MATERIAL SAFETY DATA SHEET
FOR INDUSTRIAL USE ONLY

DESCRIPTION: 23-227 Techniset NFZ Pt2 TD7734/2.4M#

1. Chemical Product and Company Identification

DESCRIPTION: 23-227 Techniset NFZ Pt2 TD7734/2.4M#
PRODUCT CODE: 341508
PRODUCT TYPE: Liquid Isocyanate Resin
APPLICATION: Foundry

Manufacturer/Supplier Information
MSDS prepared by:
HA International, LLC
630 Oakmont Lane
Westmont, IL
60559

For Emergency Medical Assistance
Call Health & Safety Information Services
1-866-303-6949

For additional health and safety or regulatory information, call (630)575-5722.

2. Hazards Identification

2.1 Emergency Overview

Appearance
Dark brown liquid
Odor
Characteristic

WARNING!
Toxic gases/fumes may be given off during burning or thermal decomposition. Closed
container may forcibly rupture under extreme heat or when contents have been contaminated
with water. Use cold water spray to cool fire-exposed containers to minimize the risk of
rupture.
May become unstable at high temperatures or may react with water.
Hazardous polymerization may occur.
Harmful if inhaled. If material is heated, sprayed or otherwise dispersed, may cause irritation
of nose, throat and lungs.
May cause allergic respiratory reaction.
Causes eye irritation.
Causes skin irritation.
May cause allergic skin reaction.

NORTH AMERICAN EMERGENCY RESPONSE GUIDE, 2000, NO: 171

HMIS Rating

HEALTH = 3 (serious)
FLAMMABILITY = 1 (slight)
REACTIVITY = 1 (slight)
CHRONIC = *
2.2 Potential Health Effects

Immediate Hazards

INGESTION: Not expected to be harmful under normal conditions of use.
If accidentally swallowed, burns or irritation to mucous membranes,
esophagus or GI tract can result.

INHALATION: Harmful if inhaled. If material is heated, sprayed or otherwise dispersed,
may cause irritation of nose, throat and lungs. Exposures to
concentrations below the exposure guidelines may cause allergic
respiratory reactions in individuals already sensitized. Symptoms may
include coughing, difficult breathing and a feeling of tightness in the
chest. Effects may be delayed.

SKIN: Skin contact may result in allergic skin reactions or respiratory
sensitization. However, it is not expected to result in absorption of
amounts sufficient to cause other adverse effects. Isocyanates react
with skin protein and moisture and can cause irritation. Cured material
is difficult to remove.

EYES: Causes irritation.

Delayed Hazards

101-68-8 Diphenylmethane 4,4'-Diisocyanate (MDI)
Lung tumors have been observed in laboratory animals exposed to aerosol droplets of
diphenylmethane 4,4'-diisocyanate (MDI)/polymeric MDI (6 mg/m³) for their lifetime. Tumors
occurred concurrently with respiratory irritation and lung injury. This material has not been
listed by NTP, classified by IARC, nor regulated by OSHA as a carcinogen.
Repeated exposure or a single large exposure may cause isocyanate sensitization (chemical
asthma). Once sensitized, individuals may react to a later exposure at levels well below the
applicable exposure limits. These symptoms, which can include chest tightness, wheezing,
cough, shortness of breath or asthmatic attack, could be immediate or delayed up to several
hours after exposure. There are reports that once sensitized, symptoms may occur upon
exposure to dust, cold air or other irritants. Sensitization can either be temporary or
permanent.
Chronic overexposure to isocyanates has also been reported to cause lung damage (including
fibrosis, decrease in lung function) which may be permanent. Preexisting asthma and other
respiratory disorders (bronchitis, emphysema, hyperreactivity) may be aggravated by
exposure.

9016-87-9 Polymeric Diphenylmethane Diisocyanate
See hazards listed above for MDI (CAS# 101-68-8).
-- See Footnote at end of section

26447-40-5 Isocyanic Acid, Methylenebisphenylene Ester
See hazards listed above for MDI (CAS# 101-68-8).
-- See Footnote at end of section

Footnote: As of the date of issuance of this document, this material has not been listed by NTP, classified by IARC nor
regulated by OSHA as a carcinogen.

3. Composition, Information on Ingredients
The ingredients listed below have been associated with one or more immediate and/or delayed(*) health hazards. Risk of damage and effects depends upon duration and level of exposure. BEFORE USING, HANDLING, OR EXPOSURE TO THESE INGREDIENTS, READ AND UNDERSTAND THE MSDS.

<table>
<thead>
<tr>
<th>% by weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>9016-87-9 *Polymeric Diphenylmethane Diisocyanate</td>
</tr>
<tr>
<td>101-68-8 *Diphenylmethane 4,4'-Diisocyanate (MDI)</td>
</tr>
<tr>
<td>26447-40-5 *Isocyanic Acid, Methylenebisphenylene Ester</td>
</tr>
</tbody>
</table>

Any applicable Canadian trade secret numbers will be listed in Section 15.2.

4. First Aid Measures

INGESTION: If accidentally swallowed, dilute by drinking large quantities of water. If the individual is drowsy or unconscious, do not give anything by mouth. Immediately contact poison control center or hospital emergency room for advice on whether to induce vomiting or for any other additional treatment directions.

INHALATION: If inhaled, remove to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen. Asthmatic-type symptoms may develop and may be immediate or delayed up to several hours. Treatment is essentially symptomatic. Call a physician. Any individual having a dermal or pulmonary sensitization reaction to this material must be removed from any further exposure to any isocyanate.

SKIN: Immediately wash with soap and plenty of water for at least 15 minutes while removing contaminated clothing. Call a physician if symptoms occur. Wash clothing before reuse.

EYES: Immediately flush eyes with plenty of water for at least 15 minutes. Eyelids should be held apart during irrigation to ensure water contact with entire surface of eyes and lids. Call a physician.

5. Fire Fighting Measures

Suitable Extinguishing Media: In case of fire, use dry chemical, foam or CO2; use water spray for large fires. Reacts with water to produce CO2. Water contamination can cause rupture of closed containers. Wear full emergency protective equipment including NIOSH approved pressure demand self-contained breathing apparatus. Isocyanate vapors and other irritating, highly toxic gases may be generated by thermal decomposition or combustion. Cool fire-exposed containers with cold-water spray to minimize risk of rupture.

Will burn.

6. Accidental Release Measures
Evacuate area of all persons not wearing proper protective equipment. If indoors, ventilate area. If product is on the ground, dike area to prevent entry into water systems and soil. Wear full protective equipment including respiratory equipment during clean-up. If temporary control of isocyanate vapor is required, a blanket of protein foam (available at most fire departments) may be spread. Contain and/or absorb spill with inert material (e.g. sand, vermiculite), place in a suitable unsealed container, transport to well-ventilated area (outside) and treat with neutralizing solution: mixture of water (80%) with non-ionic surfactant Tergitol TMN-10 (20%), or; water (90%), concentrated ammonia (3-8%) and liquid detergent (2%). Add about 10 parts of neutralizer per one part of isocyanate, with mixing. Allow to stand uncovered for 48 hours to let CO2 escape.

7. Handling and Storage

7.1 Handling

Handle in accordance with good industrial hygiene and safety practices. These practices include avoiding unnecessary exposure and removal of the material from eyes, skin and clothing. Wash thoroughly after handling. Always use appropriate Personal Protective Equipment (PPE).

**INHALATION:**
Do not breathe aerosols or vapors. Warning properties (irritation of the eyes, nose and throat or odor) are not adequate to prevent chronic overexposure from inhalation. This material can produce asthmatic sensitization upon either single inhalation exposure to a relatively high concentration or upon repeated inhalation exposures to lower concentrations.

**SKIN:**
Avoid contact with skin and clothing.

**EYES:**
Avoid contact with eyes.

Do not allow containers to be heated above recommended storage temperatures because they can be pressurized and possibly rupture. Exposure to vapors of heated isocyanate can be dangerous. Employee education and training in the safe use and handling of isocyanates is required.

7.2 Storage

Never use air pressure to empty containers.
Do not use air to unload bulk trucks. Unload using pumps or an inert gas, such as nitrogen.
Use with adequate ventilation.
Will react with water. Keep tightly closed and dry.
Do not store near strong oxidizing chemicals.

8. Exposure Controls/Personal Protection

8.1 Exposure Guidelines

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>9016-87-9</td>
<td>Polymeric Diphenylmethane Diisocyanate</td>
<td></td>
</tr>
<tr>
<td>ACGIH TLV</td>
<td>None established</td>
<td></td>
</tr>
<tr>
<td>OSHA PEL</td>
<td>None established</td>
<td></td>
</tr>
<tr>
<td>101-68-8</td>
<td>Diphenylmethane 4,4'-Diisocyanate (MDI)</td>
<td></td>
</tr>
<tr>
<td>ACGIH TLV</td>
<td>8-hr TWA</td>
<td>0.005 ppm</td>
</tr>
<tr>
<td>OSHA PEL</td>
<td>Ceiling</td>
<td>0.02 ppm</td>
</tr>
<tr>
<td>26447-40-5</td>
<td>Isocyanic Acid, Methylenebiphenylene Ester</td>
<td></td>
</tr>
</tbody>
</table>
8.2 Exposure Controls

ENGINEERING CONTROLS: The following exposure control techniques may be used to effectively minimize employee exposure: local exhaust ventilation, enclosed system design, process isolation and remote control in combination with appropriate use of personal protective equipment and prudent work practices. These techniques may not necessarily address all issues pertaining to your operations. We, therefore, recommend that you consult with experts of your choice to determine whether or not your programs are adequate.

If airborne contaminants are generated, sufficient ventilation in volume and air flow patterns should be provided to keep air contaminant concentration levels below acceptable criteria.

8.3 Personal Protection

Wear synthetic apron and boots if contact is likely. Where air contaminants can exceed acceptable criteria, use NIOSH (42 CFR Part 84) air supplied approved respiratory protection equipment. Respirators should be selected based on the form and concentration of contaminants in air in accordance with OSHA laws and regulations or other applicable standards or guidelines, including ANSI standards regarding respiratory protection. OSHA permits other NIOSH respirators (negative pressure type) under specified conditions. Use goggles and face shield if contact is likely. Wear permeation resistant gloves (butyl rubber, nitrile rubber, neoprene) as required to prevent skin contact. Cover as much of the exposed skin area as possible with appropriate clothing.

MEDICAL SURVEILLANCE: Medical supervision of all employees who handle or come in contact with isocyanates is recommended. These should include preemployment and periodic medical examinations with pulmonary respiratory allergies such as hay fever, eczema, history of prior isocyanate sensitization, or lack of smell (anosmia) are possible reasons for medical exclusion from isocyanate areas. Once a person is accurately diagnosed as sensitized to an isocyanate, no further exposure can be permitted.

9. Physical and Chemical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Dark brown liquid</td>
</tr>
<tr>
<td>Odor</td>
<td>Characteristic</td>
</tr>
<tr>
<td>Odor threshold</td>
<td>Not available</td>
</tr>
<tr>
<td>pH</td>
<td>Not available</td>
</tr>
<tr>
<td>Freezing point</td>
<td>Not available</td>
</tr>
<tr>
<td>Boiling point, 760 mm Hg</td>
<td>329 °C (624 °F)</td>
</tr>
<tr>
<td>Flash point</td>
<td>Greater than 204 °C (399 °F)</td>
</tr>
<tr>
<td>Evaporation rate</td>
<td>Not available</td>
</tr>
<tr>
<td>Lower explosion limit</td>
<td>Not available</td>
</tr>
<tr>
<td>Upper explosion limit</td>
<td>Not available</td>
</tr>
<tr>
<td>Vapor pressure</td>
<td>Less than 0.001 mm Hg</td>
</tr>
<tr>
<td>Vapor density</td>
<td>Less than 1.0</td>
</tr>
<tr>
<td>Specific gravity</td>
<td>1.20</td>
</tr>
<tr>
<td>Solubility in water</td>
<td>Insoluble</td>
</tr>
<tr>
<td>Octanol/water partition coefficient</td>
<td>Not available</td>
</tr>
<tr>
<td>Autoignition temperature</td>
<td>Not available</td>
</tr>
<tr>
<td>Viscosity</td>
<td>175 - 250 cPs</td>
</tr>
</tbody>
</table>
10. Stability and Reactivity

Chemical Stability

Normally stable, but will react with water. Normally stable. Contact with moisture or other materials that react with isocyanates, or temperatures above 350°F (177°C) may cause polymerization. Product may form carbon dioxide which will cause a build-up of pressure in closed containers causing a possible hazardous rupture.

Conditions to avoid

High heat and moisture.

Incompatible Materials

Water, alcohols, amines, bases and direct UV. Strong oxidizers, reducing agents, acids and alkaline materials.

Hazardous Decomposition Products

NH3, HCN and oxides of carbon and nitrogen.

Possibility of Hazardous Reactions

Hazardous polymerization may occur.

Other Hazards

During core/mold making, vapors of hydrocarbons and 4,4'-diphenylmethane diisocyanate may be released.

11. Toxicological Information

See Section 3 Hazards Identification information.

9016-87-9 Polymeric Diphenylmethane Diisocyanate
LC50: rat=0.490 mg/l/4 h (vapor)
LD50: Oral-rat=Greater than 10,000 mg/kg (Sax); Skin-rabbit=Greater than 9,400 mg/kg (Sax)

101-68-8 Diphenylmethane 4,4'-Diisocyanate (MDI)
LC50: rat=0.178 mg/l (RTECS)
LD50: Oral-muskrat= 2,200 mg/kg (RTECS); Skin-rabbit=Greater than 10,000 mg/kg (vendor)

26447-40-5 Isocyanic Acid, Methylene diphenylene Ester
LC50: Not available
LD50: Not available

12. Ecological Information

Mono- and poly-diphenylmethane diisocyanates react readily with water to form insoluble polyureas. Therefore, no ecotoxicity data for the isocyanates is available. The monomer degrades photochemically in air with an estimated half-life of 32 hours. Leaching from soil is not environmentally important. Bioconcentration in carp does not occur over an eight week period.

13. Disposal Considerations
Dispose of according to local, state/provincial, and federal requirements. Incineration is the preferred method. Empty container. Empty containers retain product residue. Observe all precautions for product. DO NOT heat or cut empty container with electric or gas torch because highly toxic vapors and gases are formed. Do not reuse without thorough commercial cleaning and reconditioning. If container is to be disposed, ensure all product residues are removed prior to disposal.

14. Transport Information

14.1 U.S. Department of Transportation (DOT)

The data provided in this section is for information only and may not be specific to your package size or mode of transport. You will need to apply the appropriate regulations to properly classify your shipment for transportation.

<table>
<thead>
<tr>
<th>Proper shipping name</th>
<th>ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. ( Diphenylmethane 4,4'-Diisocyanate (MDI))</th>
</tr>
</thead>
<tbody>
<tr>
<td>UN/NA number</td>
<td>3082</td>
</tr>
<tr>
<td>Class</td>
<td>9</td>
</tr>
<tr>
<td>Packing group</td>
<td>III</td>
</tr>
<tr>
<td>Label</td>
<td>9</td>
</tr>
<tr>
<td>RQ Ingredients</td>
<td>Diphenylmethane 4,4'-Diisocyanate (MDI)</td>
</tr>
</tbody>
</table>

14.2 Canadian Transportation of Dangerous Goods (TDG)

Regulation: Non regulated

14.3 Other Regulations

- **ADR/RID**
  Regulation: Non regulated

- **IMO/IMDG**
  Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.
  UN Number: 3082
  Class: Class 9
  Packing group: III
  Label: 9

- **IATA (Passenger)**
  Regulation: Non regulated

15. Regulatory Information (Selected Regulations)

15.1 U.S. Federal Regulations


This material is a "health hazard" and/or a "physical hazard" as determined when reviewed according to the requirements of the Occupational Safety and Health Administration 29 CFR Part 1910.1200 "Hazard Communication" Standard.

**SARA Title III: Section 311/312**
Immediate health hazard
Delayed health hazard
Reactivity hazard

SARA Title III: Section 313 and 40 CFR Part 372

This product contains the following toxic chemical(s) subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986, and Subpart C-Supplier Notification Requirement of 40 CFR Part 372.

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methylenebis(4-phenylisocyanate) (MDI)</td>
<td>N120</td>
<td>42.19%</td>
</tr>
<tr>
<td>Polymeric Diphenylmethane Diisocyanate</td>
<td>N120</td>
<td>51.45%</td>
</tr>
</tbody>
</table>

TSCA Section 8(b) Inventory

All reportable chemical substances are listed on the TSCA Inventory. We rely on certifications of compliance from our suppliers for chemical substances not manufactured by us.

15.2 Canadian Regulations

Workplace Hazardous Materials Information System (WHMIS)

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulation (CPR) and the MSDS contains all the information required by the CPR.

- Class D1A
- Class D2A
- Class D2B

Canadian Environmental Protection Act (CEPA)

All reportable chemical substances are listed on the Domestic Substances List (DSL) or otherwise comply with CEPA new substance notification requirements.

National Pollutant Release Inventory (NPRI)

This product contains the following chemical(s) subject to the reporting requirements of the Canadian Environmental Protection Act (CEPA) subsection 16(1), National Pollutant Release Inventory.

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methylenebis(phenylisocyanate)</td>
<td>101-68-8</td>
<td>42.19%</td>
</tr>
<tr>
<td>Polymeric Diphenylmethane Diisocyanate</td>
<td>9016-87-9</td>
<td>51.45%</td>
</tr>
</tbody>
</table>

16. Other Information

User's Responsibility

The OSHA Hazard Communication Standard 29CFR 1910.1200 and the Workplace Hazardous Materials Information System (WHMIS) require that the information contained on these sheets be made available to your workers. Educate and train your workers regarding OSHA and WHMIS precautions. Instruct your workers to handle this product properly. Consult with appropriate experts to guard against hazards associated with use of this product and its ingredients.
Disclaimer

SELLER MAKES NO WARRANTY, EXPRESS OR IMPLIED, CONCERNING THE PRODUCT OR THE MERCHANTABILITY OR FITNESS THEREOF FOR ANY PURPOSE, except that the product shall conform to contracted specifications, and that the product does not infringe any valid United States or Canadian patent. No claim of any kind shall be greater in amount than the purchase price of the quantity of product in respect of which damages are claimed. In no event shall Seller be liable for incidental or consequential damages, whether Buyer's claim is based on contract, breach of warranty, negligence or otherwise.