1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND COMPANY/UNDERTAKING

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Methyl isobutyl ketone (MIBK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product Uses</td>
<td>Industrial solvent.</td>
</tr>
<tr>
<td>Manufacturer/Supplier</td>
<td>TOP Solvent Company Limited</td>
</tr>
<tr>
<td></td>
<td>555/1 Energy Complex Building A, 11th Floor</td>
</tr>
<tr>
<td></td>
<td>Viphavadi Rangsit Road Chatuchak, Bangkok 10900 Thailand</td>
</tr>
<tr>
<td>Telephone</td>
<td>+66 2 299 0003 or +66 2 797 2993</td>
</tr>
<tr>
<td>Fax</td>
<td>+66 2 797 2983</td>
</tr>
<tr>
<td>Emergency Telephone Number</td>
<td>+66 2 299 0003 [working hours] or</td>
</tr>
<tr>
<td></td>
<td>+66 38 683090 ext.103 [out of working hours]</td>
</tr>
<tr>
<td>Other Information</td>
<td>TOPSol is a trademark owned by TOP Solvent Company Limited</td>
</tr>
</tbody>
</table>

2. HAZARDS IDENTIFICATION

GHS Classification:
- FLAMMABLE LIQUIDS, Category 2
- ACUTE TOXICITY - ORAL, Category 5
- ACUTE TOXICITY - SKIN/DERMAL, Category 5
- ACUTE TOXICITY - INHALATION, Category 4
- SERIOUS EYE DAMAGE/IRRITATION, Category 2A
- SPECIFIC TARGET ORGAN SYSTEMIC TOXICITY (SINGLE EXPOSURE), Category 3 Respiratory tract irritation

GHS label elements
Symbol(s):

![Flammable and Dangerous Symbols](image)

Signal words: Danger

GHS Hazard Statements
Methyl Isobutyl Ketone (MIBK)

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Effective Date 1-June-2012

Physical Hazards: H225 - Highly flammable liquid and vapor
Health Hazards:
- H303 - May be harmful if swallowed.
- H313 - May be harmful in contact with skin.
- H319 - Causes serious eye irritation.
- H332 - Harmful if inhaled
- H335 - May cause respiratory irritation.

Environmental Hazards: Not classified as an environmental hazard under GHS criteria.

GHS Precautionary statements

Prevention:
- P210 - Keep away from heat/sparks/open flames/hot surfaces. -No smoking.
- P240 - Ground/bond container and receiving equipment.
- P241 - Use explosion-proof electrical/ventilating/lighting equipment.
- P242 - Use only non-sparking tools.
- P243 - Take precautionary measures against static discharge.
- P260 - Do not breathe mist/vapours/spray.
- P264 - Wash hands thoroughly after handling.
- P270 - Do not eat, drink or smoke when using this product.
- P271 - Use only outdoors or in a well-ventilated area.
- P280 - Wear protective gloves/protective clothing/eye protection/face protection.

Response:
- P303+P361+P353: IF ON SKIN (or hair): Remove/take off immediately all contaminated clothing. Rinse skin with water/shower.
- P304+P340: IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
- P312: Call a POISON CENTER or doctor/physician if you feel unwell.
- P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- P337+P313: If eye irritation persists: Get medical advice/attention.
- P370+P378: In case of fire: Use appropriate media for extinction.
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3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Identity : Methyl isobutyl ketone,
CAS No : 108-10-1
EINECS No. : 203-550-1

Classification of components according to GHS

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Synonyms</th>
<th>CAS</th>
<th>Hazard Class (category)</th>
<th>Hazard statement</th>
<th>Conc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methyl isobutyl ketone</td>
<td></td>
<td>108-10-1</td>
<td>Flam. Liq.- 2, Act Oral Tox. – 5 Act Skin Tox. – 5 Act Inhale Tox. – 4 Eye damage – 2A STOT SE. -3</td>
<td>H225,H303 , H313,H319, H332,H335</td>
<td>&gt; 99.5 %</td>
</tr>
</tbody>
</table>

4. FIRST AID MEASURES

General Information : Keep victim calm. Obtain medical treatment immediately.
Inhalation : Remove to fresh air. If rapid recovery does not occur, transport to nearest medical facility for additional treatment.
Skin Contact : Remove contaminated clothing. Immediately flush skin with large amounts of water for at least 15 minutes, and follow by washing with soap and water if available. If redness, swelling, pain and/or blisters occur, transport to the nearest medical facility for additional treatment.
Eye Contact : Flush eye with copious quantities of water. If persistent irritation occurs, obtain medical attention.
**Ingestion**

If swallowed, do not induce vomiting: transport to nearest medical facility for additional treatment. If vomiting occurs spontaneously, keep head below hips to prevent aspiration.

**Notes to physician**

**Most important symptoms/effects, acute & delayed**

Eye irritation signs and symptoms may include a burning sensation, redness, swelling, and/or blurred vision.

Skin irritation signs and symptoms may include a burning sensation, redness, swelling, and/or blisters.

Defatting dermatitis signs and symptoms may include a burning sensation and/or a dried/cracked appearance.

Respiratory irritation signs and symptoms may include a temporary burning sensation of the nose and throat, coughing, and/or difficulty breathing.

If material enters lungs, signs and symptoms may include coughing, choking, wheezing, difficulty in breathing, chest congestion, shortness of breath, and/or fever.

**Immediate medical attention, special treatment**

Causes central nervous system depression. Call a doctor or poison control center for guidance.

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**5. FIRE FIGHTING MEASURES**

Clear fire area of all non-emergency personnel.

**Specific Hazards**

Containers exposed to intense heat from fires should be cooled with large quantities of water. The vapour is heavier than air, spreads along the ground and distant ignition is possible along the ground and distant ignition is possible.

**Extinguishing Media**

Alcohol-resistant foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only. Do not discharge extinguishing waters into the aquatic environment.

**Unsuitable Extinguishing Media**

Do not use water in a jet.

**Protective Equipment for Firefighters**

Wear full protective clothing and self-contained breathing apparatus.

**Other Advice**

Keep adjacent containers cool by spraying with water.
6. ACCIDENTAL RELEASE MEASURES

Observe all relevant local and international regulations.

- **Personal Precautions, Protective Equipment and Emergency Procedures**
  - Isolate hazard area and deny entry to unnecessary or unprotected personnel. Stay upwind and keep out of low areas.

- **Environmental Precautions**
  - Shut off leaks, if possible without personal risks. Remove all possible sources of ignition in the surrounding area. Use appropriate containment (of product and fire fighting water) to avoid environmental contamination. Prevent from spreading or entering drains, ditches or rivers by using sand, earth, or other appropriate barriers. Attempt to disperse the vapour or to direct its flow to a safe location for example by using fog sprays. Take precautionary measures against static discharge. Ensure electrical continuity by bonding and grounding (earthing) all equipment.

- **Methods and material for containment and clean up**
  - For small liquid spills (< 1 drum), transfer by mechanical means to a labelled, sealable container for product recovery or safe disposal. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely. For large liquid spills (> 1 drum), transfer by mechanical means such as vacuum truck to a salvage tank for recovery or safe disposal. Do not flush away residues with water. Retain as contaminated waste. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely.

- **Additional Advice**
  - Notify authorities if any exposure to the general public or the environment occurs or is likely to occur. Vapour may form an explosive mixture with air.

7. HANDLING AND STORAGE

- **General Precautions**
  - Avoid breathing vapours or contact with material. Only use in well ventilated areas. Wash thoroughly after handling. On guidance on selection of personal protective equipment
see Chapter 8 of this Material Safety Data Sheet. Use the information in this data sheet as input to a risk assessment of local circumstances to help determine appropriate controls for safe handling, storage and disposal of this material.

Precautions for safe Handling:
- Avoid inhaling vapour and/or mists. Avoid contact with skin, eyes, and clothing. Extinguish any naked flames. Do not smoke. Remove ignition sources. Avoid sparks. Electrostatic charges may be generated during pumping. Electrostatic discharge may cause fire. Ensure electrical continuity by bonding and grounding (earthing) all equipment. Restrict line velocity during pumping in order to avoid generation of electrostatic discharge (<= 1 m/sec until fill pipe submerged to twice its diameter, then <= 7 m/sec). Avoid splash filling. Do NOT use compressed air for filling, discharging, or handling operations.

Conditions for safe Storage:
- Must be stored in a well-ventilated area, away from sunlight, ignition sources and other sources of heat. Keep away from aerosols, flammables, oxidizing agents, corrosives and from other flammable products which are not harmful or toxic to man or to the environment. The vapour is heavier than air. Beware of accumulation in pits and confined spaces. Vapours from tanks should not be released to atmosphere. Breathing losses during storage should be controlled by a suitable vapour treatment system. Bulk storage tanks should be diked (bunded).

Product Transfer:
- Electrostatic charges may be generated during pumping. Electrostatic discharge may cause fire. Keep containers closed when not in use. Do not use compressed air for filling, discharging or handling.

Recommended Materials:
- For containers, or container linings use mild steel, stainless steel. For container paints, use epoxy paint, zinc silicate paint.

Unsuitable Materials:
- Aluminium. Plastics. Natural, neoprene or nitrile rubbers.

Container Advice:
- Containers, even those that have been emptied, can contain explosive vapours. Do not cut, drill, grind, weld or perform similar operations on or near containers.

Other Advice:
- Ensure that all local regulations regarding handling and storage facilities are followed. Ensure that all
local regulations regarding handling and storage facilities are followed.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

If the American Conference of Governmental Industrial Hygienists (ACGIH) value is provided on this document, it is provided for information only.

**Occupational Exposure Limits**

<table>
<thead>
<tr>
<th>Material</th>
<th>Source</th>
<th>Type</th>
<th>ppm</th>
<th>mg/m³</th>
<th>Notation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methyl Isobutyl Ketone</td>
<td>ACGIH</td>
<td>TWA</td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>STEL</td>
<td>75</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Biological Exposure Index (BEI) - See reference for full details**

<table>
<thead>
<tr>
<th>Material</th>
<th>Determinant</th>
<th>Sampling time</th>
<th>BEI</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methyl Isobutyl Ketone</td>
<td>MIBK in Urine</td>
<td>End of shift</td>
<td>1 mg/l</td>
<td>ACGIH BEL (2010)</td>
</tr>
</tbody>
</table>

**Appropriate Engineering Controls**: The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. Appropriate measures include: Adequate explosion-proof ventilation to control airborne concentrations below the exposure guidelines/limits. Eye washes and showers for emergency use.

**Individual protection Measures**: Personal protective equipment (PPE) should meet recommended national standards. Check with PPE suppliers.

**Respiratory protection**: If engineering controls do not maintain airborne concentrations to a level which is adequate to protect worker health, select respiratory protection equipment suitable for the specific conditions of use and meeting relevant legislation. Check with respiratory protective equipment suppliers. Where air-filtering respirators are suitable, select an appropriate combination of mask and filter. Select a filter suitable for organic gases and vapours [boiling point >65 °C (149 °F)] meeting EN14387. Where air-filtering respirators are unsuitable (e.g., airborne
concentrations are high, risk of oxygen deficiency, confined space) use appropriate positive pressure breathing apparatus.

**Eye protection**
- Chemical splash goggles (chemical monogoggles). Monogoggles (EN166)

**Body protection**
- Use protective clothing which is chemical resistant to this material. Safety shoes and boots should also be chemical resistant.

**Hand protection**
- Where hand contact with the product may occur the use of gloves approved to relevant standards (e.g. Europe: EN374, US: F739, AS/NZS:2161) made from the following materials may provide suitable chemical protection: Longer term protection: Natural rubber. Butyl rubber. Incidental contact/Splash protection: Neoprene rubber. Viton.

Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, glove thickness, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced. Personal hygiene is a key element of effective hand care. Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturizer is recommended.

**Monitoring Methods**
- Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with an OEL and adequacy of exposure controls. For some substances biological monitoring may also be appropriate. Examples of sources of recommended air monitoring methods are given below or contact supplier. Further national methods may be available. National Institute of Occupational Safety and Health (NIOSH), USA: Manual of Analytical Methods, [http://www.cdc.gov/niosh/nmam/nmammenu.html](http://www.cdc.gov/niosh/nmam/nmammenu.html).


Environmental Exposure Controls: Local guidelines on emission limits for volatile substances must be observed for the discharge of exhaust air containing vapour.

9. PHYSICAL AND CHEMICAL PROPERTIES

- **Appearance**: Colourless Liquid.
- **Odour**: Characteristic
- **Odour threshold**: <100 ppm.
- **pH**: Not applicable.
- **Boiling point**: 114 -117 °C / 237 - 243 °F
- **Melting / freezing point**: Typical -84.7 °C
- **Flash point**: Typical 14 °C (Closed cup)
- **Explosion / Flammability limits in air**: 1.3- 8 % (V)
- **Auto-ignition temperature**: 460 °C / 860 °F (ASTM E659)
- **Vapour pressure**: 1.9 kPa at 20 °C / 68 °F
- **Density**: Typical 802 kg/m3 at 20 °C (ASTM D-1298)
- **Water solubility**: Miscible. 20 g/l at 20 °C / 68 °F
- **n-octanol/water partition coefficient (log Pow)**: 1.38
- **Decomposition temperature**: Note: Stable under normal conditions of use.
- **Evaporation rate**: 1.6 (ASTM D 3539, nBuAc=1)
- **Vapour density (air=1)**: Data not available
- **Volatile organic carbon**: 71.9 % (EC/1999/13)

10. STABILITY AND REACTIVITY

- **Chemical stability**: Stable under normal conditions of use.
- **Conditions to Avoid**: Avoid any source of ignition. Avoid contact with heat, sparks, open flame, and static discharge.
- **Incompatible materials**: Keep away from: peroxides, oxidizing agents, strong acids, amines.
- **Decomposition Products**: Thermal decomposition is highly dependent on conditions. A complex mixture of airborne solids, liquids and gases, including carbon monoxide, carbon dioxide and other organic compounds will be evolved when this material undergoes combustion or thermal or oxidative degradation.
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Sensitivity to Static Discharge: Yes, in certain circumstances product can ignite due to static electricity.

### 11. TOXICOLOGICAL INFORMATION

Information on Toxicological effects

<table>
<thead>
<tr>
<th>Basis for Assessment</th>
<th>: Information given is based on product testing, and/or similar products, and/or components.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Likely routes of exposure</td>
<td>: Exposure may occur via inhalation, ingestion, skin absorption, skin or eye contact, and accidental ingestion.</td>
</tr>
<tr>
<td>Acute Toxicity</td>
<td></td>
</tr>
<tr>
<td>Acute Oral Toxicity</td>
<td>: May be harmful if swallowed. LD50 &gt;2000 - &lt;=5000 mg/kg , Rat</td>
</tr>
<tr>
<td>Acute Dermal Toxicity</td>
<td>: May be harmful in contact with skin. LD50 &gt;2000 - &lt;=5000 mg/kg , Rabbit</td>
</tr>
<tr>
<td>Acute Inhalation Toxicity</td>
<td>: Harmful if inhaled. LC50 &gt; 10,0 - &lt;= 20,0 mg/l , 4 hours, Rat High concentrations may cause central nervous system depression resulting in headaches, dizziness and nausea; continued inhalation may result in unconsciousness and/or death.</td>
</tr>
<tr>
<td>Skin corrosion/irritation</td>
<td>: Not irritating to skin. Prolonged/repeated contact may cause defatting of the skin which can lead to dermatitis.</td>
</tr>
<tr>
<td>Serious eye damage/irritation</td>
<td>: Irritating to eyes.</td>
</tr>
<tr>
<td>Respiratory Irritation</td>
<td>: Inhalation of vapours or mists may cause irritation to the respiratory system.</td>
</tr>
<tr>
<td>Respiratory or skin Sensitization</td>
<td>: Not expected to be a skin sensitiser.</td>
</tr>
<tr>
<td>Aspiration hazard</td>
<td>: May be harmful if swallowed and enters airways.</td>
</tr>
<tr>
<td>Germ cell mutagenicity</td>
<td>: Not mutagenic.</td>
</tr>
<tr>
<td>Reproductive and Developmental Toxicity</td>
<td>: Not expected to impair fertility.</td>
</tr>
<tr>
<td>Carcinogenicity</td>
<td>: Not carcinogenic.</td>
</tr>
<tr>
<td>Specific target organ toxicity - single exposure</td>
<td>: May cause drowsiness or dizziness. May cause respiratory irritation.</td>
</tr>
<tr>
<td>Specific target organ</td>
<td>: Kidney: caused kidney effects in male rats which are not</td>
</tr>
</tbody>
</table>
Methyl Isobutyl Ketone (MIBK)

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**11. TOXICITY - REPEATED EXPOSURE**

Additional Information: Exposure may enhance the toxicity of other materials.

**12. ECOLOGICAL INFORMATION**

**Basis for Assessment:** Information given is based on product testing.

**Acute Toxicity**

- **Fish:** Low toxic: LC/EC/IC50 >100 mg/L
- **Aquatic Invertebrates:** Low toxic: LC/EC/IC50 >100 mg/L
- **Algae:** Low toxic: LC/EC/IC50 >100 mg/L
- **Microorganisms:** Low toxic: LC/EC/IC50 >100 mg/L

**Mobility:** Floats on water.

**Persistence/degradability:** Readily biodegradable meeting the 10 day window criterion. Oxidizes rapidly by photo-chemical reactions in air.

**Bioaccumulative potential:** Does not have the potential to bioaccumulate significantly.

**13. DISPOSAL CONSIDERATIONS**

**Material Disposal:** Recover or recycle if possible. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations.

Do not dispose into the environment, in drains or in water courses. Waste product should not be allowed to contaminate soil or water.

**Container Disposal:** Drain container thoroughly. After draining, vent in a safe place away from sparks and fire. Residues may cause an explosion hazard. Do not, puncture, cut, or weld uncleaned drums. Send to drum recoverer or metal reclaimer.

**Local Legislation:** Disposal should be in accordance with applicable regional, national, and local laws and regulations.

**14. TRANSPORT INFORMATION**

**Land (as per ADR classification):** Regulated

Class: 3
Material Safety Data Sheet

Packing group : II
Hazard identification no. : 33
UN No. : 1245
Danger label (primary risk) : 3
Proper shipping name : METHYL ISOBUTYL KETONE
Environmentally Hazardous : No

IMDG
Identification number : UN 1245
Proper shipping name : METHYL ISOBUTYL KETONE
Class / Division : 3
Packing group : II
Marine pollutant : No

IATA (Country variations may apply)
UN No. : 1145
Proper shipping name : Methyl isobutyl ketone
Class / Division : 3
Packing group : II

Sea (Annex II of MARPOL 73/78 and the IBC code)
Pollution Category : Z
Ship Type : 3
Product Name : Methyl isobutyl ketone
Special Precaution : Refer to Chapter 7, Handling & Storage, for special precautions which a user needs to be aware of or needs to comply with in connection with transport.

Additional Information
: This product may be transported under nitrogen blanketing. Nitrogen is an odourless and invisible gas. Exposure to nitrogen may cause asphyxiation or death. Personnel must observe strict safety precautions when involved with a confined space entry.

15. REGULATORY INFORMATION

The regulatory information is not intended to be comprehensive. Other regulations may apply to this material.

Chemical Inventory Status
Methyl Isobutyl Ketone (MIBK)

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AICS : Listed.
DSL : Listed.
INV (CN) : Listed.
ENCS (JP) : Listed. (2)-542
TSCA : Listed.
EINECS : Listed. 203-550-1
KECI (KR) : Listed. KE-24725
PICCS (PH) : Listed.

16. OTHER INFORMATION

MSDS Version Number : 2.1
MSDS Effective Date : 1-June-2012
Uses and Restrictions : Raw material for use in the chemical industry.
Use only in industrial processes
MSDS Distribution : The information in this document should be made available to all who may handle the product
Disclaimer : This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.