8 hours time-weighted average

Relevant DNELs/DMELs/PNECs and other threshold levels  
- human health values
2-Butanol ≥98.5%, for synthesis

**article number:** KK02

### Exposure controls

**Individual protection measures (personal protective equipment)**

#### Eye/face protection

Use safety goggle with side protection.

#### Skin protection

- **hand protection**
  
  Wear suitable gloves. Chemical protection gloves are suitable, which are tested according to EN 374. For special purposes, it is recommended to check the resistance to chemicals of the protective gloves mentioned above together with the supplier of these gloves.

- **type of material**
  
  NBR (Nitrile rubber)

- **material thickness**
  
  0.4 mm.

- **breakthrough times of the glove material**
  
  >480 minutes (permeation: level 6)

- **other protection measures**

  Take recovery periods for skin regeneration. Preventive skin protection (barrier creams/ointments) is recommended.

#### Respiratory protection

Respiratory protection necessary at: Aerosol or mist formation. Type: A (against organic gases and vapours with a boiling point of > 65 °C, colour code: Brown).

Observe the wear time limits according GefStoffV in combination with the rules for using respiratory protection apparatus (BGR 190).

---

**Endpoint** | **Threshold level** | **Protection goal, route of exposure** | **Used in** | **Exposure time**
--- | --- | --- | --- | ---
DNEL | 212 mg/m³ | human, inhalatory | worker (industry) | chronic - systemic effects
DNEL | 405 mg/kg | human, dermal | worker (industry) | chronic - systemic effects

### Environmental values

<table>
<thead>
<tr>
<th>Endpoint</th>
<th>Threshold level</th>
<th>Environmental compartment</th>
<th>Exposure time</th>
</tr>
</thead>
<tbody>
<tr>
<td>PNEC</td>
<td>47,1 mg/l</td>
<td>freshwater</td>
<td>short-term (single instance)</td>
</tr>
<tr>
<td>PNEC</td>
<td>47,1 mg/l</td>
<td>marine water</td>
<td>short-term (single instance)</td>
</tr>
<tr>
<td>PNEC</td>
<td>761 mg/l</td>
<td>sewage treatment plant (STP)</td>
<td>short-term (single instance)</td>
</tr>
<tr>
<td>PNEC</td>
<td>196,2 mg/kg</td>
<td>freshwater sediment</td>
<td>short-term (single instance)</td>
</tr>
<tr>
<td>PNEC</td>
<td>196,2 mg/kg</td>
<td>marine sediment</td>
<td>short-term (single instance)</td>
</tr>
<tr>
<td>PNEC</td>
<td>11,58 mg/kg</td>
<td>soil</td>
<td>short-term (single instance)</td>
</tr>
</tbody>
</table>
Environmental exposure controls
Keep away from drains, surface and ground water.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance

Physical state: liquid (fluid)
Colour: colourless
Odour: characteristic
Odour threshold: No data available

Other physical and chemical parameters

pH (value): This information is not available.
Melting point/freezing point: -115 °C
Initial boiling point and boiling range: 99 - 102 °C
Flash point: 24 °C (c.c.) (closed cup)
Evaporation rate: no data available
Flammability (solid, gas): not relevant (fluid)

Explosive limits

• lower explosion limit (LEL): 1.4 vol%
• upper explosion limit (UEL): 9.8 vol%
Explosion limits of dust clouds: not relevant
Vapour pressure: 17 hPa at 20 °C
Density: 0.81 g/cm³ at 20 °C
Vapour density: This information is not available.
Bulk density: Not applicable
Relative density: Information on this property is not available.

Solubility(ies)

Water solubility: 125 g/l at 20 °C

Partition coefficient

n-octanol/water (log KOW): 0.61 (exp. Lit.)

Auto-ignition temperature: 390 °C - (DIN 51794)
Decomposition temperature: no data available
There is no additional information.

**SECTION 10: Stability and reactivity**

### 10.1 Reactivity

Risk of ignition. Vapours can form explosive mixtures with air.

### 10.2 Chemical stability

The material is stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.

### 10.3 Possibility of hazardous reactions

Exothermic reaction with: Alkali metals, Alkaline earth metal, Strong oxidiser, Aluminium, Reducing agents

### 10.4 Conditions to avoid

Keep away from heat.

### 10.5 Incompatible materials

Aluminium, Rubber articles, different plastics

### 10.6 Hazardous decomposition products

Hazardous combustion products: see section 5.

**SECTION 11: Toxicological information**

### 11.1 Information on toxicological effects

#### Acute toxicity

Shall not be classified as acutely toxic.

<table>
<thead>
<tr>
<th>Exposure route</th>
<th>Endpoint</th>
<th>Value</th>
<th>Species</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>inhalation: vapour</td>
<td>LC50</td>
<td>48,5 mg/l/4h</td>
<td>rat</td>
<td>RTECS</td>
</tr>
<tr>
<td>oral</td>
<td>LD50</td>
<td>2.193 mg/kg</td>
<td>rat</td>
<td>TOXNET</td>
</tr>
<tr>
<td>dermal</td>
<td>LD50</td>
<td>&gt;2.000 mg/kg</td>
<td>rat</td>
<td>TOXNET</td>
</tr>
</tbody>
</table>

**Skin corrosion/irritation**

Shall not be classified as corrosive/irritant to skin.

**Serious eye damage/eye irritation**

Causes serious eye irritation.

**Respiratory or skin sensitisation**

Shall not be classified as a respiratory or skin sensitiser.
2-Butanol ≥98.5%, for synthesis

Summary of evaluation of the CMR properties
Shall not be classified as germ cell mutagenic, carcinogenic nor as a reproductive toxicant

• **Specific target organ toxicity - single exposure**
  May cause respiratory irritation. May cause drowsiness or dizziness.

• **Specific target organ toxicity - repeated exposure**
  Shall not be classified as a specific target organ toxicant (repeated exposure).

**Aspiration hazard**
Shall not be classified as presenting an aspiration hazard.

**Symptoms related to the physical, chemical and toxicological characteristics**

• **If swallowed**
  Nausea, vomiting, presenting an aspiration hazard

• **If in eyes**
  Causes serious eye irritation

• **If inhaled**
  Fatigue, dizziness, vertigo, headache, cough, Dyspnoea, narcosis

• **If on skin**
  Prolonged or repeated skin contact may cause removal of natural fat from the skin resulting in dermatitis (skin inflammation)

**Other information**
None

### SECTION 12: Ecological information

#### 12.1 Toxicity

acc. to 1272/2008/EC: Shall not be classified as hazardous to the aquatic environment.

**Aquatic toxicity (acute)**

<table>
<thead>
<tr>
<th>Endpoint</th>
<th>Value</th>
<th>Species</th>
<th>Source</th>
<th>Exposure time</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC50</td>
<td>4.227 mg/l</td>
<td><em>daphnia magna</em></td>
<td>ECOTOX Database</td>
<td>48 hours</td>
</tr>
<tr>
<td>LC50</td>
<td>3.670 mg/l</td>
<td><em>Pimephales promelas</em></td>
<td>ECOTOX Database</td>
<td>96 hours</td>
</tr>
<tr>
<td>ErC50</td>
<td>2.029 mg/l</td>
<td><em>algae</em></td>
<td>ECHA</td>
<td>96 hours</td>
</tr>
</tbody>
</table>

**Aquatic toxicity (chronic)**

<table>
<thead>
<tr>
<th>Endpoint</th>
<th>Value</th>
<th>Species</th>
<th>Source</th>
<th>Exposure time</th>
</tr>
</thead>
<tbody>
<tr>
<td>LC50</td>
<td>1.816 mg/l</td>
<td><em>fish</em></td>
<td>ECHA</td>
<td>24 h</td>
</tr>
<tr>
<td>EC50</td>
<td>&gt;345 mg/l</td>
<td><em>aquatic invertebrates</em></td>
<td>ECHA</td>
<td>24 h</td>
</tr>
<tr>
<td>ErC50</td>
<td>1.901 mg/l</td>
<td><em>algae</em></td>
<td>ECHA</td>
<td>24 h</td>
</tr>
</tbody>
</table>
2-Butanol ≥98,5%, for synthesis

article number: KK02

12.2 Process of degradability
The substance is readily biodegradable.
Theoretical Oxygen Demand: 2.59 mg/mg
Theoretical Carbon Dioxide: 2.375 mg/mg
Biochemical Oxygen Demand: 1.870 mg/l at 5 d

<table>
<thead>
<tr>
<th>Process</th>
<th>Degradation rate</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>oxygen depletion</td>
<td>86 %</td>
<td>5 d</td>
</tr>
</tbody>
</table>

12.3 Bioaccumulative potential
Does not significantly accumulate in organisms.
n-octanol/water (log KOW) 0,61
BOD5/COD 0,75708502

12.4 Mobility in soil
Data are not available.

12.5 Results of PBT and vPvB assessment
Data are not available.

12.6 Other adverse effects
Slightly hazardous to water.

SECTION 13: Disposal considerations

13.1 Waste treatment methods
This material and its container must be disposed of as hazardous waste. Dispose of contents/container in accordance with local/regional/national/international regulations.

Sewage disposal-relevant information
Do not empty into drains.

Waste treatment of containers/packagings
It is a dangerous waste; only packagings which are approved (e.g. acc. to ADR) may be used.

13.2 Relevant provisions relating to waste
The allocation of waste identity numbers/waste descriptions must be carried out according to the EEC, specific to the industry and process.

13.3 Remarks
Waste shall be separated into the categories that can be handled separately by the local or national waste management facilities. Please consider the relevant national or regional provisions.
SECTION 14: Transport information

14.1 UN number 1120
14.2 UN proper shipping name BUTANOLS
    Hazardous ingredients 2-Butanol
14.3 Transport hazard class(es)
    Class 3 (flammable liquids)
14.4 Packing group III (substance presenting low danger)
14.5 Environmental hazards none (non-environmentally hazardous acc. to the dangerous goods regulations)
14.6 Special precautions for user
    Provisions for dangerous goods (ADR) should be complied within the premises.
14.7 Transport in bulk according to Annex II of MARPOL and the IBC Code
    The cargo is not intended to be carried in bulk.
14.8 Information for each of the UN Model Regulations
    • Transport of dangerous goods by road, rail and inland waterway (ADR/RID/ADN)
      UN number 1120
      Proper shipping name BUTANOLS
      Particulars in the transport document UN1120, BUTANOLS, 3, III, (D/E)
      Class 3
      Classification code F1
      Packing group III
      Danger label(s) 3
      Excepted quantities (EQ) E1
      Limited quantities (LQ) 5 L
      Transport category (TC) 3
      Tunnel restriction code (TRC) D/E
      Hazard identification No 30
      Emergency Action Code 2YE
    • International Maritime Dangerous Goods Code (IMDG)
      UN number 1120
      Proper shipping name BUTANOLS
      Particulars in the shipper's declaration UN1120, BUTANOLS, 3, III, 24°C c.c.
      Class 3
      Packing group III
2-Butanol ≥98.5%, for synthesis

article number: KK02

Danger label(s) 3

Special provisions (SP) 223
Excepted quantities (EQ) E1
Limited quantities (LQ) 5 L
EmS F-E, S-D
Stowage category B

SECTION 15: Regulatory information

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

Relevant provisions of the European Union (EU)

- Regulation 649/2012/EU concerning the export and import of hazardous chemicals (PIC)
  Not listed.
- Regulation 1005/2009/EC on substances that deplete the ozone layer (ODS)
  Not listed.
- Regulation 850/2004/EC on persistent organic pollutants (POP)
  Not listed.
- Restrictions according to REACH, Annex XVII
  not listed
- List of substances subject to authorisation (REACH, Annex XIV)
  not listed
- Seveso Directive

2012/18/EU (Seveso III)

<table>
<thead>
<tr>
<th>No</th>
<th>Dangerous substance/hazard categories</th>
<th>Qualifying quantity (tonnes) for the application of lower and upper-tier requirements</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>P5c</td>
<td>flammable liquids (cat. 2, 3)</td>
<td>5.000</td>
<td>50.000 51)</td>
</tr>
</tbody>
</table>

Notation
51) Flammable liquids, categories 2 or 3 not covered by P5a and P5b

- Limitation of emissions of volatile organic compounds due to the use of organic solvents in certain paints and varnishes and vehicle refinishing products (2004/42/EC, Deco-Paint Directive)
  VOC content 100 %
- Directive on industrial emissions (VOCs, 2010/75/EU)
  VOC content 100 %
2-Butanol ≥98.5%, for synthesis

article number: KK02

**Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS) - Annex II**
not listed

**Regulation 166/2006/EC concerning the establishment of a European Pollutant Release and Transfer Register (PRTR)**
not listed

**Directive 2000/60/EC establishing a framework for Community action in the field of water policy (WFD)**
not listed

**National inventories**
Substance is listed in the following national inventories:

- EINECS/ELINCS/NLP (Europe)
- REACH (Europe)

**15.2 Chemical Safety Assessment**
No Chemical Safety Assessment has been carried out for this substance.

**SECTION 16: Other information**

**Abbreviations and acronyms**

<table>
<thead>
<tr>
<th>Abbr.</th>
<th>Descriptions of used abbreviations</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADN</td>
<td>Accord européen relatif au transport international des marchandises dangereuses par voies de navigation intérieures (European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways)</td>
</tr>
<tr>
<td>ADR</td>
<td>Accord européen relatif au transport international des marchandises dangereuses par route (European Agreement concerning the International Carriage of Dangerous Goods by Road)</td>
</tr>
<tr>
<td>BOD</td>
<td>Biochemical Oxygen Demand</td>
</tr>
<tr>
<td>CAS</td>
<td>Chemical Abstracts Service (service that maintains the most comprehensive list of chemical substances)</td>
</tr>
<tr>
<td>CLP</td>
<td>Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures</td>
</tr>
<tr>
<td>CMR</td>
<td>Carcinogenic, Mutagenic or toxic for Reproduction</td>
</tr>
<tr>
<td>COD</td>
<td>chemical oxygen demand</td>
</tr>
<tr>
<td>DMEL</td>
<td>Derived Minimal Effect Level</td>
</tr>
<tr>
<td>DNEL</td>
<td>Derived No-Effect Level</td>
</tr>
<tr>
<td>EINECS</td>
<td>European Inventory of Existing Commercial Chemical Substances</td>
</tr>
<tr>
<td>ELINCS</td>
<td>European List of Notified Chemical Substances</td>
</tr>
<tr>
<td>EmS</td>
<td>Emergency Schedule</td>
</tr>
<tr>
<td>GHS</td>
<td>“Globally Harmonized System of Classification and Labelling of Chemicals” developed by the United Nations</td>
</tr>
<tr>
<td>IMDG</td>
<td>International Maritime Dangerous Goods Code</td>
</tr>
<tr>
<td>index No</td>
<td>the Index number is the identification code given to the substance in Part 3 of Annex VI to Regulation (EC) No 1272/2008</td>
</tr>
<tr>
<td>MARPOL</td>
<td>International Convention for the Prevention of Pollution from Ships (abbr. of “Marine Pollutant”)</td>
</tr>
<tr>
<td>NLP</td>
<td>No-Longer Polymer</td>
</tr>
<tr>
<td>PBT</td>
<td>Persistent, Bioaccumulative and Toxic</td>
</tr>
<tr>
<td>PNEC</td>
<td>Predicted No-Effect Concentration</td>
</tr>
</tbody>
</table>
The above information describes exclusively the safety requirements of the product and is based on our present-day knowledge. The information is intended to give you advice about the safe handling of the product named in this safety data sheet, for storage, processing, transport and disposal. The information cannot be transferred to other products. In the case of mixing the product with other products or in the case of processing, the information on this safety data sheet is not necessarily valid for the new made-up material.