

*******MATERIAL SAFETY DATA SHEET*******

Manufacturer's Name: PRECISION CONVERTING
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*******SECTION I – PRODUCT IDENTIFICATION*******

CHEMICAL FAMILY: Methylene diphenyl diisocyanate (M.D.I.)
TRADE NAME AND SYNONYMS: PC 00, 10, 20, 30, 40, 50, 55, 65, 70, 85 F, 360,
FORMULA: The specific chemical formula for this material is a Trade Secret of PRECISION
CONVERTING
CHEMICAL NAME: Isocyanic Acid, Polymethylenepolyphenylene Ester
SYNONYMS: Polymeric Diphenylmethane Diisocyanate (MDI)
CAS NUMBER: 9016-87-9
FORMULA: Not Applicable

*******SECTION II – COMPOSITION/INFORMATION INGREDIENTS*******

HAZARDOUS INGREDIENTS

<u>INGREDIENT NAME</u> <u>CAS NUMBER</u>	<u>EXPOSURE LIMITS</u>	<u>CONCENTRATION</u>
4,4'-Diphenylmethane Diisocyanate (MDI) CAS # 101-68-8	OSHA: .02 ppm Ceiling .20 mg/m3 Ceiling ACGIH: .005 ppm TWA .951 mg/m3 TWA	Upper Bound 22.5%
Higher Oligomers of MDI CAS # 9016-87-9	OSHA: Not established ACGIH: Not established	22.5%
Diphenylmethane Diisocyanate (MDI) CAS # 26447-40-5	OSHA: Not established ACGIH: Not established	5%
Toluene Diisocyanate (TDI) CAS #26471-62-5	OSHA: PEL 0.02 ppm Ceiling ACGIH: .005 ppm TWA	Less than 1%

*******SECTION III – HAZARDS IDENTIFICATION*******

EMERGENCY OVERVIEW:

- **WARNING!** May cause eye, skin, and respiratory tract irritation. Harmful if inhaled; may cause allergic respiratory reaction, may cause allergic skin reaction, and may cause lung damage. Toxic gases/fumes are given off during burning or thermal decomposition.

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POTENTIAL HEALTH EFFECTS:

ROUTES OF ENTRY:

SKIN: Contact from liquid and aerosols (spray application)

INHALATION: Although MDI is low in volatility, an inhalation hazard can exist from MDI aerosols or vapors formed during heating, foaming or spraying. Individuals that are sensitized to TDI exposure may result in allergic respiratory reactions.

HUMAN EFFECTS AND SYMPTOMS OF OVEREXPOSURE:

ACUTE INHALATION: MDI/TDI vapors or mist at concentrations above the TLV can irritate (burning sensation) the mucous membranes in the respiratory tract (nose, throat, and lungs) causing runny nose, sore throat, coughing, chest discomfort, shortness of breath and reduced lung function (breathing obstruction). Persons with a preexisting, nonspecific bronchial hyperactivity can respond to concentrations below the TLV with similar symptoms as well as asthma attack. Exposure well above the TLV may lead to bronchitis, bronchial spasm and pulmonary edema (fluid in lungs). These effects are usually reversible. Chemical or hypersensitive pneumonitis, with flu-like symptoms (e.g., fever, and chills) has also been reported. These symptoms can be delayed up to several hours after exposure.

CHRONIC INHALATION: As a result of previous repeated overexposures or a single large dose, certain individuals develop isocyanate at levels well below the TLV. These symptoms, which can include chest tightness, wheezing, cough, shortness of breath or asthma attack, could be immediate or delayed (up to several hours after exposure), similar to many non-specific asthmatic responses. There are reports that once sensitized an individual can experience these symptoms upon exposure to dust, cold air or other irritants. This increased lung sensitivity can persist for weeks and in severe cases for several years. Overexposure to isocyanates has also been reported to cause lung damage, (including decrease in lung function) which may be permanent. Sensitization can either be temporary or permanent.

ACUTE SKIN CONTACT: Isocyanates react with skin protein and moisture and can cause irritation, which may include the following symptoms; reddening, swelling, rash, scaling or blistering. Cured material is difficult to remove.

CHRONIC SKIN CONTACT: Prolonged contact can cause reddening, swelling, rash, scaling, blistering, and in some cases, skin sensitization. Individuals who have skin sensitization can develop these symptoms from contact with liquid vapors. Animal tests have indicated that respiratory sensitization can result from skin contact with MDI. This data reinforces the need to prevent skin contact with MDI (see Toxicological Information, SENSITIZATION).

ACUTE EYE CONTACT: Liquid, aerosols or vapors are irritating and can cause tearing, reddening and swelling. If left untreated, corneal damage can occur and injury is slow to heal. However, damage is usually reversible (see First Aid Measures for treatment).

ACUTE INGESTION: Can result in irritation and corrosive action in the mouth, stomach tissue and digestive tract. Symptoms can include sore throat, abdominal pain, nausea, vomiting and diarrhea.

CARCINOGENICITY: Neither MDI nor polymeric MDI are listed by the NTP, IARC or regulated by OSHA as carcinogens.

NTP: Not listed

IARC: Not listed

OSHA: Not regulated

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Asthma, other respiratory disorders (bronchitis, emphysema, bronchial hyperactivity), skin allergies, eczema.

CARCINOGENICITY : TDI is listed as a carcinogen by IARC (2B) and NTP. TDI has been shown to cause cancer in lab animals when administered orally. Carcinogenicity through inhalation (most likely route of industrial exposure) has not been proven.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Asthma, other respiratory disorders (Bronchitis, emphysema, bronchial hyperactivity), skin allergies, eczema.

*****SECTION IV – FIRST AID MEASURES*****

FIRST AID FOR EYES: Flush with copious amounts of water, preferably, lukewarm water for at least 15 minutes, holding eyelids open all the time. Refer individual to physician or ophthalmologist for immediate follow-up.

FIRST AID FOR SKIN: Remove contaminated clothing. Wash affected skin thoroughly with soap and water. Wash contaminated clothing thoroughly before reuse. For severe exposure, get under safety shower after removing clothing, then get medical attention. For lesser exposures, seek medical attention if irritation develops or persists after the area is washed.

FIRST AID FOR INHALATION: Move to an area free from risk of further exposure. Administer oxygen or artificial respiration if needed. Obtain medical attention. Asthmatic-type symptoms may develop and may be immediate or delayed up to several hours. Consult physician should this occur.

FIRST AID FOR INGESTION: DO NOT induce vomiting. Give 1 to 2 cups of milk or water to drink. DO NOT GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON. Consult physician.

NOTE TO PHYSICIAN:

EYES: Stain for evidence of corneal injury. If cornea is burned, install antibiotic steroid preparation frequently. Work place vapors have produced reversible corneal epithelial edema impairing vision.

SKIN: This compound is a known skin sensitizer. Treat symptomatically as for contact dermatitis or thermal burns. If burned, treat as thermal burn.

INGESTION: Treat symptomatically. There is no specific antidote. Inducing vomiting is contraindicated because of the irritating nature of this compound.

RESPIRATORY: This compound is a known pulmonary sensitizer. Treatment is essentially symptomatic. An individual having a skin or pulmonary sensitization reaction to this material should be removed from exposure to any isocyanate.

*****SECTION V – FIRE FIGHTING MEASURES*****

FLASH POINT: 390.0 F (198.8 C) Pensky-Martens Closed

EXTINGUISHING MEDIA: Dry chemical, carbon dioxide, foam, and water spray for large fires.

SPECIAL FIRE FIGHTING PROCEDURES: Full emergency equipment with self contained breathing apparatus and full protective clothing should be worn by firefighters. During a fire, MDI vapors and other irritating, highly toxic gases may be generated by thermal decomposition or combustion (see Reactivity and Stability Section). At temperatures greater than 400 F (204 C) polymeric MDI can polymerize and decompose which can cause pressure build up in closed containers. Explosive rupture is possible. Therefore, use cold water to cool fire-exposed containers.

*****SECTION VI – ACCIDENTAL RELEASE MEASURES*****

SPILL OR LEAK PROCEDURES: Evacuate and ventilate spill area. Dike spill to prevent entry into water system. Wear full protective equipment, including respiratory equipment during clean-up (see Employee Protection Recommendations).

MAJOR SPILL: Call PRECISION CONVERTING at (713) 934-1650. If transportation spill, call CHEMTREC at 800-424-9300. If temporary control of isocyanate vapor is required, a blanket of protection foam (available at most fire departments) may be placed over the spill. Large quantities may be pumped into closed, but not sealed container for disposal.

MINOR SPILL: Absorb isocyanates with sawdust or other absorbents. Shovel into suitable unsealed containers; transport to well ventilated area (outside) and treat with neutralizing solution: mixture of water (80%) with non-ionic surfactant Tergitol TMN-10 (20%); or

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water (90%), concentrated ammonia (3-8%) and detergent (2%). Add about 10 parts of neutralizer per part of isocyanate with mixing. Allow to stand uncovered for 48 hours to let CO₂ escape.

CLEAN UP: Decontaminate floor with decontamination solution letting stand for at least 15 minutes.

*******SECTION VII – HANDLING AND STORAGE*******

STORAGE TEMPERATURE (min./max.): 64 F (18 C)/86 F (30 C)

SHELF LIFE: 6 months

SPECIAL SENSITIVITY: If container is exposed to high heat, 400 F (204 C) it can be pressurized and possible rupture. MDI reacts slowly with water to form CO₂ gas. This gas can cause sealed containers to expand and possibly rupture.

HANDLING/STORAGE PRECAUTIONS: Store in tightly closed containers to prevent moisture contamination. Do not reseal if contamination is suspected. Avoid contact with skin and eyes. 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 exposure to lower concentrations. Exposure to vapors of heated MDI can be extremely dangerous. Employee education and training in the safe use and handling of this compound are required under the OSHA Hazard Communication Standard.

*******SECTION VIII – PERSONAL PROTECTION*******

EYE PROTECTION REQUIREMENTS: Liquid chemical goggles. Vapor resistant goggles should be worn when contact lenses are in use. In a splash hazard environment chemical goggles should be used in combination with a full-face shield.

SKIN PROTECTION REQUIREMENTS: Permeation resistant gloves (butyl rubber, nitrile rubber, and polyvinyl alcohol). However, please note that PVA degrades in water. Cover as much of the exposed skin area as possible with appropriate clothing. If skin creams are used, keep area covered by the cream to a minimum.

VENTILATION REQUIREMENTS: Local exhaust should be used to maintain levels below the TLV whenever MDI is processed, heated or spray applied. Standard reference sources regarding industrial ventilation (i.e., ACGIH Industrial Ventilation) should be consulted for guidance about adequate ventilation.

RESPIRATOR REQUIREMENTS: Concentrations greater than the TLV can occur when MDI is sprayed, heated or used in a poorly ventilated area. In such cases, or whenever concentrations of MDI exceed the TLV or are not known, respiratory protection must be worn. A supplied air respirator (either positive pressure or continuous flow type) is required. In an emergency situation, a self-contained breathing apparatus may be used. MDI has poor warning properties, since the concentration at which MDI can be smelled is substantially higher than the maximum exposure limit. Observe OSHA regulations for respirator use (29 CFR 1910.134).

MONITORING: Isocyanate exposure levels must be monitored. Monitoring of airborne isocyanates in the breathing zone of individuals should become part of the overall employee exposure characterization program. Monitoring techniques have been developed by NIOSH and OSHA. Upon request, PRECISION CONVERTING can make available methods, which are modifications of these NIOSH, and OSHA methods.

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MEDICAL SURVEILLANCE: Medical supervision of all employees who handle or come in contact with isocyanates is recommended. These should include pre-employment and periodic medical examinations with pulmonary function tests (FEC, FVC as a minimum). Persons with asthmatic-type conditions, chronic bronchitis, other chronic respiratory diseases or recurrent skin eczema or sensitization should be excluded from working with isocyanates. Once a person is diagnosed as sensitized to an isocyanate, no further exposure should be permitted.

ADDITIONAL PROTECTIVE MEASURES: Safety showers and eyewash stations should be available. Educate and train employees in safe use of product. Follow all label instructions. For additional information, contact PRECISION CONVERTING

*******SECTION IX – PHYSICAL AND CHEMICAL PROPERTIES*******

PHYSICAL FORM: Liquid
COLOR: Clear
ODOR: Slightly musty odor
ODOR THRESHOLD: Not established
pH: Not established
BOILING POINT: 406 F (208 C) at 5 mm Hg for MDI
MELTING/FREEZING POINT: Below 32 F (0 C) for MDI
VISCOSITY: 1100 cps @ 77 F (25 C)
SOLUBILITY IN WATER: Not soluble. Reacts slowly with water to liberate CO₂ gases.
SPECIFIC GRAVITY: 1.24 @ 77 F (25 C)
BULK DENSITY: 9 lbs./gal.
% VOLATILE BY VOLUME: Negligible
VAPOR PRESSURE: Less than 10-5 mm Hg at 77 F (25 C) for MDI
VAPOR DENSITY: 8.5 (MDI) (Air – 1)

*******SECTION X – STABILITY AND REACTIVITY*******

STABILITY: This is a stable material
HAZARDOUS POLYMERIZATION: May occur; contact with moisture, other materials, which react with isocyanates, or temperatures about 400 F (204 C), may cause polymerization.
INCOMPATIBILITIES: Water, amines, strong bases, alcohol's will cause some corrosion to copper alloys and aluminum.
INSTABILITY CONDITIONS: Contamination with water and high temperatures above 400 F (204 C).
DECOMPOSITION PRODUCTS: By high heat and fire; carbon monoxide, oxides of nitrogen, traces of HCN, MDI vapors or aerosols.

*******SECTION XI – TOXICOLOGICAL INFORMATION*******

TOXICITY DATA FOR: Diphenylmethane Diisocyanate (Monomeric and Polymeric)

ACUTE TOXICITY:
ORAL LD₅₀: Greater than 15,800 mg/kg (rat)
DERMAL LD₅₀: Greater than 5,010 but less than 7,940 mg/kg (rabbit)
INHALATION LC₅₀: The 4-hour LC₅₀ for polymeric MDI in rats ranges from 370 to 490 mg/m³. The LC₅₀ for monomeric MDI was estimated to be between 172 and 187 mg/m³.
EYE EFFECTS: Slight to moderate irritation.
SKIN EFFECTS: Slight to moderate irritation.

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SENSITIZATION: MDI has been shown to produce dermal sensitization in laboratory animals. Evidence of respiratory sensitization has also been observed in guinea pigs. In addition, there is some evidence suggestive of cross-sensitization between different types of diisocyanates.

CHRONIC TOXICITY: In a combined chronic inhalation toxicity/oncogenicity study, rats were exposed to an aerosol of polymeric MDI for 6 hours per day, 5 days per week for one or two years. The exposure concentrations were 0, 0.2, 1.0 and 6.0 mg/m³. Microscopic examination of tissues revealed the effects of irritation to the nasal cavity and lungs in animals exposed to 1.0 and 6.0 mg/m³. The No Observable Effect Level (NOEL) was 0.2 mg/m³.

CARCINOGENICITY: In the study described above (CHRONIC TOXICITY), the occurrence of pulmonary adenomas and a single pulmonary adenocarcinoma was considered to be related to MDI. These tumors were observed only in rats exposed to the high concentration of 6.0 mg/m³.

MUTAGENICITY: Positive (Salmonella microsome test with metabolic activation; cell transformation assay) as well as negative (mouse lymphoma specific locus mutation test with or without metabolic activation) results have been observed "in vitro". However, MDI was negative in an "in vivo" (mouse micronucleus) assay.

DEVELOPMENTAL TOXICITY: Rats were exposed to polymeric MDI at air concentrations of 0, 1, 4 and 12 mg/m³ during days 6 – 15 of gestation. Maternal Toxicity (including mortality) was observed at the highest concentration of 12 mg/m³ accompanied by embryo and fetal toxicity. However, no teratogenic effects were observed even at this lethal concentration.

*******SECTION XII – ECOLOGICAL INFORMATION*******

ECOLOGY DATA FOR: Diphenylmethane Diisocyanate (Monomeric and Polymeric)

AQUATIC TOXICITY: LC50 – 24 hours (static): Greater than 500 mg/liter for Daphnia magna, Limnea Stagnalis, and Zebra fish (Brachydanio rerio) for both polymeric and monomeric MDI.

*******SECTION XIII – DISPOSAL CONSIDERATIONS*******

WASTE DISPOSAL METHOD: Waste must be disposed of in accordance with federal, state and local environmental control regulations. Incineration is the preferred method.

EMPTY CONTAINER PRECAUTIONS: Empty containers must be handled with care due to product residue. Decontaminate containers prior to disposal. Empty decontaminated containers should be crushed to prevent reuse. **DO NOT HEAT OR CUT EMPTY CONTAINER WITH ELECTRIC OR GAS TORCH** (see Fire Fighting Measures and Stability & Reactivity). Gases may be highly toxic.

TRANSPORTATION EMERGENCIES: Bayer requires that CHEMTREC be immediately notified at 800-424-9300 when this product is unintentionally released from its container during its course of distribution, regardless of the amount released. Distribution includes transportation, storage incidental to transportation, loading and unloading. Such notification must be immediate and made by the person having knowledge of the release.

*******SECTION XIV – TRANSPORTATION INFORMATION*******

TECHNICAL SHIPPING NAME: Methylene diphenyl diisocyanate

DOT (DOMESTIC SURFACE)

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PROPER SHIPPING NAME: Chemicals, N.O.I. (isocyanate, NMFC 60,000). Nonregulated
HAZARD CLASS OR DIVISION: None
UN/NA NUMBER: None
FREIGHT CLASS: 55
PACKAGING GROUP: None
HAZARDOUS SUBSTANCE: Methylene Diphenyl Diisocyanate
DOT PRODUCT RQ lbs.: 5000 lbs.
HAZARD PANEL(s): None
HAZARD PLACARD(s): None

- WHEN IN INDIVIDUAL CONTAINERS OF LESS THAN THE PRODUCT RQ, THIS MATERIAL SHIPS AS NON-REGULATED.

IMO / IMDG CODE (OCEAN)

HAZARD CLASS DIVISION NUMBER: Non-regulated
ICAO / IATA (AIR)

HAZARD CLASS DIVISION NUMBER: Non-regulated

*******SECTION XV – REGULATORY INFORMATION*******

OSHA STATUS: This product is hazardous under the criteria of the Federal OSHA Hazard Communication Standard 29 CFR 1910.1200.

TSCA STATUS: On TSCA Inventory

CERCLA REPORTABLE QUANTITY: 5000 lbs. for 4,4'-Diphenylmethane Diisocyanate, CAS # 101-68-8.

SARA TITLE III:

SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES: None

SECTION 311/312 HAZARD CATEGORIES: Immediate Health Hazard; Delayed Health Hazard; Reactive Hazard

SECTION 313 TOXIC CHEMICALS: Polymeric Diphenylmethane Diisocyanate, CAS # 9016-87-9, 100%; Contained in this polymeric MDI product is 4,4'-Diphenylmethane Diisocyanate, CAS # 101-68-8, Upper Bound 45%.

RCRA STATUS: MDI is not listed as a hazardous waste. To the best of our knowledge, MDI does not meet the criteria of a hazardous waste if discarded in its purchased form. However, under RCRA, it is the responsibility of the user of products to determine, at the time of disposal, whether a product meets any of the criteria for a hazardous waste. This is because product uses, transformations, mixtures, processes, etc., may render the resulting material hazardous, under the criteria of ignitability, corrosivity, reactivity and toxicity characteristics under the new Toxicity Characteristics Leaching Procedure (TCLP) 40 Code of Federal Regulations 261.20-24.

The following chemicals are specifically listed by individual states; other product specific health and safety data in other sections of the MSDS may also be applicable for state requirements. For details on your regulatory requirements you should contact the appropriate agency in your state.

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<u>COMPONENT NAME</u> <u>CAS NUMBER</u>	<u>CONCENTRATION</u>	<u>STATE CODE</u>
4,4'-Diphenylmethane Diisocyanate (MDI) CAS # 101-68-8	Upper Bound 45%	PA1, FL, IL, MA, NJ1, NJ4, CN2
Higher Oligomers of MDI CAS # 9016-87-9	45-55%	PA3, NJ4
Diphenylmethane Diisocyanate (MDI) CAS # 26447-40-5	1-10%	PA3, NJ4
Phenyl isocyanate CAS # 103-71-9	Trace - ppm	MA

- * FL Florida Substance List
- IL Illinois Toxic Substance List
- MA Massachusetts Hazardous Substance List
- NJ1 New Jersey Hazardous Substance List
- NJ4 New Jersey Other – included in 5 predominant ingredients > 1%
- PA1 Pennsylvania Hazardous Substance List
- PA3 Pennsylvania Non-hazardous present at 3% or greater
- RI Rhode Island List of Designated Substances
- CN2 Canada WHMIS Ingredient Disclosure List over 0.1%

*******SECTION XVI – OTHER INFORMATION*******

NFPA 704M RATINGS: Health 3 Flammability 1 Reactivity 1 Other

0 – Insignificant
 1 – Slight
 2 – Moderate
 3 – High
 4 – Extreme

HMIS RATINGS: Health 3* Flammability 1 Reactivity 1 Other

0 – Minimal
 1 – Slight
 2 – Moderate
 3 – Serious
 4 – Severe

- Chronic Health Hazard

PREPARED BY: C. Boddie
 APPROVAL DATE: 12/98
 SUPERCEDES DATE: 06/97

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