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

1.1 Product identifier
Trade name cis-2-Butene-1,4-diol
Stock number: A19182

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
Zeppelinstr. 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 986687-0

1.4 Emergency telephone number:
Carechem 24: +44 (o) 1235 239 670 (Multi-language emergency number)
Poison Information Center Mainz
www.giftinfo.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

GHS07
Acute Tox. 4 H302 Harmful if swallowed.
Skin Irrit. 2 H315 Causes skin irritation.
Eye Irrit. 2 H319 Causes serious eye irritation.
STOT SE 3 H335 May cause respiratory irritation.

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

Hazard pictograms

GHS07

Signal word Warning
Hazard-determining components of labelling:
cis-2-Butene-1,4-diol
trans-2-Butene-1,4-diol

Hazard statements
H302 Harmful if swallowed.
H315 Causes skin irritation.
H319 Causes serious eye irritation.
H335 May cause respiratory irritation.

Precautionary statements
P261 Avoid breathing dust/fume/gas/mist/vapours/spray.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P305+P340 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P405 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

3.2 Mixtures
Dangerous components:
CAS: 6117-80-2 cis-2-Butene-1,4-diol ⚠ Acute Tox. 4, H302; Skin Irrit. 2, H315; Eye Irrit. 2, H319; STOT SE 3, H335 90,0%
CAS: 821-11-4 trans-2-Butene-1,4-diol ⚠ Acute Tox. 4, H302; Skin Irrit. 2, H315; Eye Irrit. 2, H319 10,0%

Additional information
None known.

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.

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.
Harmful if swallowed.
Causes serious eye irritation.
May cause respiratory irritation.

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.
Trade name: cis-2-Butene-1,4-diol

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

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.

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).
Dispose of contaminated material as waste according to section 13.
Ensure adequate ventilation.

Prevention of secondary hazards: No special measures required.

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: No information known.

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:
Do not store together with acids.
Store away from oxidising agents.
Store away from reducing agents.
Store away from halogens.
Store away from acid chlorides.
Store away from acid anhydrides.
Store away from chloroformates.

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:
The product does not contain any relevant quantities of materials with critical values that have to be monitored at the workplace.

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.
Instantly 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.

Recommended filter device for short term use:
Use a respirator with multi-purpose combination (US) or type ABEK (EN 14387) as a backup to engineering controls. Risk assessment should be performed to determine if air-purifying respirators are appropriate. Only use equipment tested and approved under appropriate government standards such as NIOSH (USA) or CEN (EU).

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: Nitrile rubber, NBR
Penetration time of glove material (in minutes) 480
Glove thickness 0.4 mm

Eye protection:
Safety glasses

Face protection:
Body protection: Protective work clothing.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties
General Information
Appearance:
Form: Liquid
Smell: Odourless
Odour threshold: Not determined.
P.H.value: Not determined.

Change in condition
Melting point/Melting range: 6-8 °C
Boiling point/Boiling range: 131-132/12mm °C
Sublimation temperature / start: Not determined

Flash point: 127 °C
Inflammability (solid, gaseous) Not determined.
Ignition temperature: Not determined
Decomposition temperature: Not determined
**Safety data sheet**

according to 1907/2006/EC, Article 31

**Trade name** cis-2-Butene-1,4-diol

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**Self-inflammability:** Product is not selfigniting.

<table>
<thead>
<tr>
<th>Danger of explosion:</th>
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</tr>
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<tbody>
<tr>
<td>Critical values for explosion:</td>
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<tr>
<td>Lower:</td>
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<tr>
<td>Upper:</td>
<td>Not determined</td>
</tr>
<tr>
<td>Steam pressure:</td>
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</tr>
<tr>
<td>Density at 20 °C:</td>
<td>1.07 g/cm³</td>
</tr>
<tr>
<td>Relative density:</td>
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</tr>
<tr>
<td>Vapour density:</td>
<td>Not determined.</td>
</tr>
<tr>
<td>Evaporation rate:</td>
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<tr>
<td>Solubility in / Miscibility with Water:</td>
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<tr>
<td>Partition coefficient (n-octanol/water):</td>
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<tr>
<td>Viscosity: dynamic:</td>
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</tr>
<tr>
<td>kinematic:</td>
<td>Not determined.</td>
</tr>
</tbody>
</table>

**Solvent content:**
- Organic solvents: 0.0 %
- Solids content: 10.0 %

**9.2 Other information**

No further relevant information available.

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**SECTION 10: Stability and reactivity**

10.1 Reactivity: No information known.

10.2 Chemical stability: Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions: Reacts with strong oxidising agents.

10.4 Conditions to avoid: No further relevant information available.

10.5 Incompatible materials:
- Acids
- Oxidising agents
- Reducing agents
- Halogen
- Acid chlorides
- Acid anhydrides
- Chlorofromates

10.6 Hazardous decomposition products: Carbon monoxide and carbon dioxide.

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**SECTION 11: Toxicological information**

11.1 Information on toxicological effects
- Acute toxicity: Harmful if swallowed.
- LD/LC50 values that are relevant for classification: No data
- Skin irritation or corrosion: Causes skin irritation.
- Eye irritation or corrosion: Causes serious eye irritation.
- Sensitization: No sensitizing effect known.
- Germ cell mutagenicity: No effects known.
- Carcinogenicity: No classification data on carcinogenic properties of this material is available from the EPA, IARC, NTP, OSHA or ACGIH.
- Reproductive toxicity: No effects known.
- Specific target organ system toxicity - repeated exposure: No effects known.
- Specific target organ system toxicity - single exposure: May cause respiratory irritation.
- Aspiration hazard: No effects known.
- Subacute to chronic toxicity: No effects known.

**Additional toxicological information:**
To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.

The product shows the following dangers according to the calculation method of the General EC Classification Guidelines for Preparations as issued in the latest version:
- Harmful
- Irritant

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**SECTION 12: Ecological information**

12.1 Toxicity
- Aquatic toxicity: No further relevant information available.

12.2 Persistence and degradability: No further relevant information available.

12.3 Bioaccumulative potential: No further relevant information available.

12.4 Mobility in soil: No further relevant information available.

**Additional ecological information:**
- General notes:
  - Water hazard class 1 (Self-assessment): slightly hazardous for water.
  - Do not allow undiluted product or large quantities to reach ground water, water course or sewage system.
  - Avoid transfer into the environment.

- 12.5 Results of PBT and vPvB assessment
  - PBT: Not applicable.
  - vPvB: Not applicable.

- 12.6 Other adverse effects: No further relevant information available.

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**SECTION 13: Disposal considerations**

13.1 Waste treatment methods
- Recommendation: Hand over to disposers of hazardous waste.

**Uncleaned packagings:**
- Recommendation: Disposal must be made according to official regulations.

**Recommended cleaning agent:** Water, if necessary with cleaning agent.

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**SECTION 14: Transport information**

**UN-Number**
- Not applicable
- ADR, ADN, IMDG, IATA

**14.2 UN proper shipping name**
- Not applicable
- ADR, ADN, IMDG, IATA
Trade name cis-2-Butene-1,4-diol

14.3 Transport hazard class(es)
ADR, ADN, IMDG, IATA
Class
Not applicable
Packaging group
ADR, IMDG, IATA
Not applicable

14.5 Environmental hazards:
Class
Not applicable
Packing group
ADR, IMDG, IATA
Not applicable

14.6 Special precautions for user
Marine pollutant:
No
Not applicable

14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code
UN “Model Regulation”:
Not applicable

SECTION 15: Regulatory information

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

Australian Inventory of Chemical Substances
6117-80-2 cis-2-Butene-1,4-diol

Standard for the Uniform Scheduling of Medicines and Poisons
None of the ingredients is listed.

National regulations
Information about limitation of use:
For use only by technically qualified individuals.
Employment restrictions concerning young persons must be observed.

Classification according to VbF: Not applicable

Water hazard class: Water hazard class 1 (Self-assessment): slightly hazardous for water.

Other regulations, limitations and prohibitive regulations

ELINCS (European List of Notified Chemical Substances)
None of the ingredients is listed.

Substance of Very High Concern (SVHC) according to the REACH Regulations (EC) No. 1907/2006.
None of the ingredients are 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.
None of the ingredients is listed.

Annex XIV of the REACH Regulations (requiring Authorisation for use)
None of the ingredients is 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.

Relevant phrases
H302 Harmful if swallowed.
H315 Causes skin irritation.
H319 Causes serious eye irritation.
H335 May cause respiratory irritation.

Department issuing SDS: Global Marketing Department

Abbreviations and acronyms:
ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
DHHS: Globally Harmonized System of Classification and Labelling of Chemicals
EINECS: European Inventory of Existing Commercial Chemical Substances
ELINCS: European List of Notified Chemical Substances
GHS: Chemical Abstracts Service (division of the American Chemical Society)
VfB: 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)
Acute Tox. 4: Acute toxicity, Hazard Category 4
Skin Irrit. 2: Skin corrosion/irritation, Hazard Category 2
Eye Irrit. 2: Serious eye damage/eye irritation, Hazard Category 2
STOT SE 3: Specific target organ toxicity - Single exposure, Hazard Category 3