SAFETY DATA SHEET

Section 1. Identification

GHS product identifier	:	**ISO 760A**
Product code	:	ISO 760A
Chemical name	:	4,4'-Methylenediphenyl diisocyanate, oligomeric reaction products with butane-1,3-diol, 2,4'-diisocyanatodiphenylmethane, 1,1'-methylenebis(4-isocyanatobenzene) homopolymer, [(methylethylene)bis(oxy)]dipropanol and propane-1,2-diol
Other means of identification	:	Not available.
Product type	:	Liquid.
Material uses	:	Component of a Polyurethane System
Supplier's details	:	Forsch Polymer Corp. 3025 S. Wyandot St. Englewood, CO. 80110 303-322-9611
Phone		

e-mail address of person responsible for this SDS	:Bill@forschpolymer.com **:James@forschpolymer.com**
Emergency telephone number (24h/7day)	**:** 303-548-7716

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : ACUTE TOXICITY: INHALATION - Category 4
SKIN CORROSION/IRRITATION - Category 2
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 2B
RESPIRATORY SENSITIZATION - Category 1
SKIN SENSITIZATION - Category 1
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) [Respiratory tract irritation] - Category 3

GHS label elements

Hazard pictograms

Signal word : Danger

Hazard statements

Section 2. Hazards identification

Harmful if inhaled.
Causes skin and eye irritation.
May cause allergy or asthma symptoms or breathing difficulties if inhaled.
May cause an allergic skin reaction.
May cause respiratory irritation.

Precautionary statements : Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Wear protective gloves. Wear eye or face protection. In case of inadequate ventilation wear respiratory protection. Use only outdoors or in a well-ventilated area. Avoid breathing vapor. Wash hands thoroughly after handling. Contaminated work clothing should not be allowed out of the workplace. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or physician if you feel unwell. If experiencing respiratory symptoms: Call a POISON CENTER or physician. IF ON SKIN: Wash with plenty of soap and water. Take off contaminated clothing. Wash contaminated clothing before reuse. If skin irritation or rash occurs: Get medical attention. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention. Store locked up. Dispose of contents and container in accordance with all local, regional, national and international regulations.

Other hazards which do not result in classification : Not available.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Ingredient name	%	CAS number
Diphenylmethane 4,4'-diisocyanate	30 - 60	101-68-8
4,4'-MDI HOMOPOLYMER/1,3-BD/PG/TPG (NCO-ENDED)	30 - 60	70644-57-4
Homopolymer of methylenediphenyl diisocyanate	13 - 30	25686-28-6
2,6-di-tert-butyl-p-cresol	0.1 - 1	128-37-0

Any concentration shown as a range is to protect confidentiality or is due to batch variation.
Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Eye contact : In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention immediately.

Inhalation : Move exposed person to fresh air. Get medical attention immediately. Treatment is symptomatic for primary irritation or bronchospasm. If breathing is laboured, oxygen should be administered by qualified personnel.

Skin contact : After contact with skin, wash immediately with plenty of warm soapy water: Remove contaminated clothing and shoes. Continue to rinse for at least 10 minutes. An MDI study has demonstrated that a polyglycol-based skin cleanser (such as D-TamTM, PEG-400) or corn oil may be more effective than soap and water. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Provided the patient is conscious, wash out mouth with water. Get medical attention if symptoms appear.

Section 4. First aid measures

Most important symptoms/effects. acute and delayed

Potential acute health effects

Eye contact Causes eye irritation.

Inhalation Harmful if inhaled. May cause respiratory irritation. This product is a respiratory irritant and potential respiratory sensitizer: repeated inhalation of vapor or aerosol at levels above the occupational exposure limit could cause respiratory sensitization. Symptoms may include irritation to the eyes, nose, throat and lungs, possibly combined with dryness of the throat, tightness of chest and difficulty in breathing. The onset of the respiratory symptoms may be delayed for several hours after exposure. A hyper-reactive response to even minimal concentrations of MDI may develop in sensitized persons. LC50 (rat) : ca. 490 mg/m^3 (4 hours) : using experimentally produced respirable aerosol having aerodynamic diameter <5microns.

Skin contact : Causes skin irritation. May cause sensitization by skin contact. Animal studies have shown that respiratory sensitization can be induced by skin contact with known respiratory sensitizers including diisocyanates. These results emphasize the need for protective clothing including gloves to be worn at all times when handling these chemicals or in maintenance work.

Ingestion : Low oral toxicity, but ingestion may cause irritation of the gastrointestinal tract.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing
wheezing and breathing difficulties
asthma

Skin contact : Adverse symptoms may include the following:
irritation
redness

Ingestion : No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Symptomatic treatment and supportive therapy as indicated. Following severe exposure the patient should be kept under medical review for at least 48 hours.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Flash point : Closed cup: >210°C (>410°F) [EC A.9 Flash-Point (closed cup)]
Open cup: >100°C (>212°F)

Extinguishing media

Suitable extinguishing media : Foam, CO_2 or dry powder.

Unsuitable extinguishing media : Water may be used if no other available and then in copious quantities. Reaction between water and hot isocyanate may be vigorous. Prevent washings from entering water courses, keep fire exposed containers cool by spraying with water.

Specific hazards arising from the chemical : In a fire or if heated, a pressure increase will occur and the container may burst.

Hazardous thermal decomposition products : Combustion products may include: carbon monoxide, carbon dioxide, nitrogen oxides, hydrocarbons and HCN.

Special protective actions for fire-fighters Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Special protective equipment for fire-fighters Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. PVC boots, gloves, safety helmet and protective clothing should be worn.

Remark Due to reaction with water producing CO_2-gas, a hazardous build-up of pressure could result if contaminated containers are re-sealed. Containers may burst if overheated.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

For emergency responders : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up : If the product is in its solid form: Spilled MDI flakes should be picked up carefully. The area should be vacuum cleaned to remove remaining dust particles completely. If the product is in its liquid form: Absorb spillages onto sand, earth or any suitable adsorbent material. Leave to react for at least 30 minutes. Shovel into open-top drums for further decontamination. Wash the spillage area with water. Test atmosphere for MDI vapor. Neutralize small spillages with decontaminant. Remove and dispose of residues. The compositions of liquid decontaminants are given in Section 16. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Persons with a history of skin sensitization problems or asthma, allergies or chronic or recurrent respiratory disease should not be employed in any process in which this product is used. Avoid exposure - obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not get in eyes or on skin or clothing. Do not ingest. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Keep container tightly closed in a cool, well-ventilated place. Keep away from moisture. Due to reaction with water producing 002-gas, a hazardous build-up of pressure could result if contaminated containers are re-sealed. Do not reseal contaminated containers. Uncontaminated containers, free of moisture, may be resealed only after placing under a nitrogen blanket. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. Unsuitable containers: Do not store in containers made of copper, copper alloys or galvanized surfaces.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Diphenylmethane 4,4' diisocyanate	**ACGIH TLV (United States, 6/2013).** TWA: 0.005 ppm 8 hours. **OSHA PEL (United States, 2/2013).** CEIL: 0.02 ppm CEIL: 0.2 mg/m^3

Appropriate engineering controls Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Diisocyanates can only be smelled if the occupational exposure limit has been exceeded considerably.

Medical supervision of all employees who handle or come in contact with respiratory sensitizers is recommended. Personnel with a history of asthma-type conditions, bronchitis or skin sensitization conditions should not work with MDI based products. The Occupational Exposure Limits listed do not apply to previously sensitized individuals. Sensitized individuals should be removed from any further exposure.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Section 8. Exposure controls/personal protection

Hygiene measures

Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection

Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.

Hand protection

Use chemical resistant gloves classified under Standard EN374: protective gloves against chemicals and microorganisms.Examples of glove materials that might provide suitable protection include :Butyl rubber, Chlorinated polyethylene, Polyethylene, Ethyl vinyl alcohol copolymers laminated ("EVAL"), Polychloroprene (Neoprene*), Nitrile/butadiene rubber ("nitrile" or "NBR"), Polyvinyl chloride ("PVC" or "vinyl"), Fluoroelastomer (Viton*).

When prolonged or frequently repeated contact may occur, a glove with protection class of 5 or higher (breakthrough time greater then 240 minutes according to EN374) is recommended.

Contaminated gloves should be decontaminated and disposed of.
Notice: The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all requisite workplace factors such as, but not limited to : other chemicals that may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), as well as instructions/ specifications provided by the glove supplier. Protective gloves should be worn when handling freshly made polyurethane products to avoid contact with trace residual materials which may be hazardous in contact with skin.

Body protection

Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. Recommended: Overall (preferably heavy cotton) or Tyvek-Pro Tech 'C' , Tyvek-Pro 'F' disposable coverall.

Other skin protection

Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection

Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Thermal hazards : Not available.

Section 9. Physical and chemical properties

Appearance

Physical state Liquid.

Color Not available.

Odor Not available.

Odor threshold Not available.

pH Not available.

Melting point/Freezing point -16.5 to -12.3°C (2.3 to 9.9°F)

Boiling/condensation point >300°C decomposes

Flash point Closed cup: >210°C (>410°F) [EC A.9 Flash-Point (closed cup)]
Open cup: >100°C (>212°F)

Evaporation rate Not available.

Section 9. Physical and chemical properties

Flammability (solid, gas) : Not available.

Lower and upper explosive (flammable) limits : Not available.

Vapor pressure : Not available.

Vapor density : Not available.

Relative density : Not available.

Solubility in water : Insoluble

Partition coefficient: n-octanol/water : Not available.

Auto-ignition temperature : >600°C

Decomposition temperature : Not available.

Viscosity : Not available.

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : Stable at room temperature.

Possibility of hazardous reactions : Reaction with water (moisture) produces 002-gas. Exothermic reaction with materials containing active hydrogen groups. The reaction becomes progressively more vigorous and can be violent at higher temperatures if the miscibility of the reaction partners is good or is supported by stirring or by the presence of solvents. MDI is insoluble with, and heavier than water and sinks to the bottom but reacts slowly at the interface. A solid water-insoluble layer of polyurea is formed at the interface by liberating carbon dioxide gas.

Conditions to avoid : Avoid high temperatures.

Incompatible materials : Water, alcohols, amines, bases, and acids.

Hazardous decomposition products : Combustion products may include: carbon oxides (CO, CO^2) nitrogen oxides (NO, NO^2 etc.) hydrocarbons and HCN

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Test	Endpoint	Species	Result
Diphenylmethane 4,4'-diisocyanate	OECD 403 Acute Inhalation Toxicity	LC50 Inhalation Dusts and mists	Rat - Male, Female	0.49 mg/l
	OECD 402 Acute Dermal Toxicity	LD50 Dermal	Rabbit - Male, Female	>9400 mg/kg
	OECD 401 Acute Oral Toxicity	LD50 Oral	Rat - Male	>10000 mg/kg
Homopolymer of methylenediphenyl diisocyanate	OECD 403 Acute Inhalation Toxicity	LC50 Inhalation Dusts and mists	Rat - Male, Female	0.49 mg/l
	OECD 425 Acute Oral Toxicity: Up-and-	LD50 Oral	Rat - Female	>5000 mg/kg

Section 11. Toxicological information

	Down Procedure			
	OECD 402 Acute Dermal Toxicity	LD50 Dermal	Rabbit - Male, Female	>9400 mg/kg
	No official guidelines	LD50 Intraperitoneal	Rabbit - Male	100 mg/kg
2,6-di-tert-butyl-p-cresol	OECD 402 Acute Dermal Toxicity	LD50 Dermal	Rat - Male, Female	>2000 mg/kg
	-	LD50 Oral	Rat	890 mg/kg
	OECD 401 Acute Oral Toxicity	LD50 Oral	Rat - Male, Female	>2930 mg/kg
4,4'-Methylenediphenyl diisocyanate, oligomeric reaction products with butane-1,3-diol, 2,4'-diisocyanatodiphenylmethane, 1,1'-methylenebis (4-isocyanatobenzene) homopolymer, [(methylethylene)bis(oxy)] dipropanol and propane-1, 2-diol	OECD 403 Acute Inhalation Toxicity	LC50 Inhalation Dusts and mists	Rat - Male, Female	0.49 mg/l
	OECD 402 Acute Dermal Toxicity	LD50 Dermal	Rabbit - Male, Female	>9400 mg/kg
	OECD 425 Acute Oral Toxicity: Up-and-Down Procedure	LD50 Oral	Rat - Female	>5000 mg/kg

Conclusion/Summary :

4,4'-Methylenediphenyl diisocyanate	Irritating to respiratory system.

Irritation/Corrosion

Product/ingredient name	Test	Species	Result
Diphenylmethane 4,4'-diisocyanate	OECD 404 Acute Dermal Irritation/Corrosion	Rabbit	Skin - Irritant
	OECD 405 Acute Eye Irritation/ Corrosion	Rabbit	Eyes - Non-irritant.
Homopolymer of methylenediphenyl diisocyanate	OECD 405 Acute Eye Irritation/ Corrosion	Rabbit	Eyes - Non-irritant.
	OECD 404 Acute Dermal Irritation/Corrosion	Rabbit	Skin - Irritant
	OECD 404 Acute Dermal Irritation/Corrosion	Other	Non-corrosive
2,6-di-tert-butyl-p-cresol	No official guidelines	Rabbit	Skin - Non-irritant.
	No official guidelines	Rabbit	Eyes - Non-irritant.
4,4'-Methylenediphenyl diisocyanate, oligomeric reaction products with butane-1,3-diol, 2,4'-diisocyanatodiphenylmethane, 1, 1'-methylenebis (4-isocyanatobenzene) homopolymer, [(methylethylene) bis(oxy)]dipropanol and propane-1, 2-diol	OECD 404 Acute Dermal Irritation/Corrosion	Rabbit	Skin - Irritant
	OECD 405 Acute Eye Irritation/ Corrosion	Rabbit	Eyes - Non-irritant.

Conclusion/Summary

Section 11. Toxicological information

Skin	Diphenylmethane 4,4'-diisocyanate	Irritating to skin.
	4,4'-MDI HOMOPOLYMER/1 ,3-BD/ PG/TPG (NCO-ENDED)	No additional information.
	Homopolymer of methylenediphenyl diisocyanate	Irritating to skin.
	2,6-di-tert-butyl-p-cresol	Slightly irritating to the skin.
Eyes	Diphenylmethane 4,4'-diisocyanate	Based on the human occupational exposure data, this substance is considered as irritating to eyes.
	4,4'-MDI HOMOPOLYMER/1 ,3-BD/ PG/TPG (NCO-ENDED)	No additional information.
	Homopolymer of methylenediphenyl diisocyanate	Irritating to eyes.
	2,6-di-tert-butyl-p-cresol	Slightly irritating to the eyes.
Respiratory	Diphenylmethane 4,4'-diisocyanate	No additional information.
	4,4'-MDI HOMOPOLYMER/1 ,3-BD/ PG/TPG (NCO-ENDED)	No additional information.
	Homopolymer of methylenediphenyl diisocyanate	No additional information.
	2,6-di-tert-butyl-p-cresol	No additional information.

Sensitization

Product/ingredient name	Test	Route of exposure	Species	Result
Diphenylmethane 4,4'-diisocyanate	OECD 429 Skin Sensitization: Local Lymph Node Assay	skin	Mouse	Sensitizing
	OECD 406 Skin Sensitization	skin	Guinea pig	Not sensitizing
	No official guidelines	Respiratory	Guinea pig	Sensitizing
Homopolymer of methylenediphenyl diisocyanate	OECD 406 Skin Sensitization	skin	Guinea pig	Sensitizing
	No official guidelines	Respiratory	Guinea pig	Sensitizing
2,6-di-tert-butyl-p-cresol	No official guidelines	skin	Human	Not sensitizing
4,4'-Methylenediphenyl diisocyanate, oligomeric reaction products with butane-1,3-diol, 2,4'-diisocyanatodiphenylmethane, 1,1'-methylenebis(4-isocyanatobenzene) homopolymer, [(methylethylene)bis(oxy)]	No official guidelines	Respiratory	Guinea pig	Sensitizing

dipropanol and propane-1, 2-diol	OECD 406 Skin Sensitization	skin	Guinea pig	Sensitizing

Mutagenicity

Product/ingredient name	Test	Result
Diphenylmethane 4,4'-diisocyanate	Experiment: In vitro Subject: Bacteria Metabolic activation: +/-	Negative
	Experiment: In vivo Subject: Mammalian-Animal	Negative
Homopolymer of methylenediphenyl diisocyanate	Experiment: In vitro Subject: Bacteria Metabolic activation: +/-	Negative
	Experiment: In vivo Subject: Mammalian-Animal	Negative
2,6-di-tert-butyl-p-cresol	Experiment: In vitro Subject: Bacteria Metabolic activation: +/-	Negative
	Experiment: In vitro Subject: Mammalian-Animal Metabolic activation: +/-	Negative
	Experiment: In vitro Subject: Mammalian-Animal Metabolic activation: +	Negative
	Experiment: In vivo Subject: Mammalian-Animal	Negative
	Subject: Mammalian-Animal	Negative
	Experiment: In vivo Subject: Mammalian-Animal	Negative
4,4'-Methylenediphenyl diisocyanate, oligomeric reaction products with butane-1,3-diol, 2,4'-diisocyanatodiphenylmethane, 1,1'-methylenebis (4-isocyanatobenzene) homopolymer, [(methylethylene)bis(oxy)] dipropanol and propane-1, 2-diol	Experiment: In vitro Subject: Bacteria Metabolic activation: +/-	Negative
	Experiment: In vivo Subject: Mammalian-Animal	Negative

Conclusion/Summary :

4,4'-Methylenediphenyl diisocyanate	No mutagenic effect.

Carcinogenicity

Section 11. Toxicological information

Product/ingredient name	Test	Species	Dose	Exposure	Result/Result type
Diphenylmethane 4,4'-diisocyanate	OECD 453 Combined Chronic Toxicity/ Carcinogenicity Studies	Rat - Male, Female	1 mg/m^3	2 years; 5 days per week	Positive - Inhalation - NOAEL
Homopolymer of methylenediphenyl diisocyanate	OECD 453 Combined Chronic Toxicity/ Carcinogenicity Studies	Rat - Male, Female	1 mg/m^3	2 years; 5 days per week	Negative - Inhalation - NOAEL
2,6-di-tert-butyl-p-cresol	No official guidelines	Rat - Male, Female	-	-	Negative - Oral - NOAEL
4,4'-Methylenediphenyl diisocyanate, oligomeric reaction products with butane-1,3-diol, 2,4'-diisocyanatodiphenylmethane, 1,1'-methylenebis (4-isocyanatobenzene) homopolymer, [(methylethylene)bis(oxy)] dipropanol and propane-1, 2-diol	OECD 453 Combined Chronic Toxicity/ Carcinogenicity Studies	Rat - Male, Female	1 mg/m^3	2 years; 5 days per week	Negative - Inhalation - NOAEL

Reproductive toxicity

Product/ingredient name	Test	Species	Maternal toxicity	Fertility	Developmental effects
2,6-di-tert-butyl-p-cresol	No official guidelines	Rat - Male, Female	Negative	-	-

Conclusion/Summary

4,4'-Methylenediphenyl diisocyanate	No known significant effects or critical hazards.

Teratogenicity

Product/ingredient name	Test	Species	Result/Result type
Diphenylmethane 4,4'-diisocyanate	OECD 414 Prenatal Developmental Toxicity Study	Rat - Female	Negative - Inhalation
Homopolymer of methylenediphenyl diisocyanate	OECD 414 Prenatal Developmental Toxicity Study	Rat - Male, Female	Negative - Inhalation
2,6-di-tert-butyl-p-cresol	No official guidelines	Rat	Negative - Oral
4,4'-Methylenediphenyl diisocyanate, oligomeric reaction products with butane-1,3-diol, 2,4'-diisocyanatodiphenylmethane, 1,1'-methylenebis (4-isocyanatobenzene) homopolymer, [	OECD 414 Prenatal Developmental Toxicity Study	Rat - Male, Female	Negative - Inhalation

(methylethylene)bis(oxy)] dipropanol and propane-1, 2-diol			

Conclusion/Summary :

4,4'-Methylenediphenyl diisocyanate	No known significant effects or critical hazards.

Specific target organ toxicity (single exposure)

Product/ingredient name	Category	Route of exposure	Target organs
Diphenylmethane 4,4'-diisocyanate	Category 3	Not applicable.	Respiratory tract irritation
4,4'-MDI HOMOPOLYMER/1,3-BD/PG/ TPG (NCO-ENDED)	Category 3	Not applicable.	Respiratory tract irritation
Homopolymer of methylenediphenyl diisocyanate	Category 3	Not applicable.	Respiratory tract irritation

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Causes eye irritation.

Inhalation : Harmful if inhaled. May cause respiratory irritation. This product is a respiratory irritant and potential respiratory sensitiser: repeated inhalation of vapour or aerosol at levels above the occupational exposure limit could cause respiratory sensitisation. Symptoms may include irritation to the eyes, nose, throat and lungs, possibly combined with dryness of the throat, tightness of chest and difficulty in breathing. The onset of the respiratory symptoms may be delayed for several hours after exposure. A hyper-reactive response to even minimal concentrations of MDI may develop in sensitised persons. LC50 (rat) : ca. 490 mg/m^3 (4 hours): using experimentally produced respirable aerosol having aerodynamic diameter <5microns.

Skin contact : Causes skin irritation. May cause sensitization by skin contact. Animal studies have shown that respiratory sensitisation can be induced by skin contact with known respiratory sensitisers including diisocyanates. These results emphasize the need for protective clothing including gloves to be worn at all times when handling these chemicals or in maintenance work.

Ingestion : Low oral toxicity, but ingestion may cause irritation of the gastrointestinal tract.

Symptoms related to the physical. chemical and toxicological characteristics

Eye contact Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation Adverse symptoms may include the following:
respiratory tract irritation
coughing
wheezing and breathing difficulties
asthma

Section 11. Toxicological information

Skin contact : Adverse symptoms may include the following:
irritation
redness

Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Product/ingredient name	Test	Endpoint	Species	Result
4,4'-Methylenediphenyl diisocyanate, oligomeric reaction products with butane-1,3-diol, 2,4'-diisocyanatodiphenylmethane, 1,1'-methylenebis (4-isocyanatobenzene) homopolymer, [(methylethylene)bis(oxy)] dipropanol and propane-1, 2-diol	OECD 453 Combined Chronic Toxicity/ Carcinogenicity Studies	Chronic NOEC Inhalation Dusts and mists	Rat - Male, Female	0.2 mg/m^3
	OECD 413 Subchronic Inhalation Toxicity: 90-day Study	Sub-chronic NOEC Inhalation Dusts and mists	Rat - Male, Female	1 mg/m^3

General May cause damage to organs through prolonged or repeated exposure if inhaled. Once sensitized, a severe allergic reaction may occur when subsequently exposed to very low levels.

Carcinogenicity Rats have been exposed for two years to a respirable aerosol of polymeric MDI which resulted in chronic pulmonary irritation at high concentrations. Only at the top level (6 mg/m3), there was a significant incidence of a benign tumor of the lung (adenoma) and one malignant tumor (adenocarcinoma). There were no lung tumors at 1 mg/ m3 and no effects at 0.2 mg/m3. Overall, the tumor incidence, both benign and malignant, and the number of animals with the tumors were not different from controls. The increased incidence of lung tumors is associated with prolonged respiratory irritation and the concurrent accumulation of yellow material in the lung, which occurred throughout the study. In the absence of prolonged exposure to high concentrations leading to chronic irritation and lung damage, it is highly unlikely that tumor formation will occur.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Section 11. Toxicological information

Developmental effects No birth defects were seen in two independent animal (rat) studies. Fetotoxicity was observed at doses that were extremely toxic (including lethal) to the mother. Fetotoxicity was not observed at doses that were not maternally toxic. The doses used in these studies were maximal, respirable concentrations, which are well in excess of defined occupational exposure limits.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Route	ATE value
Inhalation (dusts and mists)	1.5 mg/l

Other information : Not available

Section 12. Ecological information

Toxicity

Product/ingredient name	Test	Endpoint		Exposure	Species	Result	
Diphenylmethane 4,4'-diisocyanate	OECD 202 *Daphnia* sp. Acute Immobilization Test	Acute	EC50	24 hours Static	Daphnia	>1000	mg/l
	OECD 203 Fish, Acute Toxicity Test	Acute	LC50	96 hours Static	Fish	>1000	mg/l
	OECD 211 *Daphnia* Magna Reproduction Test	Chronic	NOEC	21 days Semi-static	Daphnia	>10	mg/l
	OECD 201 Alga, Growth Inhibition Test	Chronic	NOECr	72 hours Static	Algae	1640	mg/l
Homopolymer of methylenediphenyl diisocyanate	OECD 201 Alga, Growth Inhibition Test	Acute	EC50	72 hours Static	Algae	>1640	mg/l
	OECD 209 Activated Sludge, Respiration Inhibition Test	Acute	EC50	3 hours Static	Bacteria	>100	mg/l
	OECD 202 *Daphnia* sp. Acute Immobilization Test	Acute	EC50	24 hours Static	Daphnia	>1000	mg/l
	OECD 203 Fish, Acute Toxicity Test	Acute	LC50	96 hours Static	Fish	>1000	mg/l
	OECD 211 *Daphnia Magna* Reproduction Test	Chronic	NOEC	21 days Semi-static	Daphnia	>10	mg/l
2,6-di-tert-butyl-p-cresol	EU EC C.3 Algal Inhibition Test	Acute	EC50	72 hours Static	Algae	>0.4	mg/l
	EU EC 88/302/EC	Acute	EC50	3 hours Static	Bacteria	>10000	mg/l
	OECD 202 *Daphnia* sp. Acute Immobilization Test	Acute	EC50	48 hours Static	Daphnia	0.61	mg/l
	EU EC 88/302/EC	Chronic	ECO	3 hours Static	Bacteria	1000	mg/l
	EU EC C.2 Acute	Chronic	ECO	48 hours	Daphnia	>0.31	mg/l

Section 12. Ecological information

	Toxicity for Daphnia EU EC C.1 Acute Toxicity for Fish	Chronic	LCO	Static 96 hours Semi-static	Fish	>0.57	mg/l
	EU EC C.3 Algal Inhibition Test	Chronic	NOEC	72 hours Static	Algae	>0.42	mg/l
	OECD OECD 202: Part **II** (Daphnia sp., Reproduction Test	Chronic	NOEC	21 days Semi-static	Daphnia	0.316	mg/l
4,4'-Methylenediphenyl diisocyanate, oligomeric reaction products with butane-1,3-diol, 2,4'-diisocyanatodiphenylmethane, 1,1'-methylenebis (4-isocyanatobenzene) homopolymer, [(methylethylene)bis(oxy)] dipropanol and propane-1, 2-diol	OECD 201 Alga, Growth Inhibition Test	Acute	EC50	72 hours Static	Algae	>1640	mg/l
	OECD 209 Activated Sludge, Respiration Inhibition Test	Acute	EC50	3 hours Static	Bacteria	>100	mg/l
	OECD 202 *Daphnia* sp. Acute Immobilization Test	Acute	EC50	24 hours Static	Daphnia	>1000	mg/l
	OECD 203 Fish, Acute Toxicity Test	Acute	LC50	96 hours Static	Fish	>1000	mg/l
	OECD 211 *Daphnia Magna* Reproduction Test	Chronic	NOEC	21 days Semi-static	Daphnia	>10	mg/l

Persistence and degradability

Product/ingredient name	Test	Period	Result
Diphenylmethane 4,4'-diisocyanate	OECD 302C Inherent Biodegradability: Modified MITI Test (II)	28 days	0 %
Homopolymer of methylenediphenyl diisocyanate	OECD 302C Inherent Biodegradability: Modified MITI Test (II)	28 days	0 %
4,4'-Methylenediphenyl diisocyanate, oligomeric reaction products with butane-1,3-diol, 2,4'-diisocyanatodiphenylmethane, 1,1'-methylenebis (4-isocyanatobenzene) homopolymer, [(methylethylene)bis(oxy)] dipropanol and propane-1, 2-diol	OECD 302C Inherent Biodegradability: Modified MITI Test (II)	28 days	0 %

Conclusion/Summary : 4,4'-Methylenediphenyl diisocyanate — Not biodegradable

Section 12. Ecological information

Product/ingredient name	Aquatic half-life	Photolysis	Biodegradability
4,4'-Methylenediphenyl diisocyanate, oligomeric reaction products with butane-1,3-diol, 2,4'-diisocyanatodiphenylmethane, 1,1'-methylenebis (4-isocyanatobenzene) homopolymer, [(methylethylene)bis(oxy)] dipropanol and propane-1, 2-diol	-	-	Not readily
Diphenylmethane 4,4'-diisocyanate	Fresh water 0.83 days	-	Not readily
Homopolymer of methylenediphenyl diisocyanate	-	-	Not readily
2,6-di-tert-butyl-p-cresol	-	-	Inherent

Bioaccumulative potential

Product/ingredient name	LogPow	BCF	Potential
4,4'-Methylenediphenyl diisocyanate, oligomeric reaction products with butane-1,3-diol, 2,4'-diisocyanatodiphenylmethane, 1,1'-methylenebis (4-isocyanatobenzene) homopolymer, [(methylethylene)bis(oxy)] dipropanol and propane-1, 2-diol	15.98	200	low
Diphenylmethane 4,4'-diisocyanate	4.51	200	low
Homopolymer of methylenediphenyl diisocyanate	8.56	200	low
2,6-di-tert-butyl-p-cresol	5.1	330 to 1800	high

Mobility in soil

Mobility : By considering the production and use of the substance, it is unlikely that significant environmental exposure in the air or water will arise. Immiscible with water, but will react with water to produce inert and non-biodegradable solids. Conversion to soluble products, including diamino- diphenylmethane (MDA), is very low under the optimal laboratory conditions of good dispersion and low concentration. In air, the predominant degradation process is predicted to be a relatively rapid OH radical attack, by calculation and by analogy with related diisocyanates.

Other adverse effects : No known significant effects or critical hazards.

Other ecological information

BOD5 : Not determined.

COD : Not determined.

Section 12. Ecological information

TOC : Not determined.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Section 14. Transport information

Proper shipping name

DOT : OTHER REGULATED SUBSTANCES, LIQUID, N.O.S. (Methylene Diphenyl Diisocyanate)

TDG : Not regulated.

IMDG : Not regulated.

IATA : Not regulated.

Regulatory information	UN number	Classes	PG*	Label	Additional information
DOT Classification	NA3082	9	III		**Reportable quantity5000 lbs. (2270 kg)** Single containers less than 5,000 lbs. are not regulated.
TDG Classification	Not regulated.	-	-		-
IMDG Classification	Not regulated.	-	-		-
IATA Classification	Not regulated.	-	-		-

PG*: Packing group

Section 15. Regulatory information

Safety. health and environmental regulations specific for the product

United States Regulations

TSCA 8(b) inventory : All components are listed or exempted.

TSCA 5(a)2 final significant new use rule (SNUR) : No ingredients listed.

TSCA 5(e) substance consent order : No ingredients listed.

TSCA 12(b) export notification : No ingredients listed.

SARA 311/312 : Immediate (acute) health hazard

Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs) :

Product name	Concentration %
4,4'-Methylenediphenyl diisocyanate	47.265 - 55.043

Clean Air Act - Ozone Depleting Substances (ODS) : This product does not contain nor is it manufactured with ozone depleting substances.

SARA 313 Form R - Reporting requirements :

Product name	Concentration %
Diphenylmethane 4,4'-diisocyanate	47.265 - 55.043

	Ingredient name	%	Section 304 CERCLA Hazardous Substance	CERCLA Reportable Quantity (Lbs)	Product Reportable Quantity (Lbs)
CERCLA Hazardous substances	• Diphenylmethane 4,4' diisocyanate	45.7	Listed	5000	10941

State regulations

PENNSYLVANIA - RTK : 4,4'-Methylenediphenyl diisocyanate

California Prop 65 : No ingredients listed.

Canadian regulations

CEPA DSL : All components are listed or exempted.

WHMIS Classes : WHMIS Class D-2A: Material causing other toxic effects (Very toxic).
WHMIS Class D-2B: Material causing other toxic effects (Toxic).

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

Brazil Regulations

Section 15. Regulatory information

Classification system used : **Norma ABNT-NBR 14725-2:2012**

International lists : **Australia inventory (AICS):** At least one component is not listed.
China inventory (IECSC): At least one component is not listed.
Japan inventory: Not determined.
Korea inventory: At least one component is not listed.
Malaysia Inventory (EHS Register): Not determined.
New Zealand Inventory of Chemicals (NZIoC): At least one component is not listed.
Philippines inventory (PICCS): At least one component is not listed.
Taiwan inventory (CSNN): Not determined.

Section 16. Other information

Hazardous Material Information System (U.S.A.)

Health *	**2**
Flammability	**1**
Physical hazards	**1**
Personal protection	**H**

The customer is responsible for determining the PPE code for this material.

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on SDSs under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA).

National Fire Protection Association (U.S.A.)

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Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

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Version : 4

r Indicates information that has changed from previously issued version.

Section 16. Other information

Liquid decontaminants (percentages by weight or volume):
Decontaminant 1 : *- sodium carbonate : 5 - 10 % *- liquid detergent : 0.2 - 2 % *- water: to make up to 100 %
Decontaminant 2 : *- concentrated ammonia solution : 3 - 8 % *- liquid detergent : 0.2 - 2 % *- water : to make up to 100 °A)
Decontaminant 1 reacts slower with diisocyanates but is more environmentally friendly than decontaminant 2.
Decontaminant 2 contains ammonia. Ammonia presents health hazards. (See supplier safety information.)
Literature reference: PU 193-1 : 'MDI-Based Compositions: Hazards and Safe Handling Procedures.'
PU 181-15 : Recommended melting procedures for MDI-based isocyanates.
ISOPA Guidelines for safe Loading/Unloading, Transportation, Storage of TDI and MDI, Ref.03-96 PSC-0005-GUIDL.
SPI PMDI User Guidelines for the Chemical Protective Clothing Selection.
References of methods used in the Physico-Chemical Properties section are reported in Annex V part A to Commission Directive 92/69/EEC of 31 July 1992 adapting to technical progress for the Seventeenth time Council Directive 67/548/EEC.

Notice to reader

While the information and recommendations in this publication are to the best of our knowledge, information and belief accurate at the date of publication, NOTHING HEREIN IS TO BE CONSTRUED AS A WARRANTY, EXPRESS OR OTHERWISE.

IN ALL CASES, IT IS THE RESPONSIBILITY OF THE USER TO DETERMINE THE APPLICABILITY OF SUCH INFORMATION AND RECOMMENDATIONS AND THE SUITABILITY OF ANY PRODUCT FOR ITS OWN PARTICULAR PURPOSE.

THE PRODUCT MAY PRESENT HAZARDS AND SHOULD BE USED WITH CAUTION. WHILE CERTAIN HAZARDS ARE DESCRIBED IN THIS PUBLICATION, NO GUARANTEE IS MADE THAT THESE ARE THE ONLY HAZARDS THAT EXIST.

Hazards, toxicity and behavior of the products may differ when used with other materials and are dependent upon the manufacturing circumstances or other processes. Such hazards, toxicity and behavior should be determined by the user and made known to handlers, processors and end users.

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