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

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

2. HAZARDS IDENTIFICATION

GHS Classification:
- FLAMMABLE LIQUIDS, Category 2
- SKIN CORROSION/IRRITATION, Category 2
- TOXIC TO REPRODUCTION, Category 2
- Specific target organ toxicity – single exposure, Category 3
- Narcotic effects.
- Specific target organ toxicity – repeated exposure, Category 2
- Auditory system.
- ASPIRATION HAZARD, Category 1
- AQUATIC TOXICITY (ACUTE), Category 2

GHS label elements
Symbol(s):
![GHS symbols]

Signal words: Danger
GHS Hazard Statements

Physical Hazards: H225 Highly flammable liquid and vapor.

Health Hazards: H304 May be fatal if swallowed and enters airways.
H315 Causes skin irritation.
H336 May cause drowsiness or dizziness.
H361 Suspected to damaging fertility or the unborn child.
H373 May cause damage to organs or organ system.

Environmental Hazards: H401 Toxic to aquatic life.

GHS Precautionary statements

Prevention: P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P233 Keep container tightly closed.
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.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P264 Wash hands thoroughly after handling.
P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P281 Use personal protective equipment as required.
P261 Avoid breathing dust/fume/gas/mist/vapors/spray.
P271 Use only outdoors or in a well-ventilated area.
P260 Do not breathe dust/fume/gas/mist/vapours/spray.
P273 Avoid release to the environment.

Response: P303+P361+P353 IF ON SKIN (or hair): Remove/take off immediately all contaminated clothing. Rinse skin with water/shower.
P370+P378 In case of fire: Use appropriate media for extinction.
P302+P352 IF ON SKIN: Wash with plenty of soap and water.
P321 Specific treatment (see details on label).
P332+P313: If skin irritation occurs: Get medical...
advice/attention.
P362 Take off contaminated clothing and wash before reuse.
P308+P313 If exposed or concerned, get medical advice/attention.
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.
P314 Get medical advice/attention if you fell unwell.
P301+P310: IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
P331: Do NOT induce vomiting.

Storage:
P403+P235 Store in a well-ventilated place. Keep cool.
P405 Store locked up.
P233 Keep Container tightly closed.

Disposal:
P501: Dispose of contents and container to appropriate waste site or reclaimer in accordance with local and national regulations.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Identity: Benzene, methyl
Synonyms: Methyl Benzol
          Phenyl methane
          Toluol
CAS No.: 108-88-3
EINECS No.: 203-625-9

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>
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</thead>
<tbody>
<tr>
<td>Toluene</td>
<td></td>
<td>108-88-3</td>
<td>Flam. Liq.- 2, Repr. -2, Asp.Tox., - 1 STOT RE. -2, Skin Irrit. -2 STOT SE. -3</td>
<td>H225,H361d H304,H373 H315,H336</td>
<td>100%</td>
</tr>
</tbody>
</table>
4. FIRST AID MEASURES

General Information:
Keep victim calm. Obtain medical treatment immediately.

Inhalation:
DO NOT DELAY. 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:
Immediately flush eyes with large amounts of water for at least 15 minutes while holding eyelids open. Transport to the nearest medical facility for additional treatment.

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. If any of the following delayed signs and symptoms appear within the next 6 hours, transport to the nearest medical facility: fever greater than 101°F (38.3°C), shortness of breath, chest congestion or continued coughing or wheezing. If vomiting occurs spontaneously, keep head below hips to prevent aspiration. Give nothing by mouth. Do not induce vomiting.

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.
If material enters lungs, signs and symptoms may include coughing, choking, wheezing, difficulty in breathing, chest congestion, shortness of breath, and/or fever.
The onset of respiratory symptoms may be delayed for several hours after exposure.
Breathing of high vapour concentrations may cause central nervous system (CNS) depression resulting in dizziness, lightheadedness, headache, nausea and loss of coordination.
Continued inhalation may result in unconsciousness and death. Auditory system effects may include temporary hearing loss and/or ringing in the ears. Immediate medical attention, special treatment

Potential for chemical pneumonitis. Potential for cardiac sensitisation, particularly in abuse situations. Hypoxia or negative inotropes may enhance these effects. Consider: oxygen therapy. Call a doctor or poison control center for guidance.

5. FIRE FIGHTING MEASURES

Clear fire area of all non-emergency personnel.

Specific Hazards: The vapour is heavier than air, spreads along the ground and distant ignition is possible. Will float and can be reignited on surface water. Carbon monoxide may be evolved if incomplete combustion occurs.

Extinguishing Media: Foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only.

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. Avoid contact with spilled or released material. For guidance on selection of personal protective equipment see Chapter 8 of this Material Safety Data Sheet. See Chapter 13 for information on disposal.

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
Methods and material for containment and clean up:

- 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.
- 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.

Additional Advice:

- Notify authorities if any exposure to the general public or the environment occurs or is likely to occur. Local authorities should be advised if significant spillages cannot be contained.
- The vapour is heavier than air, spreads along the ground and distant ignition is possible. Vapour may form an explosive mixture with air. See Chapter 13 for information on disposal.

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.
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 (\(\leq 1\) m/sec until fill pipe submerged to twice its diameter, then \(\leq 7\) m/sec). Avoid splash filling. Do NOT use compressed air for filling, discharging, or handling operations. Handling Temperature: Ambient.

Conditions for safe Storage: Bulk storage tanks should be diked (bunded). Vapours from tanks should not be released to atmosphere. Breathing losses during storage should be controlled by a suitable vapour treatment system. Must be stored in a diked (bunded) wellventilated 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. Storage Temperature: Ambient.

Product Transfer: 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 (\(\leq 1\) m/sec until fill pipe submerged to twice its diameter, then \(\leq 7\) m/sec). Avoid splash filling. Do NOT use compressed air for filling, discharging, or handling operations. 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.

Unsuitable Materials: Natural, butyl, neoprene or nitrile rubbers.
**Toluene**

**Material Safety Data Sheet**

**Effective Date**: 1-June-2012

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**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.

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### 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>Toluene</td>
<td>ACGIH</td>
<td>TWA</td>
<td>20 ppm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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#### 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>Toluene</td>
<td>o-Cresol in urine</td>
<td>End of shift</td>
<td>0.5 mg/l</td>
<td>ACGIH (2003)</td>
</tr>
<tr>
<td>Toluene</td>
<td>Hippuric acid in urine</td>
<td>End of shift</td>
<td>1.6 g/g creatinine</td>
<td>ACGIH (2003)</td>
</tr>
<tr>
<td>Toluene</td>
<td>Toluene in blood</td>
<td>Sampling time: Prior to last shift of work week</td>
<td>0.02 mg/l</td>
<td>ACGIH BEL (2010)</td>
</tr>
<tr>
<td>Toluene</td>
<td>o-Cresol with hydrolysis in creatinine in urine</td>
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<td>0.3 mg/g</td>
<td>ACGIH BEL (2010)</td>
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<tr>
<td>Toluene</td>
<td>Toluene in urine</td>
<td>Sampling time: End of shift</td>
<td>0.03 mg/g</td>
<td>ACGIH BEL (2010)</td>
</tr>
</tbody>
</table>

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**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: Use sealed systems as far as possible. Adequate explosion-proof ventilation to control airborne concentrations below the exposure guidelines/limits. Local exhaust ventilation is recommended. Firewater monitors and deluge systems are recommended. 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 respiratory protective equipment is required, use a fullface mask. Where air-filtering respirators are unsuitable (e.g., airborne concentrations are high, risk of oxygen deficiency, confined space) use appropriate positive pressure breathing apparatus.

**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: Viton. Incidental contact/Splash protection: Nitrile rubber. 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.
Eye Protection : Chemical splash goggles (chemical monogoggles).
Body protection : Chemical resistant gloves/gauntlets, boots, and apron.
Where risk of splashing or in spillage clean up, use chemical resistant one-piece overall with integral hood.

Thermal hazards: Not applicable


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 : Aromatic
Odour threshold : 1.74 ppm
pH : Not applicable
Boiling point : Typical 110 - 111 °C / 230 - 232 °F
Melting / freezing point: Typical -95 °C / -139 °F
Flash point: Typical 4 °C / 39 °F (Abel)
Explosion / Flammability
  limits in air: 1.2 - 7.1 %(V)
  Auto-ignition temperature: 480 - 536 °C / 896 - 997 °F (ASTM E-659)
  Flammability (solid, gas): Yes
Vapour pressure:
  Typical 1 kPa at 0 °C / 32 °F
  Typical 3 - 3.5 kPa at 20 °C / 68 °F
  Typical 12 kPa at 50 °C / 122 °F
Density: Typical 871 kg/m3 at 15 °C / 59 °F (ASTM D-1298)
Water solubility: 0.515 kg/m3
n-octanol/water partition coefficient (log Pow): 2.65
Decomposition temperature: Note: Stable under normal conditions of use., Reacts violently with strong oxidising agents.
Dynamic viscosity: Data not available.
Kinematic viscosity: 0.63 mm2/s at 25 °C / 77 °F
Vapour density (air=1): 3.1
Evaporation rate (nBuAc=1):
  6.1 (DIN 53170, di-ethyl ether=1)
  2 (ASTM D 3539, nBuAc=1)
Surface tension: Typical 28.5 mN/m at 20 °C / 68 °F (ASTM D-971)
Molecular weight: 92 g/mol

10. STABILITY AND REACTIVITY

Chemical stability: Stable under normal conditions of use. Reacts violently with strong oxidising agents.
Conditions to Avoid: Avoid heat, sparks, open flames and other ignition sources. Prevent vapour accumulation.
Incompatible materials: Strong oxidising agents.
Hazardous 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.
Possibility of hazardous Reactions: Data not available.
Sensitivity to Static: Yes
**11. TOXICOLOGICAL INFORMATION**

Information on Toxicological effects  
**Basis for Assessment**: Information given is based on product data.

**Likely routes of exposure**: Inhalation is the primary route of exposure although absorption may occur through skin contact or following accidental ingestion.

**Acute Toxicity**  
**Acute Oral Toxicity**: Low toxicity: LD50 >5000 mg/kg, Rat  
**Acute Dermal Toxicity**: Low toxicity: LD50 >5000 mg/kg, Rabbit  
**Acute Inhalation Toxicity**: Expected to be low toxicity if inhaled. High concentration may cause central nervous system depression resulting in headache, dizziness and nausea.

**Skin corrosion/irritation**: Cause skin irritation.

**Serious eye damage/irritation**: Slightly irritating to the eye.

**Respiratory Irritation**: Cause respiratory irritation (vapours)

**Respiratory or skin Sensitization**: Not expected to be a skin sensitiser.

**Aspiration hazard**: Aspiration into the lungs when swallowed or vomited may cause chemical pneumonitis which can be fatal.

**Germ cell mutagenicity**: Not mutagenic.

**Carcinogenicity**: Not expected to be carcinogenic.

**Reproductive and Developmental Toxicity**: Suspected of damaging fertility or the unborn child. Does not impair fertility.

**Specific target organ toxicity - single exposure**: Inhalation of vapours or mists may cause irritation to the respiratory system.

**Specific target organ toxicity - repeated exposure**: Central nervous system: repeated exposure affects the nervous system. Effects were seen at high doses only. Respiratory system: repeated exposure affects the respiratory system. Effects were seen at high doses only. Visual system: may cause decreased color perception. These subtle changes have not been found to lead to...
functional colour vision deficits. Auditory system: prolonged and repeated exposures to high concentrations have resulted in hearing loss in rats. Solvent abuse and noise interaction in the work environment may cause hearing loss.

Additional Information: Exposure to very high concentrations of similar materials has been associated with irregular heart rhythms and cardiac arrest. Abuse of vapours has been associated with organ damage and death.

12. ECOLOGICAL INFORMATION

Basis for Assessment: Ecotoxicological data are based on product testing.

Acute Toxicity
- Fish: Toxic: LL/EL/IL50 1 - 10 mg/l
- Aquatic Invertebrates: Toxic: LL/EL/IL50 1 - 10 mg/l
- Algae: Practically non toxic: LL/EL/IL50 >100 mg/l
- Microorganisms: Data not available.

Mobility: Floats on water. If product enters soil, one or more constituents will be mobile and may contaminate groundwater.

Persistence/degradability: Readily biodegradable. Oxidises rapidly by photo-chemical reactions in air.

Bioaccumulative potential: Does not 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

<table>
<thead>
<tr>
<th>Land (as per ADR classification)</th>
<th>Regulated</th>
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<tbody>
<tr>
<td>Class</td>
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<tr>
<td>Packing group</td>
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<tr>
<td>UN No.</td>
<td>1294</td>
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<td>Proper shipping name</td>
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<tr>
<td>Environmentally Hazardous</td>
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</table>

**IMDG**

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<tr>
<td>Marine pollutant</td>
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**IATA (Country variations may apply)**

<table>
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<th>UN No.</th>
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<tr>
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<tr>
<td>Class / Division</td>
<td>3</td>
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<tr>
<td>Packing group</td>
<td>III</td>
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**Sea (Annex II of MARPOL 73/78 and the IBC code)**

<table>
<thead>
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<tbody>
<tr>
<td>Ship Type</td>
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<tr>
<td>Product Name</td>
<td>Toluene</td>
</tr>
<tr>
<td>Special Precaution</td>
<td>Refer to Chapter 7, Handling &amp; Storage, for special precautions which a user needs to be aware of or needs to comply with in connection with transport.</td>
</tr>
</tbody>
</table>

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

Chemical Inventory Status
AICS : Listed.
DSL : Listed.
INV (CN) : Listed.
ENCS (JP) : Listed. (3)-21
TSCA : Listed.
EINECS : Listed. 203-625-9
KECI (KR) : Listed. 97-1-298
KECI (KR) : Listed. KE-33936
PICCS (PH) : Listed.

16. OTHER INFORMATION

GHS Hazard statements
H225 Highly flammable liquid and vapour.
H304 May be fatal if swallowed and enters airways.
H315 Causes skin irritation.
H36 May cause drowsiness or dizziness.
H361d Suspected of damaging the unborn child.
H373 May cause damage to organs (or state all organs affected, if known) through prolonged or repeated exposure (state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard).

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.