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

1.1 Product identifier

Trade name Isobutanol

Stock number: B23091
CAS Number: 78-83-1
EC number: 201-148-0
Index number: 603-108-00-1

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

Identified use: SU24 Scientific research and development

1.3 Details of the supplier of the safety data sheet

Manufacturer/Supplier: Thermo Fisher (Kandel) GmbH Zeppelininstr. 7b 76185 Karlsruhe / Germany Tel: +49 (0) 721 84007 280 Fax: +49 (0) 721 84007 300 Email: tech@alfa.com www.alfa.com

Informing department: Product safety Tel + +049 (0) 7275 988687-0

1.4 Emergency telephone number:

Carechem 24: +44 (0) 1235 239 670 (Multi-language emergency number)
Poison Information Center Mainz www.giftnfo.uni-mainz.de Telephone: +49(0)6131/19240

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008

GHS02 flame Flammable liquid and vapour.

GHS05 corrosion Eye Dam. 1 H318 Causes serious eye damage.

GHS07 Skin Irrit. 2 H315 Causes skin irritation.

STOT SE 3 H335-H336 May cause respiratory irritation. May cause drowsiness or dizziness.

Other hazards that do not result in classification No information known.

2.2 Label elements

Labelling according to Regulation (EC) No 1272/2008 The substance is classified and labelled according to the CLP regulation.

Hazard pictograms

GHS02 GHS05 GHS07

Signal word Danger

Hazard statements

H226 Flammable liquid and vapour.
H315 Causes skin irritation.
H318 Causes serious eye damage.
H335-H336 May cause respiratory irritation. May cause drowsiness or dizziness.

Precautionary statements

P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P261 Avoid breathing dust/fume/gas/mist/vapours/spray.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P303+P361+P353 If ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P304+P340 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P310 Immediately call a POISON CENTER or doctor/physician.
P312 Take off contaminated clothing and wash before reuse.
P305 Store locked up.
P501 Dispose of contents/container in accordance with local/regional/national/international regulations.

2.3 Other hazards

Results of PBT and vPvB assessment

PBT: Not applicable.
vPvB: Not applicable.

SECTION 3: Composition/information on ingredients

3.1 Substances

CAS# Designation: 78-83-1 Isobutanol
Identification number(s):
EC number: 201-148-0
Index number: 603-108-00-1

SECTION 4: First aid measures

4.1 Description of first aid measures

After inhalation

Supply fresh air. If required, provide artificial respiration. Keep patient warm. Consult doctor if symptoms persist.
Seek immediate medical advice.

After skin contact

Instantly wash with water and soap and rinse thoroughly. Seek immediate medical advice.

(Contd. on page 2)
Trade name Isobutanol

(Contd. of page 1)

After eye contact Rinse opened eye for several minutes under running water. Then consult doctor.
After swallowing Seek medical treatment.

4.2 Most important symptoms and effects, both acute and delayed
Causes skin irritation.
Causes serious eye damage.
May cause respiratory irritation.
May cause drowsiness or dizziness.

4.3 Indication of any immediate medical attention and special treatment needed No further relevant information available.

SECTION 5: Firefighting measures

5.1 Extinguishing media
Suitable extinguishing agents CO2, extinguishing powder or water jet. Fight larger fires with water jet or alcohol-resistant foam.

5.2 Special hazards arising from the substance or mixture
If this product is involved in a fire, the following can be released:

5.3 Advice for firefighters
Protective equipment:
Wear self-contained breathing apparatus.
Wear full protective suit.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Wear protective equipment. Keep unprotected persons away.
Ensure adequate ventilation
Keep away from ignition sources.

6.2 Environmental precautions
Do not allow product to reach sewage system or water bodies.

6.3 Methods and material for containment and cleaning up:
Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).
Ensure adequate ventilation.
Prevention of secondary hazards
Keep away from ignition sources.

6.4 Reference to other sections
See Section 7 for information on safe handling.
See section 8 for information on personal protection equipment.
See Section 13 for information on disposal.

SECTION 7: Handling and storage

7.1 Precautions for safe handling
Keep containers tightly sealed.
Store in cool, dry place in tightly closed containers.
Ensure good ventilation/exhaustion at the workplace.

Information about protection against explosions and fires:
Protect against electrostatic charges.
Fumes can combine with air to form an explosive mixture.
Keep ignition sources away - Do not smoke.

7.2 Conditions for safe storage, including any incompatibilities
Storage
Requirements to be met by storerooms and containers: No special requirements.
Information about storage in one common storage facility: Store away from oxidising agents.
Further information about storage conditions:
Keep container tightly sealed.
Store in cool, dry conditions in well sealed containers.

7.3 Specific end use(s)
No further relevant information available.

SECTION 8: Exposure controls/personal protection

Additional information about design of technical systems:
Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.

8.1 Control parameters
Components with critical values that require monitoring at the workplace:
78-83-1 Isobutanol (100.0%)

AOW (Germany)
Long-term value: 310 mg/m³, 100 ppm
1(I);DFG, Y
PEL (USA)
Long-term value: 300 mg/m³, 100 ppm
TLV (USA)
Long-term value: 152 mg/m³, 50 ppm

Additional information: No data

8.2 Exposure controls
Personal protective equipment:
General protective and hygienic measures
The usual precautionary measures should be adhered to in handling the chemicals.
Keep away from foodstuffs, beverages and food.
Remove any soiled and impregnated garments.
Wash hands during breaks and at the end of the work.
Avoid contact with the eyes and skin.
Maintain an ergonomically appropriate working environment.
Breathing equipment: Use breathing protection with high concentrations.
Protection of hands: Check protective gloves prior to each use for their proper condition.
The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer.
Material of gloves: Impervious gloves.
Eye protection: Tightly sealed safety glasses.
Face protection: Protective work clothing.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

General Information
Appearance: Liquid
Form: Colourless
Colour: Sweetish
Odour:
Odour threshold: Not determined.

pH-value (80 g/l) at 20 °C: 7

(Contd. on page 3)
Change in condition

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Melting point/Melting range</td>
<td>-108 °C</td>
</tr>
<tr>
<td>Boiling point/Boiling range</td>
<td>107-108 °C</td>
</tr>
<tr>
<td>Sublimation temperature / start</td>
<td>Not determined</td>
</tr>
</tbody>
</table>

Flash point: 28 °C

Inflammability (solid, gaseous): Not determined.

Ignition temperature: 390 °C

Decomposition temperature: Not determined.

Self-inflammability: Not determined.

Danger of explosion: Product is not explosive. However, formation of explosive air/steam mixtures is possible.

Critical values for explosion:
- Lower: 1.7 Vol %
- Upper: 12 Vol %

Steam pressure at 20 °C: 4-40 hPa

Density at 20 °C: 0.802 g/cm³

Flash point: 28 °C

Inflammability (solid, gaseous): Not determined.

Ignition temperature: 390 °C

Decomposition temperature: Not determined.

Self-inflammability: Not determined.

Danger of explosion: Product is not explosive. However, formation of explosive air/steam mixtures is possible.

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Inflammability (solid, gaseous): Not determined.

Ignition temperature: 390 °C

Decomposition temperature: Not determined.

Self-inflammability: Not determined.
14.3 Transport hazard class(es)
ADR
Class Label
IMDG, IATA

Class Label
3 Flammable liquids.

Packing group
ADR, IMDG, IATA
III

14.5 Environmental hazards:
Not applicable.

14.6 Special precautions for user
Warning: Flammable liquids.
Kemler Number:
30
EMS Number:
F-E,S-D

14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code
Not applicable.

Transport/Additional information:
ADR
Excepted quantities (EQ):
E1
Limited quantities (LQ)
5L
Transport category
3
Tunnel restriction code
D/E
UN "Model Regulation":
UN1212, ISOBUTANOL (ISOBUTYL ALCOHOL), 3, III

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture
Australian Inventory of Chemical Substances Substance is listed.
Standard for the Uniform Scheduling of Medicines and Poisons Substance is not listed.
National regulations
Information about limitation of use:
Employment restrictions concerning young persons must be observed.
For use only by technically qualified individuals.
Classification according to VbF: A II
Technical instructions (air):
Class Share in %
NK 100,0
Water hazard class: Water hazard class 1 (Assessment by list): slightly hazardous for water.
Other regulations, limitations and prohibitive regulations
ELINCS (European List of Notified Chemical Substances) Substance is not listed.
Substance of Very High Concern (SVHC) according to the REACH Regulations (EC) No. 1907/2006. Substance is not listed.
The conditions of restrictions according to Article 67 and Annex XVII of the Regulation (EC) No 1907/2006 (REACH) for the manufacturing, placing on the market and use must be observed.
Substance is not listed.
Annex XIV of the REACH Regulations (requiring Authorisation for use) Substance is not listed.
15.2 Chemical safety assessment:
A Chemical Safety Assessment has not been carried out.

SECTION 16: Other information
Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

Department issuing SDS: Global Marketing Department

Abbreviations and acronyms:
ADR: Accords européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
IMDG: International Maritime Code for Dangerous Goods
IATA: International Air Transport Association
GHS: Globally Harmonized System of Classification and Labelling of Chemicals
EINECS: European Inventory of Existing Commercial Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
VbF: Verordnung über brennbare Flüssigkeiten, Österreich (Ordinance on the storage of combustible liquids, Austria)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent
vPvB: very Persistent and very Bioaccumulative
ACGIH: American Conference of Governmental Industrial Hygienists (USA)
OSHA: Occupational Safety and Health Administration (USA)
NTP: National Toxicology Program (USA)
IARC: International Agency for Research on Cancer
EPA: Environmental Protection Agency (USA)
Flam. Liq. 3: Flammable liquids, Hazard Category 3
Skin Irrit. 2: Skin corrosion/irritation, Hazard Category 2
Eye Dam. 1: Serious eye damage/eye irritation, Hazard Category 1
STOT SE 3: Specific target organ toxicity - Single exposure, Hazard Category 3