SAFETY DATA SHEET

DOW CHEMICAL COMPANY LIMITED

Safety Data Sheet according to REACH Regulation (EC) No 1907/2006, as retained and amended in UK law

Product name: VORAMER™ MA 5028 Isocyanate

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DOW CHEMICAL COMPANY LIMITED encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1 Product identifier
Product name: VORAMER™ MA 5028 Isocyanate

1.2 Relevant identified uses of the substance or mixture and uses advised against
Identified uses: Use at industrial sites: Use in flexible foams, thermoplastics and elastomers. Use in rigid foams, coatings, adhesives and sealants. Formulation & (re)packing of substances and mixtures. Use in polymer production. Widespread use by professional workers: Use in flexible foams, thermoplastics and elastomers. Use in rigid foams, coatings, adhesives and sealants. Formulation & (re)packing of substances and mixtures. Use in polymer production.

1.3 Details of the supplier of the safety data sheet
COMPANY IDENTIFICATION
DOW CHEMICAL COMPANY LIMITED
5 OAKWATER AVENUE
CHEADLE ROYAL BUSINESS PARK
CHEADLE
SK8 3SR
UNITED KINGDOM

Customer Information Number: +44 (0) 1663 746518
SDSQuestion@dow.com
Fax: +44 (0) 1663 746605

1.4 EMERGENCY TELEPHONE NUMBER
24-Hour Emergency Contact: 0031 115 694 982
Local Emergency Contact: 00 31 115 69 4982

SECTION 2: HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008, as retained and amended in UK law

Acute toxicity - Category 4 - Inhalation - H332
Skin irritation - Category 2 - H315
Eye irritation - Category 2 - H319
Respiratory sensitisation - Category 1 - H334
Skin sensitisation - Category 1 - H317
Carcinogenicity - Category 2 - H351
Specific target organ toxicity - single exposure - Category 3 - H335
Specific target organ toxicity - repeated exposure - Category 2 - Inhalation - H373
For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 Label elements

Labelling according to Regulation (EC) No 1272/2008, as retained and amended in UK law

Hazard pictograms

Signal word: DANGER

Hazard statements

H315	Causes skin irritation.
H317	May cause an allergic skin reaction.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H334	May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H335	May cause respiratory irritation.
H351	Suspected of causing cancer.
H373	May cause damage to organs (Respiratory Tract, Respiratory system) through prolonged or repeated exposure if inhaled.

Precautionary statements

P201	Obtain special instructions before use.
P260	Do not breathe mist or vapours.
P264	Wash skin thoroughly after handling.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection/ hearing protection.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.

Supplemental information

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Contains Diphenylmethane Diisocyanate (MDI) Prepolymer; Diphenylmethane Diisocyanate, isomers and homologues; 4,4'-methylenediphenyl diisocyanate; o-(p-isocyanatobenzyl)phenyl isocyanate; Diphenylmethane-2,2'-diisocyanate

2.3 Other hazards
This product contains no substances assessed to be PBT or vPvB at levels of 0.1% or higher.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.2 Mixtures

This product is a mixture.

CASRN / EC-No. / Index-No.	UK REACH Registration Number	Concentration	Component	Classification: REGULATION (EC) No 1272/2008, as retained and amended in UK law
CASRN 150409-28-2 **EC-No.** Polymer **Index-No.** –	–	> 50.0 - < 70.0 %	Diphenylmethane Diisocyanate (MDI) Prepolymer	Resp. Sens. 1; H334 Skin Sens. 1; H317
CASRN 9016-87-9 **EC-No.** 618-498-9 **Index-No.** –	–	> 30.0 - < 50.0 %	Diphenylmethane Diisocyanate, isomers and homologues	Acute Tox. 4; H332 Skin Irrit. 2; H315 Eye Irrit. 2; H319 Resp. Sens. 1; H334 Skin Sens. 1; H317 Carc. 2; H351 STOT SE 3; H335 (Respiratory system) STOT RE 2; H373 (Respiratory Tract) Acute toxicity estimate Acute oral toxicity: > 10,000 mg/kg Acute inhalation toxicity: 0.49 mg/l, 4 Hour, dust/mist 2.24 mg/l, 1 Hour, Aerosol 0.387 mg/l, 4 Hour, Aerosol Acute dermal toxicity: > 9,400 mg/kg
CASRN 101-68-8 **EC-No.** 202-966-0	–	> 15.0 - < 30.0 %	4,4'-methylenediphenyl diisocyanate	Acute Tox. 4; H332 Skin Irrit. 2; H315 Eye Irrit. 2; H319 Resp. Sens. 1; H334

Index-No. 615-005-00-9				Skin Sens. 1; H317 Carc. 2; H351 STOT SE 3; H335 (Respiratory system) STOT RE 2; H373 specific concentration limit Eye Irrit. 2; H319 >= 5 % specific concentration limit STOT SE 3; H335 >= 5 % Skin Irrit. 2; H315 >= 5 % Resp. Sens. 1; H334 >= 0.1 % Acute toxicity estimate Acute oral toxicity: > 2,000 mg/kg Acute inhalation toxicity: 2.24 mg/l, 1 Hour, dust/mist Acute dermal toxicity: > 9,400 mg/kg

CASRN 5873-54-1 **EC-No.** 227-534-9 **Index-No.** 615-005-00-9	–	> 0.1 - < 1.0 %	o-(p-isocyanatobenzyl)phenyl isocyanate	Acute Tox. 4; H332 Skin Irrit. 2; H315 Eye Irrit. 2; H319 Resp. Sens. 1; H334 Skin Sens. 1; H317 Carc. 2; H351 STOT SE 3; H335 (Respiratory system) STOT RE 2; H373 specific concentration limit Eye Irrit. 2; H319 >= 5 % specific concentration limit STOT SE 3; H335 >= 5 % Skin Irrit. 2; H315 >= 5 % Resp. Sens. 1; H334 >= 0.1 % Acute toxicity estimate Acute oral toxicity: > 2,000 mg/kg

				Acute inhalation toxicity: 0.387 mg/l, 4 Hour, dust/mist 2.24 mg/l, 1 Hour, Aerosol Acute dermal toxicity: > 9,400 mg/kg

For the full text of the H-Statements mentioned in this Section, see Section 16.

Note
Both CAS# 101-68-8 and CAS# 5873-54-1 are MDI isomers that are part of CAS# 9016-87-9.

SECTION 4: FIRST AID MEASURES

4.1 Description of first aid measures
General advice:
If potential for exposure exists refer to Section 8 for specific personal protective equipment. First Aid responders should pay attention to self-protection and use the recommended protective clothing (chemical resistant gloves, splash protection).

Inhalation: Move person to fresh air and keep comfortable for breathing. If not breathing, give artificial respiration; if by mouth to mouth use rescuer protection (pocket mask, etc). If breathing is difficult, oxygen should be administered by qualified personnel. Call a physician or transport to a medical facility.

Skin contact: Remove material from skin immediately by washing with soap and plenty of water. Remove contaminated clothing and shoes while washing. Seek medical attention if irritation or rash occurs. Wash clothing before reuse. An MDI skin decontamination study demonstrated that cleaning very soon after exposure is important, and that a polyglycol-based skin cleanser or corn oil may be more effective than soap and water. Discard items which cannot be decontaminated, including leather articles such as shoes, belts and watchbands. Suitable emergency safety shower facility should be available in work area.

Eye contact: Immediately flush eyes with water; remove contact lenses, if present, after the first 5 minutes, then continue flushing eyes for at least 15 minutes. Obtain medical attention without delay, preferably from an ophthalmologist. Suitable emergency eye wash facility should be immediately available.

Ingestion: If swallowed, seek medical attention. Do not induce vomiting unless directed to do so by medical personnel.

4.2 Most important symptoms and effects, both acute and delayed:
Causes skin irritation. May cause an allergic skin reaction. Causes serious eye irritation. Harmful if inhaled. May cause allergy or asthma symptoms or breathing difficulties if inhaled. May cause respiratory irritation. Suspected of causing cancer. May cause damage to organs through prolonged or repeated exposure if inhaled.

4.3 Indication of any immediate medical attention and special treatment needed
Notes to physician: Maintain adequate ventilation and oxygenation of the patient. May cause respiratory sensitization or asthma-like symptoms. Bronchodilators, expectorants and antitussives may be of help. Treat bronchospasm with inhaled beta2 agonist and oral or parenteral corticosteroids. Respiratory symptoms, including pulmonary edema, may be delayed. Persons receiving significant

exposure should be observed 24-48 hours for signs of respiratory distress. If you are sensitized to diisocyanates, consult your physician regarding working with other respiratory irritants or sensitizers. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient. Excessive exposure may aggravate preexisting asthma and other respiratory disorders (e.g. emphysema, bronchitis, reactive airways dysfunction syndrome).

SECTION 5: FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media: Water fog or fine spray.. Dry chemical fire extinguishers.. Carbon dioxide fire extinguishers.. Foam.. Alcohol resistant foams (ATC type) are preferred. General purpose synthetic foams (including AFFF) or protein foams may function, but will be less effective..

Unsuitable extinguishing media: Do not use direct water stream.. May spread fire..

5.2 Special hazards arising from the substance or mixture

Hazardous combustion products: During a fire, smoke may contain the original material in addition to combustion products of varying composition which may be toxic and/or irritating.. Combustion products may include and are not limited to:. Nitrogen oxides.. Isocyanates.. Hydrogen cyanide.. Carbon monoxide.. Carbon dioxide..

Unusual Fire and Explosion Hazards: Material reacts slowly with water, releasing carbon dioxide which can cause pressure buildup and rupture of closed containers. Elevated temperatures accelerate this reaction.. Container may rupture from gas generation in a fire situation.. Violent steam generation or eruption may occur upon application of direct water stream to hot liquids.. Dense smoke is produced when product burns.. Electrically ground and bond all equipment..

5.3 Advice for firefighters

Fire Fighting Procedures: Keep people away. Isolate fire and deny unnecessary entry.. Stay upwind. Keep out of low areas where gases (fumes) can accumulate.. Water is not recommended, but may be applied in large quantities as a fine spray when other extinguishing agents are not available.. Fight fire from protected location or safe distance. Consider the use of unmanned hose holders or monitor nozzles.. Immediately withdraw all personnel from the area in case of rising sound from venting safety device or discoloration of the container.. Do not use direct water stream. May spread fire.. Move container from fire area if this is possible without hazard.. Use water spray to cool fire-exposed containers and fire-affected zone until fire is out.. Contain fire water run-off if possible. Fire water run-off, if not contained, may cause environmental damage.. Review the "Accidental Release Measures" and the "Ecological Information" sections of this (M)SDS..

Special protective equipment for firefighters: Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots, and gloves).. Avoid contact with this material during fire fighting operations. If contact is likely, change to full chemical resistant fire fighting clothing with self-contained breathing apparatus. If this is not available, wear full chemical resistant clothing with self-contained breathing apparatus and fight fire from a remote location.. For protective equipment in post-fire or non-fire clean-up situations, see Section 8 of the safety data sheet..

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures: Isolate area. Keep unnecessary and unprotected personnel from entering the area. Refer to section 7, Handling, for additional precautionary measures. Stay out of low areas. Keep personnel out of low areas. Keep upwind of spill. Spilled material may cause a slipping hazard. Ventilate area of leak or spill. If available, use foam to smother or suppress. See Section 10 for more specific information. Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection.

6.2 Environmental precautions: Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information.

6.3 Methods and materials for containment and cleaning up: Contain spilled material if possible. Absorb with materials such as: Dirt. Vermiculite. Sand. Clay. Do NOT use absorbent materials such as: Cement powder (Note: may generate heat). Collect in suitable and properly labeled open containers. Do not place in sealed containers. Suitable containers include: Metal drums. Plastic drums. Polylined fiber pacs. Wash the spill site with large quantities of water. Attempt to neutralize by adding suitable decontaminant solution: Formulation 1: sodium carbonate 5 - 10%; liquid detergent 0.2 - 2%; water to make up to 100%, OR Formulation 2: concentrated ammonia solution 3 - 8%; liquid detergent 0.2 - 2%; water to make up to 100%. If ammonia is used, use good ventilation to prevent vapor exposure. Contact your supplier for clean-up assistance. See Section 13, Disposal Considerations, for additional information.

6.4 Reference to other sections: References to other sections, if applicable, have been provided in the previous sub-sections.

SECTION 7: HANDLING AND STORAGE

7.1 Precautions for safe handling: Avoid breathing vapor. Avoid contact with eyes, skin, and clothing. Avoid prolonged or repeated contact with skin. Use with adequate ventilation. This material is hygroscopic in nature. Wash thoroughly after handling. Keep container tightly closed. See Section 8, EXPOSURE CONTROLS AND PERSONAL PROTECTION.
Spills of these organic materials on hot fibrous insulations may lead to lowering of the autoignition temperatures possibly resulting in spontaneous combustion.

7.2 Conditions for safe storage, including any incompatibilities: Store in a dry place. Protect from atmospheric moisture. Do not store product contaminated with water to prevent potential hazardous reaction. See Section 10 for more specific information. Additional storage and handling information on this product may be obtained by calling your sales or customer service contact.

Storage stability

Storage temperature:	**Storage Period:**
15 - 25 °C	9 Month

7.3 Specific end use(s): See the technical data sheet on this product for further information.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

If exposure limits exist, they are listed below. If no exposure limits are displayed, then no values are applicable.

Component	Regulation	Type of listing	Value
Diphenylmethane Diisocyanate, isomers and homologues	GB EH40	TWA	0.02 mg/m3 , NCO
	Further information: Sen: Capable of causing occupational asthma.		
	GB EH40	STEL	0.07 mg/m3 , NCO
	Further information: Sen: Capable of causing occupational asthma.		
4,4'-methylenediphenyl diisocyanate	ACGIH	TWA	0.005 ppm
	Dow IHG	TWA	0.005 ppm
	Dow IHG	STEL	0.02 ppm
	GB EH40	TWA	0.02 mg/m3 , NCO
	Further information: Sen: Capable of causing occupational asthma.		
	GB EH40	STEL	0.07 mg/m3 , NCO
	Further information: Sen: Capable of causing occupational asthma.		
o-(p-isocyanatobenzyl)phenyl isocyanate	GB EH40	TWA	0.02 mg/m3 , as -NCO
	Further information: 53+54: Substances that can cause occupational asthma (also known as asthmagens and respiratory sensitisers) can induce a state of specific airway hyper-responsiveness via an immunological irritant or other mechanism. Once the airways have become hyper-responsive, further exposure to the substance, sometimes even in tiny quantities, may cause respiratory symptoms. These symptoms can range in severity from a runny nose to asthma. Not all workers who are exposed to a sensitiser will become hyper-responsive and it is impossible to identify in advance those who are likely to become hyper-responsive. Substances that can cause occupational asthma should be distinguished from substances which may trigger the symptoms of asthma in people with pre-existing airway hyper-responsiveness, but which do not include the disease themselves. The latter substances are not classified as asthmagens or respiratory sensitisers. Further information can be found in the HSE publication Asthmagen? Critical assessments of the evidence for agents implicated in occupational asthma.; 55: Wherever it is reasonably practicable, exposure to substances that can cause occupational asthma should be prevented. Where this is not possible, the primary aim is to apply adequate standards of control to prevent workers from becoming hyper-responsive. For substances that can cause occupational asthma, COSHH requires that exposure be reduced to as low as is reasonably practicable. Activities giving rise to short-term peak concentrations should receive particular attention when risk management is being considered. Health surveillance is appropriate for all employees exposed or liable to be exposed to a substance which may cause occupational asthma and there should be appropriate consultation with an occupational health professional over the degree of risk and level of surveillance.; Sen: Capable of causing occupational asthma.; HSC/E plans to review the limit values for this substance.; 56: The 'Sen' notation in the list of WELs has been assigned only to those substances which may cause occupational asthma in the categories shown in Table 1. It should be remembered that other substances not in these tables may cause occupational asthma. HSE's asthma web pages (www.hse.gov.uk/asthma) provide further information.		
	GB EH40	STEL	0.07 mg/m3 , as -NCO
	Further information: 53+54: Substances that can cause occupational asthma (also known as asthmagens and respiratory sensitisers) can induce a state of specific airway hyper-responsiveness via an immunological irritant or other mechanism. Once the airways have become hyper-responsive, further exposure to the substance, sometimes even in tiny quantities, may cause respiratory symptoms. These symptoms can range		

	in severity from a runny nose to asthma. Not all workers who are exposed to a sensitiser will become hyper-responsive and it is impossible to identify in advance those who are likely to become hyper-responsive. Substances that can cause occupational asthma should be distinguished from substances which may trigger the symptoms of asthma in people with pre-existing airway hyper-responsiveness, but which do not include the disease themselves. The latter substances are not classified as asthmagens or respiratory sensitisers. Further information can be found in the HSE publication Asthmagen? Critical assessments of the evidence for agents implicated in occupational asthma.; 55: Wherever it is reasonably practicable, exposure to substances that can cause occupational asthma should be prevented. Where this is not possible, the primary aim is to apply adequate standards of control to prevent workers from becoming hyper-responsive. For substances that can cause occupational asthma, COSHH requires that exposure be reduced to as low as is reasonably practicable. Activities giving rise to short-term peak concentrations should receive particular attention when risk management is being considered. Health surveillance is appropriate for all employees exposed or liable to be exposed to a substance which may cause occupational asthma and there should be appropriate consultation with an occupational health professional over the degree of risk and level of surveillance.; Sen: Capable of causing occupational asthma.; HSC/E plans to review the limit values for this substance.; 56: The 'Sen' notation in the list of WELs has been assigned only to those substances which may cause occupational asthma in the categories shown in Table 1. It should be remembered that other substances not in these tables may cause occupational asthma. HSE's asthma web pages (www.hse.gov.uk/asthma) provide further information.		
	GB EH40	TWA	0.02 mg/m3 , NCO
	Further information: Sen: Capable of causing occupational asthma.		
	GB EH40	STEL	0.07 mg/m3 , NCO
	Further information: Sen: Capable of causing occupational asthma.		

Biological occupational exposure limits

Components	CAS-No.	Control parameters	Biological specimen	Sampling time	Permissible concentration	Basis
Diphenylmethane Diisocyanate, isomers and homologues	9016-87-9	isocyanate-derived diamine (Isocyanates)	Urine	At the end of the period of exposure	1 µmol/mol creatinine	GB EH40 BAT
4,4'-methylenediphenyl diisocyanate	101-68-8	isocyanate-derived diamine (Isocyanates)	Urine	At the end of the period of exposure	1 µmol/mol creatinine	GB EH40 BAT
o-(p-isocyanatobenzyl)phenyl isocyanate	5873-54-1	isocyanate-derived diamine (Isocyanates)	Urine	At the end of the period of exposure	1 µmol/mol creatinine	GB EH40 BAT

Recommended monitoring procedures

Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with the Occupational Exposure Limits and the adequacy of exposure controls. For some substances biological monitoring may also be appropriate. Validated exposure measurement methods should be applied by a competent person and samples should be analysed by an accredited laboratory.
Reference should be made to monitoring standards, such as the following: European Standard EN 689 (Workplace atmospheres - Guidance for the assessment of exposure by inhalation to chemical agents for comparison with limit values and measurement strategy); European Standard EN 14042

(Workplace atmospheres - Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents); European Standard EN 482 (Workplace atmospheres - General requirements for the performance of procedures for the measurement of chemical agents). Reference to national guidance documents for methods for the determination of hazardous substances will also be required.
Examples of sources of recommended exposure measurement methods are given below or contact the supplier. Further national methods may be available.
National Institute of Occupational Safety and Health (NIOSH), USA: Manual of Analytical Methods.
Occupational Safety and Health Administration (OSHA), USA: Sampling and Analytical Methods.
Health and Safety Executive (HSE), United Kingdom: Methods for the Determination of Hazardous Substances.
Institut für Arbeitsschutz Deutschen Gesetzlichen Unfallversicherung (IFA), Germany.
L'Institut National de Recherche et de Securité, (INRS), France.

Derived No Effect Level
4,4'-methylenediphenyl diisocyanate
Workers

Acute systemic effects		***Acute local effects***		***Long-term systemic effects***		***Long-term local effects***	
Dermal	Inhalation	Dermal	Inhalation	Dermal	Inhalation	Dermal	Inhalation
n.a.	n.a.	n.a.	0.100 mg/m3	n.a.	n.a.	n.a.	0.050 mg/m3

Consumers

Acute systemic effects			***Acute local effects***		***Long-term systemic effects***			***Long-term local effects***	
Dermal	Inhalation	Oral	Dermal	Inhalation	Dermal	Inhalation	Oral	Dermal	Inhalation
n.a.	n.a.	n.a.	n.a.	0.050 mg/m3	n.a.	n.a.	n.a.	n.a.	0.025 mg/m3

o-(p-isocyanatobenzyl)phenyl isocyanate
Workers

Acute systemic effects		***Acute local effects***		***Long-term systemic effects***		***Long-term local effects***	
Dermal	Inhalation	Dermal	Inhalation	Dermal	Inhalation	Dermal	Inhalation
n.a.	n.a.	n.a.	0.100 mg/m3	mg/kg bw/day	n.a.	n.a.	0.050 mg/m3

Consumers

Acute systemic effects			***Acute local effects***		***Long-term systemic effects***			***Long-term local effects***	
Dermal	Inhalation	Oral	Dermal	Inhalation	Dermal	Inhalation	Oral	Dermal	Inhalation
n.a.	n.a.	n.a.	n.a.	0.050 mg/m3	mg/kg bw/day	n.a.	mg/kg bw/day	n.a.	0.025 mg/m3

Predicted No Effect Concentration
4,4'-methylenediphenyl diisocyanate

Compartment	**PNEC**
Fresh water	1.0 mg/l
Intermittent use/release	10 mg/l
Marine water	0.100 mg/l

Sewage treatment plant	1.0 mg/l
Soil	1.0 mg/kg dry weight (d.w.)

o-(p-isocyanatobenzyl)phenyl isocyanate

Compartment	**PNEC**
Fresh water	0.0037 mg/l
Intermittent use/release	0.037 mg/l
Marine water	0.370 mg/l
Fresh water sediment	11.7 mg/kg dry weight (d.w.)
Marine sediment	1.17 mg/kg dry weight (d.w.)
Soil	2.33 mg/kg dry weight (d.w.)

8.2 Exposure controls

Engineering controls: Use only with adequate ventilation. Local exhaust ventilation may be necessary for some operations. Provide general and/or local exhaust ventilation to control airborne levels below the exposure guidelines. Exhaust systems should be designed to move the air away from the source of vapor/aerosol generation and people working at this point. The odor and irritancy of this material are inadequate to warn of excessive exposure.

Individual protection measures

Eye/face protection: Use chemical goggles. Chemical goggles should be consistent with EN 166 or equivalent.

Skin protection

Hand protection: Use chemical resistant gloves classified under Standard EN374: Protective gloves against chemicals and micro-organisms. Examples of preferred glove barrier materials include: Polyethylene. Ethyl vinyl alcohol laminate ("EVAL"). Examples of acceptable glove barrier materials include: Butyl rubber. Avoid gloves made of: Neoprene. Polyvinyl chloride ("PVC" or "vinyl"). When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes according to EN 374) is recommended. When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374) is recommended. Glove thickness alone is not a good indicator of the level of protection a glove provides against a chemical substance as this level of protection is also highly dependent on the specific composition of the material that the glove is fabricated from. The thickness of the glove must, depending on model and type of material, generally be more than 0.35 mm to offer sufficient protection for prolonged and frequent contact with the substance. As an exception to this general rule it is known that multilayer laminate gloves may offer prolonged protection at thicknesses less than 0.35 mm. Other glove materials with a thickness of less than 0.35 mm may offer sufficient protection when only brief contact is expected. NOTICE: The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all relevant workplace factors such as, but not limited to: Other chemicals which may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), potential body reactions to glove materials, as well as the instructions/specifications provided by the glove supplier.

Other protection: Use protective clothing chemically resistant to this material. Selection of specific items such as face shield, boots, apron, or full body suit will depend on the task.

Respiratory protection: Atmospheric levels should be maintained below the exposure guideline. When atmospheric levels may exceed the exposure guideline, use an approved air-

purifying respirator equipped with an organic vapor sorbent and a particle filter. For situations where the atmospheric levels may exceed the level for which an air-purifying respirator is effective, use a positive-pressure air-supplying respirator (air line or self-contained breathing apparatus). For emergency response or for situations where the atmospheric level is unknown, use an approved positive-pressure self-contained breathing apparatus or positive-pressure air line with auxiliary self-contained air supply.
Use the following CE approved air-purifying respirator: Organic vapor cartridge with a highly toxic particulate pre-filter, type AP3 (meeting standard EN 14387).

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	
Physical state	Liquid.
Color	Colorless to amber
Odor	characteristic
Odor Threshold	0.4 ppm *Based on Literature for MDI.* Odor is inadequate warning of excessive exposure.
pH	Not applicable, substance/mixture reacts with water
Melting point/range	No test data available
Freezing point	No test data available
Boiling point (760 mmHg)	Decomposes before boiling
Flash point	**closed cup** >200 °C *Estimated.*
Evaporation Rate (Butyl Acetate = 1)	No test data available
Flammability (solid, gas)	Not Applicable
Flammability (liquids)	Not expected to be a static-accumulating flammable liquid.
Lower explosion limit	No test data available
Upper explosion limit	No test data available
Vapor Pressure	< 0.000012 hPa at 25 °C *Literature*
Relative Vapor Density (air = 1)	8.5 *Literature*
Relative Density (water = 1)	1.11 - 1.15 at 20 °C / 20 °C *ASTM D891*
Water solubility	insoluble
Partition coefficient: n-octanol/water	No data available
Auto-ignition temperature	No test data available
Decomposition temperature	No test data available
Kinematic Viscosity	3300 - 6500 mm2/s at 20 °C *ASTM D4889*
Explosive properties	Not explosive
Oxidizing properties	No

9.2 Other information

Molecular weight	No test data available

NOTE: The physical data presented above are typical values and should not be construed as a specification.

SECTION 10: STABILITY AND REACTIVITY

10.1 Reactivity: Products based on diisocyanates like TDI and MDI react with many materials to release heat. The reaction rate increases with temperature as well as with increased contact; these reactions can become violent. Contact is increased by stirring or if the other material acts as a solvent. Products based on diisocyanates such as TDI and MDI are not soluble in water and will sink to the bottom, but react slowly at the interface. The reaction forms carbon dioxide gas and a layer of solid polyurea.

10.2 Chemical stability: Stable under recommended storage conditions. See Storage, Section 7.

10.3 Possibility of hazardous reactions: Can occur. Exposure to elevated temperatures can cause product to decompose and generate gas. This can cause pressure build-up and/or rupturing of closed containers. Polymerization can be catalyzed by: Strong bases. Water.

10.4 Conditions to avoid: Exposure to elevated temperatures can cause product to decompose. Generation of gas during decomposition can cause pressure in closed systems. Pressure build-up can be rapid. Avoid moisture. Material reacts slowly with water, releasing carbon dioxide which can cause pressure buildup and rupture of closed containers. Elevated temperatures accelerate this reaction.

10.5 Incompatible materials: Avoid contact with: Acids. Alcohols. Amines. Water. Ammonia. Bases. Metal compounds. Moist air. Strong oxidizers. Products based on diisocyanates like TDI and MDI react with many materials to release heat. The reaction rate increases with temperature as well as with increased contact; these reactions can become violent. Contact is increased by stirring or if the other material acts as a solvent. Products based on diisocyanates such as TDI and MDI are not soluble in water and will sink to the bottom, but react slowly at the interface. The reaction forms carbon dioxide gas and a layer of solid polyurea. Avoid contact with metals such as: Aluminum. Zinc. Brass. Tin. Copper. Galvanized metals. Avoid contact with absorbent materials such as: Moist organic absorbents. Avoid unintended contact with polyols. The reaction of polyols and isocyanates generate heat.

10.6 Hazardous decomposition products: Decomposition products depend upon temperature, air supply and the presence of other materials.. Gases are released during decomposition..

SECTION 11: TOXICOLOGICAL INFORMATION

Toxicological information appears in this section when such data are available.

11.1 Information on toxicological effects

Information on likely routes of exposure
Ingestion, Inhalation, Skin contact, Eye contact.

Acute toxicity (represents short term exposures with immediate effects - no chronic/delayed effects known unless otherwise noted)

Acute Toxicity Endpoints:
Harmful if inhaled.

Acute oral toxicity

Information for the Product:

Low toxicity if swallowed. Small amounts swallowed incidentally as a result of normal handling operations are not likely to cause injury; however, swallowing larger amounts may cause injury. Observations in animals include: Gastrointestinal irritation.

As product: Single dose oral LD50 has not been determined.

Based on information for component(s):
LD50, Rat, > 2,000 mg/kg Estimated.

Information for components:

Diphenylmethane Diisocyanate (MDI) Prepolymer
Single dose oral LD50 has not been determined.

Diphenylmethane Diisocyanate, isomers and homologues
Typical for this family of materials. LD50, Rat, > 10,000 mg/kg

4,4'-methylenediphenyl diisocyanate
LD50, Rat, > 2,000 mg/kg No deaths occurred at this concentration.

o-(p-isocyanatobenzyl)phenyl isocyanate
For similar material(s): LD50, Rat, > 2,000 mg/kg

Acute dermal toxicity

Information for the Product:

Prolonged skin contact is unlikely to result in absorption of harmful amounts.

As product: The dermal LD50 has not been determined.

Based on information for component(s):
LD50, Rabbit, > 2,000 mg/kg Estimated.

Information for components:

Diphenylmethane Diisocyanate (MDI) Prepolymer
The dermal LD50 has not been determined.

Diphenylmethane Diisocyanate, isomers and homologues
Typical for this family of materials. LD50, Rabbit, > 9,400 mg/kg

4,4'-methylenediphenyl diisocyanate
LD50, Rabbit, > 9,400 mg/kg

o-(p-isocyanatobenzyl)phenyl isocyanate
For similar material(s): LD50, Rabbit, > 9,400 mg/kg

Acute inhalation toxicity

Information for the Product:

At room temperature, vapors are minimal due to low volatility. However, certain operations may generate vapor or mist concentrations sufficient to cause respiratory irritation and other adverse effects. Such operations include those in which the material is heated, sprayed or otherwise mechanically dispersed such as drumming, venting or pumping. Excessive exposure may cause irritation to upper respiratory tract (nose and throat) and lungs. May cause pulmonary edema (fluid in the lungs.) Effects may be delayed. Decreased lung function has been associated with overexposure to isocyanates.

As product: The LC50 has not been determined.

Information for components:

Diphenylmethane Diisocyanate (MDI) Prepolymer
The LC50 has not been determined.

Diphenylmethane Diisocyanate, isomers and homologues
LC50, Rat, 4 Hour, dust/mist, 0.49 mg/l

For similar material(s): 4,4'-Methylenediphenyl diisocyanate (CAS 101-68-8). LC50, Rat, 1 Hour, Aerosol, 2.24 mg/l

For similar material(s): 2,4'-Diphenylmethane diisocyanate (CAS 5873-54-1). LC50, Rat, 4 Hour, Aerosol, 0.387 mg/l

4,4'-methylenediphenyl diisocyanate
LC50, Rat, 1 Hour, dust/mist, 2.24 mg/l

o-(p-isocyanatobenzyl)phenyl isocyanate
LC50, Rat, 4 Hour, dust/mist, 0.387 mg/l

For similar material(s): 4,4'-Methylenediphenyl diisocyanate (CAS 101-68-8). LC50, Rat, 1 Hour, Aerosol, 2.24 mg/l

Skin corrosion/irritation

Causes skin irritation.

Information for the Product:

Based on information for component(s):
Prolonged contact may cause skin irritation with local redness.
Material may stick to skin causing irritation upon removal.
May stain skin.

Information for components:

Diphenylmethane Diisocyanate (MDI) Prepolymer

Prolonged contact is essentially nonirritating to skin.

Diphenylmethane Diisocyanate, isomers and homologues
Prolonged contact may cause slight skin irritation with local redness.
May stain skin.

4,4'-methylenediphenyl diisocyanate
Prolonged contact may cause moderate skin irritation with local redness.
Repeated contact may cause moderate skin irritation with local redness.
May stain skin.

o-(p-isocyanatobenzyl)phenyl isocyanate
Prolonged contact may cause moderate skin irritation with local redness.
Repeated contact may cause moderate skin irritation with local redness.
May stain skin.

Serious eye damage/eye irritation

Causes serious eye irritation.

Information for the Product:

Based on information for component(s):
May cause eye irritation.
May cause slight temporary corneal injury.

Information for components:

Diphenylmethane Diisocyanate (MDI) Prepolymer
Essentially nonirritating to eyes.

Diphenylmethane Diisocyanate, isomers and homologues
May cause moderate eye irritation.
May cause slight temporary corneal injury.

4,4'-methylenediphenyl diisocyanate
May cause moderate eye irritation.
May cause slight temporary corneal injury.

o-(p-isocyanatobenzyl)phenyl isocyanate
May cause moderate eye irritation.
May cause slight temporary corneal injury.

Sensitization

For skin sensitization:
May cause an allergic skin reaction.

For respiratory sensitization:
May cause allergy or asthma symptoms or breathing difficulties if inhaled.

Information for the Product:

For skin sensitization:
A component in this mixture has been shown to be a skin sensitizer.
Animal studies have shown that skin contact with isocyanates may play a role in respiratory sensitization.

For respiratory sensitization:
A component in this mixture may cause an allergic respiratory response.
MDI concentrations below the exposure guidelines may cause allergic respiratory reactions in individuals already sensitized.
Asthma-like symptoms may include coughing, difficult breathing and a feeling of tightness in the chest. Occasionally, breathing difficulties may be life threatening.

Information for components:

Diphenylmethane Diisocyanate (MDI) Prepolymer
Skin contact may cause an allergic skin reaction.

May cause sensitisation by inhalation.

Diphenylmethane Diisocyanate, isomers and homologues
Skin contact may cause an allergic skin reaction.
Animal studies have shown that skin contact with isocyanates may play a role in respiratory sensitization.

May cause allergic respiratory reaction.
MDI concentrations below the exposure guidelines may cause allergic respiratory reactions in individuals already sensitized.
Asthma-like symptoms may include coughing, difficult breathing and a feeling of tightness in the chest. Occasionally, breathing difficulties may be life threatening.

4,4'-methylenediphenyl diisocyanate
For skin sensitization:
Skin contact may cause an allergic skin reaction.
Animal studies have shown that skin contact with isocyanates may play a role in respiratory sensitization.

For respiratory sensitization:
May cause allergic respiratory reaction.
MDI concentrations below the exposure guidelines may cause allergic respiratory reactions in individuals already sensitized.
Asthma-like symptoms may include coughing, difficult breathing and a feeling of tightness in the chest. Occasionally, breathing difficulties may be life threatening.

o-(p-isocyanatobenzyl)phenyl isocyanate
For skin sensitization:
For similar material(s):
Skin contact may cause an allergic skin reaction.
Animal studies have shown that skin contact with isocyanates may play a role in respiratory sensitization.

For respiratory sensitization:
May cause allergic respiratory reaction.

MDI concentrations below the exposure guidelines may cause allergic respiratory reactions in individuals already sensitized.
Asthma-like symptoms may include coughing, difficult breathing and a feeling of tightness in the chest. Occasionally, breathing difficulties may be life threatening.

Specific Target Organ Systemic Toxicity (Single Exposure)

May cause respiratory irritation.

Information for the Product:

Product test data not available.

Information for components:

Diphenylmethane Diisocyanate (MDI) Prepolymer
Available data are inadequate to determine single exposure specific target organ toxicity.

Diphenylmethane Diisocyanate, isomers and homologues
May cause respiratory irritation.
Route of Exposure: Inhalation
Target Organs: Respiratory Tract

4,4'-methylenediphenyl diisocyanate
May cause respiratory irritation.
Route of Exposure: Inhalation
Target Organs: Respiratory Tract

o-(p-isocyanatobenzyl)phenyl isocyanate
May cause respiratory irritation.
Route of Exposure: Inhalation
Target Organs: Respiratory Tract

Aspiration Hazard

Information for the Product:

Based on physical properties, not likely to be an aspiration hazard.

Information for components:

Diphenylmethane Diisocyanate (MDI) Prepolymer
Based on physical properties, not likely to be an aspiration hazard.

Diphenylmethane Diisocyanate, isomers and homologues
Based on physical properties, not likely to be an aspiration hazard.

4,4'-methylenediphenyl diisocyanate
Based on physical properties, not likely to be an aspiration hazard.

o-(p-isocyanatobenzyl)phenyl isocyanate
Based on physical properties, not likely to be an aspiration hazard.

Chronic toxicity (represents longer term exposures with repeated dose resulting in chronic/delayed effects - no immediate effects known unless otherwise noted)

Specific Target Organ Systemic Toxicity (Repeated Exposure)

May cause damage to organs (Respiratory Tract, Respiratory system) through prolonged or repeated exposure if inhaled.

Information for the Product:

Product test data not available.

Information for components:

Diphenylmethane Diisocyanate (MDI) Prepolymer
No relevant data found.

Diphenylmethane Diisocyanate, isomers and homologues
Tissue injury in the upper respiratory tract and lungs has been observed in laboratory animals after repeated excessive exposures to MDI/polymeric MDI aerosols.

4,4'-methylenediphenyl diisocyanate
Tissue injury in the upper respiratory tract and lungs has been observed in laboratory animals after repeated excessive exposures to MDI/polymeric MDI aerosols.

o-(p-isocyanatobenzyl)phenyl isocyanate
Tissue injury in the upper respiratory tract and lungs has been observed in laboratory animals after repeated excessive exposures to MDI/polymeric MDI aerosols.

Carcinogenicity

Suspected of causing cancer.

Information for the Product:

Product test data not available.

Information for components:

Diphenylmethane Diisocyanate (MDI) Prepolymer
No relevant data found.

Diphenylmethane Diisocyanate, isomers and homologues
Lung tumors have been observed in laboratory animals exposed to respirable aerosol droplets of MDI/Polymeric MDI (6 mg/m3) for their lifetime. Tumors occurred concurrently with respiratory irritation and lung injury. Current exposure guidelines are expected to protect against these effects reported for MDI.

4,4'-methylenediphenyl diisocyanate
Lung tumors have been observed in laboratory animals exposed to respirable aerosol droplets of MDI/Polymeric MDI (6 mg/m3) for their lifetime. Tumors occurred concurrently

with respiratory irritation and lung injury. Current exposure guidelines are expected to protect against these effects reported for MDI.

o-(p-isocyanatobenzyl)phenyl isocyanate
Lung tumors have been observed in laboratory animals exposed to respirable aerosol droplets of MDI/Polymeric MDI (6 mg/m3) for their lifetime. Tumors occurred concurrently with respiratory irritation and lung injury. Current exposure guidelines are expected to protect against these effects reported for MDI.

Teratogenicity

Information for the Product:

Product test data not available.

Information for components:

Diphenylmethane Diisocyanate (MDI) Prepolymer
No relevant data found.

Diphenylmethane Diisocyanate, isomers and homologues
In laboratory animals, MDI/polymeric MDI did not cause birth defects; other fetal effects occurred only at high doses which were toxic to the mother.

4,4'-methylenediphenyl diisocyanate
Has been toxic to the fetus in laboratory animals at doses toxic to the mother. Did not cause birth defects in laboratory animals.

o-(p-isocyanatobenzyl)phenyl isocyanate
For similar material(s): Has been toxic to the fetus in laboratory animals at doses toxic to the mother. Did not cause birth defects in laboratory animals.

Reproductive toxicity

Information for the Product:

Product test data not available.

Information for components:

Diphenylmethane Diisocyanate (MDI) Prepolymer
No relevant data found.

Diphenylmethane Diisocyanate, isomers and homologues
No relevant data found.

4,4'-methylenediphenyl diisocyanate
No relevant data found.

o-(p-isocyanatobenzyl)phenyl isocyanate
No relevant data found.

Mutagenicity

Information for the Product:

Product test data not available.

Information for components:

Diphenylmethane Diisocyanate (MDI) Prepolymer
No relevant data found.

No relevant data found.

Diphenylmethane Diisocyanate, isomers and homologues
Genetic toxicity data on MDI are inconclusive. MDI was weakly positive in some in vitro studies; other in vitro studies were negative. Animal mutagenicity studies were predominantly negative.

4,4'-methylenediphenyl diisocyanate
Genetic toxicity data on MDI are inconclusive. MDI was weakly positive in some in vitro studies; other in vitro studies were negative. Animal mutagenicity studies were predominantly negative.

o-(p-isocyanatobenzyl)phenyl isocyanate
For similar material(s): Genetic toxicity data on MDI are inconclusive. MDI was weakly positive in some in vitro studies; other in vitro studies were negative. Animal mutagenicity studies were predominantly negative.

SECTION 12: ECOLOGICAL INFORMATION

Ecotoxicological information appears in this section when such data are available.

12.1 Toxicity

Diphenylmethane Diisocyanate (MDI) Prepolymer

Acute toxicity to fish
No relevant data found.

Diphenylmethane Diisocyanate, isomers and homologues

Acute toxicity to fish
The measured ecotoxicity is that of the hydrolyzed product, generally under conditions maximizing production of soluble species.
Material is not classified as dangerous to aquatic organisms (LC50/EC50/IC50/LL50/EL50 greater than 100 mg/L in most sensitive species).
For similar material(s):
LC50, Danio rerio (zebra fish), static test, 96 Hour, > 1,000 mg/l, OECD Test Guideline 203 or Equivalent

Acute toxicity to aquatic invertebrates

For similar material(s):
EC50, Daphnia magna (Water flea), static test, 24 Hour, > 1,000 mg/l, OECD Test Guideline 202 or Equivalent

Acute toxicity to algae/aquatic plants
For similar material(s):
NOEC, Desmodesmus subspicatus (green algae), static test, 72 Hour, Growth rate inhibition, 1,640 mg/l, OECD Test Guideline 201 or Equivalent

Toxicity to bacteria
For similar material(s):
EC50, activated sludge, static test, 3 Hour, Respiration rates., > 100 mg/l

Toxicity to soil-dwelling organisms
EC50, Eisenia fetida (earthworms), Based on information for a similar material:, 14 d, > 1,000 mg/kg

Toxicity to terrestrial plants
EC50, Avena sativa (oats), Growth inhibition, 1,000 mg/l
EC50, Lactuca sativa (lettuce), Growth inhibition, 1,000 mg/l

4,4'-methylenediphenyl diisocyanate

Acute toxicity to fish
The measured ecotoxicity is that of the hydrolyzed product, generally under conditions maximizing production of soluble species.
Material is not classified as dangerous to aquatic organisms (LC50/EC50/IC50/LL50/EL50 greater than 100 mg/L in most sensitive species).
Based on information for a similar material:
LC50, Danio rerio (zebra fish), static test, 96 Hour, > 1,000 mg/l, OECD Test Guideline 203 or Equivalent

Acute toxicity to aquatic invertebrates
Based on information for a similar material:
EC50, Daphnia magna (Water flea), static test, 24 Hour, > 1,000 mg/l, OECD Test Guideline 202 or Equivalent

Acute toxicity to algae/aquatic plants
Based on information for a similar material:
NOEC, Desmodesmus subspicatus (green algae), static test, 72 Hour, Growth rate inhibition, 1,640 mg/l, OECD Test Guideline 201 or Equivalent

Toxicity to bacteria
Based on information for a similar material:
EC50, activated sludge, static test, 3 Hour, Respiration rates., > 100 mg/l

Toxicity to soil-dwelling organisms
EC50, Eisenia fetida (earthworms), Based on information for a similar material:, 14 d, > 1,000 mg/kg

Toxicity to terrestrial plants
EC50, Avena sativa (oats), Growth inhibition, 1,000 mg/l
EC50, Lactuca sativa (lettuce), Growth inhibition, 1,000 mg/l

o-(p-isocyanatobenzyl)phenyl isocyanate

Acute toxicity to fish
The measured ecotoxicity is that of the hydrolyzed product, generally under conditions maximizing production of soluble species.
Material is not classified as dangerous to aquatic organisms (LC50/EC50/IC50/LL50/EL50 greater than 100 mg/L in most sensitive species).
Based on information for a similar material:
LC50, Danio rerio (zebra fish), static test, 96 Hour, > 1,000 mg/l, OECD Test Guideline 203 or Equivalent

Acute toxicity to aquatic invertebrates
Based on information for a similar material:
EC50, Daphnia magna (Water flea), static test, 24 Hour, > 1,000 mg/l, OECD Test Guideline 202 or Equivalent

Acute toxicity to algae/aquatic plants
Based on information for a similar material:
NOEC, Desmodesmus subspicatus (green algae), static test, 72 Hour, Growth rate inhibition, 1,640 mg/l, OECD Test Guideline 201 or Equivalent

Toxicity to bacteria
Based on information for a similar material:
EC50, activated sludge, static test, 3 Hour, Respiration rates., > 100 mg/l

Chronic toxicity to aquatic invertebrates
Based on data from similar materials
NOEC, Daphnia magna (Water flea), 21 d, >= 10 mg/l

Toxicity to soil-dwelling organisms
EC50, Eisenia fetida (earthworms), Based on information for a similar material:, 14 d, > 1,000 mg/kg

Toxicity to terrestrial plants
EC50, Avena sativa (oats), Growth inhibition, 1,000 mg/l
EC50, Lactuca sativa (lettuce), Growth inhibition, 1,000 mg/l

12.2 Persistence and degradability

Diphenylmethane Diisocyanate (MDI) Prepolymer
Biodegradability: No relevant data found.

Diphenylmethane Diisocyanate, isomers and homologues
Biodegradability: In the aquatic and terrestrial environment, material reacts with water forming predominantly insoluble polyureas which appear to be stable. In the atmospheric environment, material is expected to have a short tropospheric half-life, based on calculations and by analogy with related diisocyanates.
10-day Window: Not applicable
Biodegradation: 0 %
Exposure time: 28 d
Method: OECD Test Guideline 302C or Equivalent

4,4'-methylenediphenyl diisocyanate

Biodegradability: In the aquatic and terrestrial environment, material reacts with water forming predominantly insoluble polyureas which appear to be stable. In the atmospheric environment, material is expected to have a short tropospheric half-life, based on calculations and by analogy with related diisocyanates.
10-day Window: Not applicable
Biodegradation: 0 %
Exposure time: 28 d
Method: OECD Test Guideline 302C or Equivalent

o-(p-isocyanatobenzyl)phenyl isocyanate

Biodegradability: In the aquatic and terrestrial environment, material reacts with water forming predominantly insoluble polyureas which appear to be stable. In the atmospheric environment, material is expected to have a short tropospheric half-life, based on calculations and by analogy with related diisocyanates.
10-day Window: Not applicable
Biodegradation: 0 %
Exposure time: 28 d
Method: OECD Test Guideline 302C or Equivalent

12.3 Bioaccumulative potential

Diphenylmethane Diisocyanate (MDI) Prepolymer

Bioaccumulation: No relevant data found.

Diphenylmethane Diisocyanate, isomers and homologues

Bioaccumulation: Bioconcentration potential is low (BCF < 100 or Log Pow < 3). Reacts with water. In the aquatic and terrestrial environment, movement is expected to be limited by its reaction with water forming predominantly insoluble polyureas.
Bioconcentration factor (BCF): 92 Cyprinus carpio (Carp) 28 d

4,4'-methylenediphenyl diisocyanate

Bioaccumulation: Bioconcentration potential is low (BCF < 100 or Log Pow < 3). Reacts with water. In the aquatic and terrestrial environment, movement is expected to be limited by its reaction with water forming predominantly insoluble polyureas.
Bioconcentration factor (BCF): 92 Cyprinus carpio (Carp) 28 d

o-(p-isocyanatobenzyl)phenyl isocyanate

Bioaccumulation: Bioconcentration potential is low (BCF < 100 or Log Pow < 3). Reacts with water. In the aquatic and terrestrial environment, movement is expected to be limited by its reaction with water forming predominantly insoluble polyureas.
Bioconcentration factor (BCF): 92 Cyprinus carpio (Carp) 28 d

12.4 Mobility in soil

Diphenylmethane Diisocyanate (MDI) Prepolymer

No relevant data found.

Diphenylmethane Diisocyanate, isomers and homologues

In the aquatic and terrestrial environment, movement is expected to be limited by its reaction with water forming predominantly insoluble polyureas.

4,4'-methylenediphenyl diisocyanate

In the aquatic and terrestrial environment, movement is expected to be limited by its reaction with water forming predominantly insoluble polyureas.

o-(p-isocyanatobenzyl)phenyl isocyanate

In the aquatic and terrestrial environment, movement is expected to be limited by its reaction with water forming predominantly insoluble polyureas.

12.5 Results of PBT and vPvB assessment

Diphenylmethane Diisocyanate (MDI) Prepolymer

This substance has not been assessed for persistence, bioaccumulation and toxicity (PBT).

Diphenylmethane Diisocyanate, isomers and homologues

This substance is not considered to be persistent, bioaccumulating and toxic (PBT).

4,4'-methylenediphenyl diisocyanate

This substance is not considered to be persistent, bioaccumulating and toxic (PBT).

o-(p-isocyanatobenzyl)phenyl isocyanate

This substance has not been assessed for persistence, bioaccumulation and toxicity (PBT).

12.6 Other adverse effects

Diphenylmethane Diisocyanate (MDI) Prepolymer

This substance is not on the Montreal Protocol list of substances that deplete the ozone layer.

Diphenylmethane Diisocyanate, isomers and homologues

This substance is not on the Montreal Protocol list of substances that deplete the ozone layer.

4,4'-methylenediphenyl diisocyanate

This substance is not on the Montreal Protocol list of substances that deplete the ozone layer.

o-(p-isocyanatobenzyl)phenyl isocyanate

This substance is not on the Montreal Protocol list of substances that deplete the ozone layer.

SECTION 13: DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

This product, when being disposed of in its unused and uncontaminated state should be treated as a hazardous waste according to EC Directive 2008/98/EC. Any disposal practices must be in compliance with all national and provincial laws and any municipal or local by-laws governing hazardous waste. For used, contaminated and residual materials additional evaluations may be required. Do not dump into any sewers, on the ground, or into any body of water. Incineration under approved, controlled conditions using incinerators suitable or designed for the disposal of hazardous chemical wastes, is the preferred method for disposal. Small quantities of waste may be pretreated for example with polyol, to neutralise prior to disposal. Empty drums should be decontaminated (see Section 6) and either punctured and scrapped or given to an approved drum reconditioner.

The definitive assignment of this material to the appropriate EWC group and thus its proper EWC code will depend on the use that is made of this material. Contact the authorized waste disposal services.

SECTION 14: TRANSPORT INFORMATION

Classification for ROAD and Rail transport (ADR/RID):

14.1	**UN number or ID number**	Not applicable
14.2	**UN proper shipping name**	Not regulated for transport
14.3	**Transport hazard class(es)**	Not applicable
14.4	**Packing group**	Not applicable
14.5	**Environmental hazards**	Not considered environmentally hazardous based on available data.
14.6	**Special precautions for user**	No data available.

Classification for INLAND waterways (ADNR/ADN):
Consult your Dow contact before transporting by inland waterway

Classification for SEA transport (IMO-IMDG):

14.1	**UN number or ID number**	Not applicable
14.2	**UN proper shipping name**	Not regulated for transport
14.3	**Transport hazard class(es)**	Not applicable
14.4	**Packing group**	Not applicable
14.5	**Environmental hazards**	Not considered as marine pollutant based on available data.
14.6	**Special precautions for user**	No data available.
14.7	**Maritime transport in bulk according to IMO instruments**	Consult IMO regulations before transporting ocean bulk

Classification for AIR transport (IATA/ICAO):

14.1	**UN number or ID number**	Not applicable
14.2	**UN proper shipping name**	Not regulated for transport
14.3	**Transport hazard class(es)**	Not applicable
14.4	**Packing group**	Not applicable
14.5	**Environmental hazards**	Not applicable
14.6	**Special precautions for user**	No data available.

This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Transportation classifications may vary by container volume and may be influenced by regional or country variations in regulations. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.

SECTION 15: REGULATORY INFORMATION

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

UK REACH - UK Statutory Instruments 2019 No.758 as amended
This product contains only components that have been either registered, notified for downstream user import (DUIN), are exempt from registration, are regarded as registered or are not subject to registration according to UK Statutory Instruments 2019 No.758 as amended (UK REACH)., Polymers are exempted from registration under REACH. All relevant starting materials and additives have been registered, notified for downstream user import (DUIN) or are exempt from registration according to UK Statutory Instruments 2019 No.758 as amended (UK REACH)., The aforementioned indications of the UK REACH registration status are provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, expressed or implied, is given. It is the buyer's/user's responsibility to ensure that his/her understanding of the regulatory status of this product is correct.

UK REACH List of restrictions (Annex 17)

Conditions of restriction for the following entries should be considered:
Number on list 3
Diphenylmethane Diisocyanate, isomers and homologues (Number on list 56, 74)
4,4'-methylenediphenyl diisocyanate (Number on list 56, 74)
o-(p-isocyanatobenzyl)phenyl isocyanate (Number on list 56, 74)

Control of Major Accident Hazards Regulations 2015 (COMAH)
Listed in Regulation: Not applicable

15.2 Chemical safety assessment
No Chemical Safety Assessment has been carried out for this substance/mixture.

SECTION 16: OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H315	Causes skin irritation.
H317	May cause an allergic skin reaction.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H334	May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H335	May cause respiratory irritation.
H351	Suspected of causing cancer.
H373	May cause damage to organs through prolonged or repeated exposure.

Classification and procedure used to derive the classification for mixtures according to Regulation (EC) No 1272/2008
Acute Tox. - 4 - H332 - Based on product data or assessment
Skin Irrit. - 2 - H315 - Calculation method
Eye Irrit. - 2 - H319 - Calculation method
Resp. Sens. - 1 - H334 - Calculation method
Skin Sens. - 1 - H317 - Calculation method
Carc. - 2 - H351 - Calculation method
STOT SE - 3 - H335 - Calculation method
STOT RE - 2 - H373 - Calculation method

Training advice
In accordance with REACH Annex XVII, restriction no. 74, from 24 August 2023 adequate training is required before industrial or professional use.

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Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

Legend

ACGIH	USA. ACGIH Threshold Limit Values (TLV)
Dow IHG	Dow Industrial Hygiene Guideline
GB EH40	UK. EH40 WEL - Workplace Exposure Limits
GB EH40 BAT	UK. Biological monitoring guidance values
STEL	Short term exposure limit
TWA	Time weighted average
Acute Tox.	Acute toxicity
Carc.	Carcinogenicity
Eye Irrit.	Eye irritation
Resp. Sens.	Respiratory sensitisation
Skin Irrit.	Skin irritation
Skin Sens.	Skin sensitisation
STOT RE	Specific target organ toxicity - repeated exposure
STOT SE	Specific target organ toxicity - single exposure

Full text of other abbreviations
ADN - European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways; ADR - Agreement concerning the International Carriage of Dangerous Goods by Road; AIIC - Australian Inventory of Industrial Chemicals; ASTM - American Society for the Testing of Materials; bw - Body weight; CLP - Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DSL - Domestic Substances List (Canada); ECHA - European Chemicals Agency; EC-Number - European Community number; ECx - Concentration associated with x% response; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; GHS - Globally Harmonized System; GLP - Good Laboratory Practice; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organization; ISHL - Industrial Safety and Health Law (Japan); ISO -

International Organisation for Standardization; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; n.o.s. - Not Otherwise Specified; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NZIoC - New Zealand Inventory of Chemicals; OECD - Organization for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; RID - Regulations concerning the International Carriage of Dangerous Goods by Rail; SADT - Self-Accelerating Decomposition Temperature; SDS - Safety Data Sheet; SVHC - Substance of Very High Concern; TCSI - Taiwan Chemical Substance Inventory; TECI - Thailand Existing Chemicals Inventory; TRGS - Technical Rule for Hazardous Substances; TSCA - Toxic Substances Control Act (United States); UN - United Nations; vPvB - Very Persistent and Very Bioaccumulative

Information Source and References
This SDS is prepared by Product Regulatory Services and Hazard Communications Groups from information supplied by internal references within our company.

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