DESMODUR 44 MC LIQUID

Version 9.0 Revision Date 26.02.2025 Print Date 27.02.2025

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

DESMODUR 44 MC LIQUID

Chemical name: diphenylmethane-4,4'-diisocyanate
Material number: 04833805

1.2 Relevant identified uses of the substance or mixture and uses advised against

Use:
Di-/polyisocyanate components for the production of polyurethanes
For details of the identified uses according to REACH-Regulation (EU) No. 1907/2006 refer to the annex of this safety data sheet.

Uses advised against:
Consumer spray application is not supported.
Consumer applications that require heating above room temperature before or during use are not supported.
Professional cleaning activities with Aprotic Polar Solvents are not supported.

1.3 Details of the supplier of the safety data sheet

Covestro Deutschland AG
COV Global Product Safety
51365 Leverkusen

Tel.: +49 214 6009 8134
Email: ProductSafetyEMLA@covestro.com

1.4 Emergency telephone number

+1-703-527-3887 (Chemtrec)

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Acute toxicity, Inhalative, Category 4 (H332)
Skin irritation, Category 2 (H315)
Eye irritation, Category 2 (H319)
Sensitization of the respiratory airways, Category 1 (H334)
Sensitization of the skin, Category 1 (H317)
Carcinogenicity, Category 2 (H351)
Specific target organ toxicity (single exposure), Category 3 (H335 (Respiratory system))
Specific target organ toxicity (repeated exposure), Category 2 (H373)

2.2 Label elements

Danger

Hazardous components which must be listed on the label
4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate

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 through prolonged or repeated exposure.

Precautionary statements:
P201 Obtain special instructions before use.
P260 Do not breathe dust.
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.
P342 + P311 If experiencing respiratory symptoms: Call a POISON CENTER or doctor/ physician.

Supplementary hazardous characteristics and labeling elements:
EUH204 Contains isocyanates. May produce an allergic reaction.
"As from 24 August 2023 adequate training is required before industrial or professional use."

2.3 Other hazards

In case of hypersensitivity of the respiratory tract (e.g. asthmatics and those who suffer from chronic bronchitis) it is inadvisable to work with the product.
Symptoms affecting the respiratory tract can also occur several hours after overexposure.
Dust, vapors and aerosols are the primary risk to the respiratory tract.

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

SECTION 3: Composition/information on ingredients

Type of product: Mixture

3.2 Mixtures

Diphenylmethane-diisocyanate

Hazardous components

4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate
Concentration [wt.-%]: >= 75 - <= 100
Index-No.: 615-005-00-9
EC-No.: 202-966-0
REACH Registration Number: 01-2119457014-47-0006, 01-2119457014-47-0007, 01-2119457014-47-0008, 01-2119457014-47-0009, 01-2119457014-47-0031
CAS-No.: 101-68-8
Classification (1272/2008/CE): Acute Tox. 4 Inhalative 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 Inhalative H373 (Respiratory tract)
Specific threshold concentration (GHS):

Eye Irrit. 2	H319	>= 5 %
Skin Irrit. 2	H315	>= 5 %
Resp. Sens. 1	H334	>= 0,1 %
STOT SE 3	H335	>= 5 %

ATE (inhalation, dust/mist): 1,5 mg/l

This contains:
o-(p-isocyanatobenzyl)phenyl isocyanate; diphenylmethane-2,4'-diisocyanate
Concentration [wt.-%]: >= 1 - < 5
Index-No.: 615-005-00-9
EC-No.: 227-534-9
REACH Registration Number: 01-2119480143-45-0000, 01-2119480143-45-0001, 01-2119480143-45-0002
CAS-No.: 5873-54-1

Classification (1272/2008/CE): Acute Tox. 4 Inhalative 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 Inhalative H373 (Respiratory tract)
Specific threshold concentration (GHS):

Eye Irrit. 2	H319	>= 5 %
Skin Irrit. 2	H315	>= 5 %
Resp. Sens. 1	H334	>= 0,1 %
STOT SE 3	H335	>= 5 %

ATE (inhalation, dust/mist): 1,5 mg/l

Candidate List of Substances of Very High Concern for Authorisation
This product contains no substances of very high concern in concentrations where an information obligation applies (REACH Regulation (EC) No. 1907/2006, Article 59).

SECTION 4: First aid measures

4.1 Description of first aid measures

General advice: Soiled, soaked clothing and shoes must be immediately removed, decontaminated and disposed of.

If inhaled: Take the person into the fresh air and keep him warm, let him rest; if there is difficulty in breathing, medical advice is required.

In case of skin contact: In the event of contact with the skin, preferably wash with a cleanser based on polyethylene glycol or with plenty of warm water and soap. Consult a doctor in the event of a skin reaction.

In case of eye contact: Hold the eyes open and rinse with preferably lukewarm water for a sufficiently long period of time (at least 10 minutes). Contact an ophthalmologist.

If swallowed: DO NOT induce vomiting. Wash/clean mouth with water. Medical advice is required.

4.2 Most important symptoms and effects, both acute and delayed

Notes to physician: The product irritates the respiratory tract and may trigger sensitisation of the skin and respiratory tract. Treatment of acute irritation or bronchial constriction is primarily symptomatic. Extended medical treatment may be required depending on the degree of exposure and the severity of the symptoms.

4.3 Indication of any immediate medical attention and special treatment needed

Therapeutic measures: No information available.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media: Carbon dioxide (CO2), Foam, extinguishing powder, in cases of larger fires, water spray should be used.

Unsuitable extinguishing media: High volume water jet

5.2 Special hazards arising from the substance or mixture

Burning releases carbon monoxide, carbon dioxide, oxides of nitrogen, isocyanate vapors and traces of hydrogen cyanide. In the event of fire and/or explosion do not breathe fumes.

Fire in vicinity poses risk of pressure build-up and rupture. Containers at risk from fire should be cooled with water and, if possible, removed from the danger area.

5.3 Advice for fire-fighters

For firefighting, self-contained breathing apparatus is required, plus a gas-tight chemical hazmat suit.

Firemen must wear self-contained breathing apparatus.

Do not allow contaminated extinguishing water to enter the soil, ground-water or surface waters.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Put on protective equipment (see section 8). Ensure adequate ventilation/exhaust extraction. Keep unauthorized persons away.

6.2 Environment related measures

Do not allow to escape into waterways, wastewater or soil.

6.3 Methods and material for containment and cleaning up

Remove mechanically; cover the remainder with wet, absorbent material (e.g. sawdust, chemical binder based on calcium silicate hydrate, sand). After approx. one hour transfer to waste container and do not seal (evolution of CO2!). Keep damp in a safe ventilated area for several days.

Spill area can be decontaminated with the following recommended decontamination solution:

Decontamination solution 1: 8-10% sodium carbonate and 2% of liquid soap in water

Decontamination solution 2: Liquid/yellow soap (potassium soap with ~15% anionic tenside): 20ml; Water:700ml; Polyethylenglycol (PEG 400): 350ml

Decontamination solution 3: 30 % commercial laundry detergent containing monoethanolamine, 70 % water

6.4 Reference to other sections

For further disposal measures see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

General conditions of use are further specified in the annex according to REACH-Regulation (EU) No. 1907/2006.

Provide sufficient air exchange and/or exhaust in work rooms. The precautions required in the handling of isocyanates must be taken.

Solid products: Avoid formation and deposition of dust.

Contact with skin and eyes and inhalation of dust/vapor must be avoided.

In all workplaces or parts of the plant where high concentrations of isocyanate aerosols and/or vapors may be generated (e.g. during pressure release, mold venting or when cleaning mixing heads with an air blast), appropriately located exhaust ventilation must be provided in order to prevent occupational exposure limits from being exceeded. The air should be drawn away from the personnel handling the product The efficiency of the exhaust equipment should be periodically checked. The threshold limit values noted in section 8 must be monitored.

The personal protective measures described in section 8 must be observed. Contact with skin and eyes and inhalation of vapors must be avoided under all circumstances.

Keep away from foodstuffs, drinks and tobacco. Wash hands before breaks and at end of work and use skin-protecting ointment. Keep working clothes separately. Take off all contaminated clothing immediately.

Decontaminate, destroy and dispose of soiled protective clothing (see Section 13)

7.2 Conditions for safe storage, including any incompatibilities

Cleaning with Aprotic Polar Solvents (meeting the IUPAC definition) may lead to formation of (hazardous) primary aromatic amines (> 0,1 %). See section 11.

Keep container tightly closed and dry. Further information on the storage conditions which must be observed to preserve quality can be found in our product information sheet.

Storage class (TRGS 510) : 10: Combustible liquids

7.3 Specific end use(s)

For details of the identified uses according to REACH-Regulation (EU) No. 1907/2006 refer to the annex of this safety data sheet.

SECTION 8: Exposure controls/personal protection

Risk management measures are further specified in the annex according to REACH-Regulation (EU) No. 1907/2006.

Provide general ventilation.
Provide suitable exact ventilation.
Inspect and maintain equipment.
Hygiene measures:
Avoid skin and eye contact.
Wash off skin contamination immediately
Clear spills immediately
Provide hazard information and training to personnel

8.1 Control parameters

Components with workplace control parameters

Substance	CAS-No.	Basis	Type	Value	Ceiling Limit Value	Remarks
4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate	101-68-8	TRGS 900	STEL CL			Category I: substances for which the localized effect has an assigned OEL or for substances with a sensitizing effect in respiratory passages.
4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate	101-68-8	TRGS 900				Listed
4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate	101-68-8	TRGS 900				Dermal absorption possible
4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate	101-68-8	TRGS 900	STEL FAC		1	Substance listed with both Peak factor and STEL factor. The Peak factor is supplied with the AGW values.
4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate	101-68-8	TRGS 900		0,05 mg/m3	2	Y
o-(p-isocyanatobenzyl) phenyl isocyanate; diphenylmethane-2,4'-diisocyanate	5873-54-1	TRGS 900				Listed
o-(p-isocyanatobenzyl) phenyl isocyanate; diphenylmethane-2,4'-diisocyanate	5873-54-1	TRGS 900		0,05 mg/m3	=2=	

o-(p-isocyanatobenzyl) phenyl isocyanate; diphenylmethane-2,4'-diisocyanate	5873-54-1	TRGS 900	STEL FAC		1	Substance listed with both Peak factor and STEL factor. The Peak factor is supplied with the AGW values.
o-(p-isocyanatobenzyl) phenyl isocyanate; diphenylmethane-2,4'-diisocyanate	5873-54-1	TRGS 900	STEL CL			Category I: substances for which the localized effect has an assigned OEL or for substances with a sensitizing effect in respiratory passages.

The product may contain traces of phenylisocyanate.

Substance	CAS-No.	Basis	Type	Value	Ceiling Limit Value	Remarks
Phenyl isocyanate	103-71-9	TRGS 900				Listed
Phenyl isocyanate	103-71-9	TRGS 900		0,01 ppm 0,05 mg/m3	1	
Phenyl isocyanate	103-71-9	TRGS 900	STEL CL			Category I: substances for which the localized effect has an assigned OEL or for substances with a sensitizing effect in respiratory passages.

Derived No Effect Level (DNEL)

4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate

Value type	Route of exposure	Health Effects	Value	Remarks
Workers	Inhalation	Long-term systemic effects		No hazard identified
Workers	Inhalation	Acute systemic effects		No hazard identified
Workers	Inhalation	Long-term local effects	0,05 mg/m3	Most sensitive endpoint: Irritation (respiratory tract)
Workers	Inhalation	Acute local effects	0,1 mg/m3	Most sensitive endpoint: Irritation (respiratory tract)
Workers	Dermal	Long-term systemic effects		No hazard identified
Workers	Dermal	Acute systemic effects		No hazard identified
Workers	Dermal	Long-term local effects		Medium hazard Most sensitive endpoint: Sensitisation (skin)
Workers	Dermal	Acute local effects		Medium hazard Most sensitive endpoint: Sensitisation (skin)
Workers	Eye contact	Local effects		Medium hazard
Consumers	Inhalation	Long-term systemic effects		No hazard identified
Consumers	Inhalation	Acute systemic effects		No hazard identified
Consumers	Inhalation	Long-term local effects	0,025 mg/m3	Most sensitive endpoint: Irritation (respiratory tract)
Consumers	Inhalation	Acute local effects	0,05 mg/m3	Most sensitive endpoint: Irritation (respiratory tract)
Consumers	Dermal	Long-term systemic effects		No hazard identified
Consumers	Dermal	Acute systemic effects		No hazard identified

Consumers	Dermal	Long-term local effects		Medium hazard Most sensitive endpoint: Sensitisation (skin)
Consumers	Dermal	Acute local effects		Medium hazard Most sensitive endpoint: Sensitisation (skin)
Consumers	Oral	Long-term systemic effects		No hazard identified
Consumers	Oral	Acute systemic effects		No hazard identified
Consumers	Eye contact	Local effects		Medium hazard

Predicted No Effect Concentration (PNEC)

4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate

Compartment	Value	Remarks
Fresh water	1 mg/l	
Marine water	0,1 mg/l	
Sewage treatment plant	1 mg/l	
Soil	1 mg/kg dry weight	
Intermittent use/release	10 mg/l	

8.2 Exposure controls

Respiratory protection
Respiratory protection required in insufficiently ventilated working areas and during spraying. An air-fed mask, or for short periods of work, a combination of charcoal filter and particulate filter A2-P2 (EN529) is recommended.

If applicable, further recommendations regarding respiratory protection can be found in the annex.

In case of hypersensitivity of the respiratory tract (e.g. asthmatics and those who suffer from chronic bronchitis) it is inadvisable to work with the product.

Hand protection
Suitable materials for safety gloves; EN 374:
Butyl rubber, nitrile rubber, chloroprene rubber (neoprene).
Notice: suitable materials that provide sufficient protection for industrial cleaning with Aprotic Polar Solvents (meeting the IUPAC definition): butyl rubber.
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 EN374) 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 EN374) 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 of the specific composition of the material a 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.
Example:
Polychloroprene - CR: thickness >=0,5mm; breakthrough time >=480min.
Nitrile rubber - NBR: thickness >=0,35mm; breakthrough time >=480min.
Butyl rubber - IIR: thickness >=0,5mm; breakthrough time >=480min.
Fluorinated rubber - FKM: thickness >=0,4mm; breakthrough time >=480min.
Recommendation: contaminated gloves should be disposed of.

Eye protection
Use safety glasses with side shields, conforming to EN 166.

Skin and body protection
Use protective clothing (chemically resistant).
In case of hypersensitivity of the skin it is inadvisable to work with the product.

Safety precautions for handling freshly molded polyurethane parts: see section 16

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Physical state:	solid at 20 °C at 1.013 hPa	
Appearance:	liquid	
Colour:	colourless to yellowish	
Odour:	weak	
Odour Threshold:	not established	
pH:	not applicable	
Freezing temperature:	38,4 °C at 1.013 hPa	EG A1
Boiling point/boiling range:	not established	
Flash point:	211 °C at 1.000 hPa	EG A9
Evaporation rate:	not established	
Flammability (solid, gas):	not applicable	
Burning number:	not applicable	
Upper/lower flammability or explosive limits:	not established	
Vapour pressure:	Diphenyl-methane-diisocyanate, (MDI) < 0,00001 hPa at 20 °C < 0,0005 hPa (50°C)	
	For products with a very low vapor pressure, the apparent vapor pressure may exceed the vapor pressure of the pure product due to conditions of manufacturing, storage or transportation, e.g. by solved gases like nitrogen or carbon dioxide:	
	0,00062 Pa at 20 °C	EG A4
	9 hPa at 50 °C	calculated
	10 hPa at 55 °C	calculated
Relative vapour density:	not established	
Density:	1,235 g/cm³ at 20 °C	calculated
	1,19 g/cm³ at 40 °C	DIN 51757
Miscibility with water:	immiscible at 15 °C	
Water solubility:	0,0068 g/l at 25 °C reacts with release of CO2	
Surface tension:	not established	
Partition coefficient (n−octanol/water):	log Pow: 4,51 at: 20 °C	
Auto-ignition temperature:	not applicable	
Ignition temperature:	601 °C	EG A15
Decomposition temperature:	not established	
Heat of combustion:	not established	
Viscosity, dynamic:	30 mPa.s at 25 °C	calculated
Viscosity, kinematic:	not established	
Particle characteristics		
Particle size:	not established	

9.2 Other information

The indicated values do not necessarily correspond to the product specification. Please refer to the technical information sheet for specification data.

Explosive properties:	not established
Dust explosion class:	not applicable
Oxidising properties:	not established

SECTION 10: Stability and reactivity

10.1 Reactivity

This information is not available.

10.2 Chemical stability

Polymerises at about 200 °C with evolution of CO2.

10.3 Possibility of hazardous reactions

Exothermic reaction with amines and alcohols; reacts with water forming CO2; in closed containers, risk of bursting owing to increase of pressure.

10.4 Conditions to avoid

This information is not available.

10.5 Incompatible materials

This information is not available.

10.6 Hazardous decomposition products

No hazardous decomposition products when stored and handled correctly.

SECTION 11: Toxicological information

Toxicological studies on the product are not yet available.

Please find below the toxicological data available to us for the components (hazardous components).

11.1 Information on hazard classes as defined in Regulation (EC) No 1272/2008

Acute toxicity, oral
4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate
LD50 rat, male/female: > 2.000 mg/kg
Method: Directive 84/449/EEC, B.1
Toxicological studies of a comparable product.

Acute toxicity, dermal
4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate
LD50 rabbit, male/female: > 9.400 mg/kg
Method: OECD Test Guideline 402
Studies of a comparable product.

Acute toxicity, inhalation
ATEmix (inhal.): 1,5 mg/l, 4 h
Test atmosphere: dust/mist
Method: Calculation method

4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate
LC50 rat, male: 0,368 mg/l, 4 h
Test atmosphere: dust/mist
Method: OECD Test Guideline 403
The test atmosphere generated in the animal study is not representative of workplace environments, how the substance is placed on the market, and how it can reasonably be expected to be used. Therefore the test result cannot be directly applied for the purpose of assessing hazard. Based on expert judgment and the weight of the evidence, a modified classification for acute inhalation toxicity is justified.

Assessment: Harmful if inhaled.

Converted acute toxicity point estimate 1,5 mg/l
Test atmosphere: dust/mist
Method: Expert judgement

Primary skin irritation
4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate
Species: rabbit
Result: irritating
Classification: Causes skin irritation.
Method: OECD Test Guideline 404
Toxicological studies of a comparable product.

Classification: Causes skin irritation.
Regulation (EC) No 1272/2008

Primary mucosae irritation
4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate
Species: rabbit
Result: non-irritant
Method: OECD Test Guideline 405
Toxicological studies of a comparable product.

Classification: Causes serious eye irritation.
Regulation (EC) No 1272/2008

Sensitisation
4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate
Skin sensitisation according to Buehler (epicutaneous test):
Species: Guinea pig
Result: negative
Classification: Does not cause skin sensitization.
Method: OECD Test Guideline 406

Skin sensitization (local lymph node assay (LLNA)):
Species: Mouse
Result: positive
Classification: May cause sensitization by skin contact.
Method: OECD Test Guideline 429

Respiratory sensitization
Species: Guinea pig
Result: positive
Classification: May cause sensitization by inhalation.

Subacute, subchronic and prolonged toxicity
4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate
NOAEL: 0,2 mg/m3
LOAEL (Lowest observable adverse effect level): 1 mg/m3
Application Route: Inhalative
Species: rat, male/female
Dose Levels: 0 - 0,2 - 1 - 6 mg/m3
Exposure duration: 2 a
Frequency of treatment: 6 hours a day, 5 days a week
Target Organs: Lungs, Nasal inner lining
Test substance: as aerosol
Method: OECD Test Guideline 453
Findings: Irritation to nasal cavity and to lungs.
Studies of a comparable product.

Carcinogenicity
4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate
Species: rat, male/female
Application Route: Inhalative
Dose Levels: 0 - 0,2 - 1 - 6 mg/m3
Test substance: as aerosol
Exposure duration: 2 a
Frequency of treatment: 6 hours/day, 5 days/week
Method: OECD Test Guideline 453

Occurrence of tumors in the highest dose group.
Studies of a comparable product.

Reproductive toxicity/Fertility
4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate
No data available.

Reproductive toxicity/Developmental Toxicity/Teratogenicity
4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate
NOAEL (teratogenicity): 12 mg/m³
NOAEL (maternal): 4 mg/m³
NOAEL (developmental toxicity): 4 mg/m³
Species: rat, female
Application Route: Inhalative
Dose Levels: 0 - 1 - 4 - 12 mg/m³
Frequency of treatment: 6 hours/day (Exposure duration: 10 days (day 6 - 15 p.c.))
Test substance: as aerosol
Method: OECD Test Guideline 414
NOAEL (developmental toxicity): 4 mg/m3
Did not show teratogenic effects in animal experiments.
Studies of a comparable product.

NOAEL (teratogenicity): 9 mg/m³
NOAEL (maternal): 3 mg/m³
NOAEL (developmental toxicity): 3 mg/m³
Species: rat, female
Application Route: Inhalative
Dose Levels: 0 - 1 - 3 - 9 mg/m³
Frequency of treatment: 6 hours/day (Exposure duration: 10 days (day 6 - 15 p.c.))
Test substance: as aerosol
Method: OECD Test Guideline 414
Did not show teratogenic effects in animal experiments.

Genotoxicity in vitro
4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate
Test type: Salmonella/microsome test (Ames test)
Test system: Salmonella typhimurium
Metabolic activation: with/without
Result: negative
Method: OECD Test Guideline 471
Toxicological studies of a comparable product.

Genotoxicity in vivo
4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate
Test type: Micronucleus test
Species: rat, male
Application Route: Inhalative (exposure period: 3x1h/day over 3 weeks)
Result: negative
Method: OECD Test Guideline 474

Test type: comet assay
Species: rat, male
Application Route: Inhalative
Dose: 2 - 5 - 11 mg/m³
Result: negative
Method: OECD Test Guideline 489

STOT evaluation – one-time exposure
4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate
Route of exposure: Inhalative
Target Organs: Respiratory tract
May cause respiratory irritation.
Regulation (EC) No 1272/2008

STOT evaluation – repeated exposure

4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate
Route of exposure: Inhalative
Target Organs: Respiratory tract
May cause damage to organs through prolonged or repeated exposure.
Regulation (EC) No 1272/2008

Aspiration toxicity

4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate
Based on available data, the classification criteria are not met.

CMR Assessment
4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate
Carcinogenicity: Suspected of causing cancer by inhalation (Carc. 2).
Mutagenicity: In vitro an in vivo tests did not show mutagenic effects. Based on available data, the classification criteria are not met.
Teratogenicity: Did not show teratogenic effects in animal experiments. Based on available data, the classification criteria are not met.
Reproductive toxicity/Fertility: Based on available data, the classification criteria are not met.

Toxicology Assessment
4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate
Acute effects: Harmful if inhaled. Causes skin irritation. Causes serious eye irritation.
Sensitization: May cause an allergic skin reaction. May cause allergy or asthma symptoms or breathing difficulties if inhaled.

11.2 Information on other hazards

Endocrine disrupting properties
The substance/mixture does not contain components considered to have endocrine disrupting properties according to REACH Article 57(f) or Commission Delegated regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at levels of 0.1% or higher.

Other information
Industrial cleaning with Aprotic Polar Solvents (meeting the IUPAC definition) may lead to formation of (hazardous) primary aromatic amines (> 0.1 %). Primary aromatic amines are chemicals that are regarded as potentially carcinogenic for humans based on animal testing. Some of these chemicals are known human carcinogens. Compliance with the control measures recommended in the exposure scenario is expected to protect against these effects.

Special properties/effects: Over-exposure entails the risk of concentration-dependent irritating effects on eyes, nose throat, and respiratory tract. Delayed appearance of the complaints and development of hypersensitivity (difficult breathing, coughing, asthma) are possible. Hypersensitive persons may suffer from these effects even at low isocyanate concentrations, including concentrations below the occupational exposure limit. Prolonged contact with the skin may cause tanning and irritant effects.

Animal tests and other research indicate that skin contact with diisocyanates can play a role in causing isocyanate sensitization and respiratory reaction.

SECTION 12: Ecological information

Ecotoxicological studies of the product are not available.

Do not allow to escape into waterways, wastewater or soil.

Please find below the ecotoxicological data available to us for the components.

12.1 Toxicity

Acute Fish toxicity
4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate
LC50 > 1.000 mg/l
Test type: Acute Fish toxicity
Species: Danio rerio (zebra fish)
Exposure duration: 96 h
Method: OECD Test Guideline 203
Studies of a comparable product.

Chronic Fish toxicity
4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate
Study scientifically not justified.

Acute toxicity for daphnia
4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate
EC50 > 1.000 mg/l
Species: Daphnia magna (Water flea)
Exposure duration: 24 h
Method: OECD Test Guideline 202
Studies of a comparable product.

Chronic toxicity to daphnia
4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate
NOEC (Reproduction) > 10 mg/l
Species: Daphnia magna (Water flea)
Exposure duration: 21 d
Method: OECD Test Guideline 202
Studies of a comparable product.

Acute toxicity for algae
4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate
ErC50 > 1.640 mg/l
Test type: Growth inhibition
Species: scenedesmus subspicatus
Exposure duration: 72 h
Method: OECD Test Guideline 201
Studies of a comparable product.

Acute bacterial toxicity
4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate
EC50 > 100 mg/l
Test type: Respiration inhibition
Species: activated sludge
Exposure duration: 3 h
Method: OECD Test Guideline 209
Studies of a comparable product.

Toxicity to soil dwelling organisms
4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate
NOEC (mortality) > 1.000 mg/kg
Species: Eisenia fetida (earthworms)
Exposure duration: 14 d
Method: OECD Test Guideline 207
Studies of a comparable product.

Toxicity to terrestrial plants
4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate
NOEC (seedling emergence) > 1.000 mg/kg
Species: Avena sativa (oats)
Exposure duration: 14 d
Method: OECD Test Guideline 208
Studies of a comparable product.

NOEC (Growth rate) > 1.000 mg/kg
Species: Avena sativa (oats)
Exposure duration: 14 d
Method: OECD Test Guideline 208
Studies of a comparable product.

NOEC (seedling emergence) > 1.000 mg/kg
Species: Lactuca sativa (lettuce)
Exposure duration: 14 d
Method: OECD Test Guideline 208
Studies of a comparable product.

NOEC (Growth rate) > 1.000 mg/kg
Species: Lactuca sativa (lettuce)
Exposure duration: 14 d
Method: OECD Test Guideline 208
Studies of a comparable product.

Ecotoxicology Assessment
4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate
Acute aquatic toxicity: Based on available data, the classification criteria are not met.
Chronic aquatic toxicity: Based on available data, the classification criteria are not met.
Toxicity Data on Soil: Not expected to adsorb on soil. The substance is graded as non-critical to soil-dwelling organisms.
Impact on Sewage Treatment: Because of the low bacterial toxicity, there is no risk of an adverse effect on the performance of biological waste water treatment plants.

12.2 Persistence and degradability

Biodegradability
4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate
Biodegradation: 0 %, 28 d, i.e. not inherently degradable
Method: OECD Test Guideline 302 C
Studies of a comparable product.

Stability in water
4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate
Test type: Hydrolysis
Half life: 20 h at 25 °C
The substance hydrolyzes rapidly in water.
Studies of a comparable product.

Photodegradation
4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate
Test type: Phototransformation in air
sensitizer: OH-radicals
Concentration sensibilisator: 500.000 1/cm3
Rate constant: 1,16E-11 cm3/s
Half-life indirect photolysis: 0,92 d
Method: SRC - AOP (calculation)
After evaporation or exposure to the air, the product will be moderately degraded by photochemical processes.

Volatility (Henry's Law constant)
4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate
Calculated value = 0,0229 Pa*m3/mol
The substance has to be scored as being slightly volatile from water.

12.3 Bioaccumulative potential

Bioaccumulation
4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate
Bioconcentration factor (BCF): 200
Species: Cyprinus carpio (Carp)
Exposure duration: 28 d
Concentration: 0,00008 mg/l
Test substance: 14C-labelled
Method: OECD Test Guideline 305 E
An accumulation in aquatic organisms is not to be expected.

Partition coefficient (n−octanol/water)

log Pow: 4,51 at: 20 °C

12.4 Mobility in soil

Distribution among environmental compartments
4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate
Adsorption/Soil
not applicable

Environmental distribution
4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate
no data available

12.5 Results of PBT and vPvB assessment

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

12.6 Endocrine disrupting properties

The substance/mixture does not contain components considered to have endocrine disrupting properties according to REACH Article 57(f) or Commission Delegated regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at levels of 0.1% or higher.

12.7 Other adverse effects

Isocyanate reacts with water at the interface forming CO2 and a solid insoluble product with high melting point (polyurea). This reaction is accelerated by surfactants (e.g. detergents) or by watersoluble solvents. Previous experience shows that polyurea is inert and non-degradable.

SECTION 13: Disposal considerations

Dispose in accordance with applicable international, national and local laws, ordinances and statutes.

For disposal within the EC, the appropriate code according to the European Waste Catalogue (EWC) should be used.

13.1 Waste treatment methods

After final product withdrawal, all residues must be removed from containers (drip-free, powder-free or paste-free). Packaging empty of usable product can be handed to a professional waste management company; in the EU, this is done per packaging type at collection points run by the existing take-back systems for the chemicals industry. The product and hazardous substance labelling must be left intact on the packaging.

Alternatively, the product and hazardous substance labelling can be removed if the product residues adhering to the sides are rendered non-hazardous. This packaging can also be handed to the collection points run by the existing take-back systems for the chemicals industry for packaging type-specific recycling.
Containers must be recycled in compliance with national legislation and environmental regulations.

No disposal into waste water.

SECTION 14: Transport information

ADR/RID

14.1 UN number or ID number	:	Not dangerous goods
14.2 UN proper shipping name	:	Not dangerous goods
14.3 Transport hazard class(es)	:	Not dangerous goods
14.4 Packing group	:	Not dangerous goods
14.5 Environmental hazards	:	Not dangerous goods

ADN

14.1 UN number or ID number	:	Not dangerous goods
14.2 UN proper shipping name	:	Not dangerous goods
14.3 Transport hazard class(es)	:	Not dangerous goods
14.4 Packing group	:	Not dangerous goods
14.5 Environmental hazards	:	Not dangerous goods

Dangerous goods classification for inland waterways tanker by request only.

IATA

14.1 UN number or ID number	:	Not dangerous goods
14.2 UN proper shipping name	:	Not dangerous goods
14.3 Transport hazard class(es)	:	Not dangerous goods
14.4 Packing group	:	Not dangerous goods
14.5 Environmental hazards	:	Not dangerous goods

IMDG

14.1 UN number or ID number	:	Not dangerous goods
14.2 UN proper shipping name	:	Not dangerous goods
14.3 Transport hazard class(es)	:	Not dangerous goods
14.4 Packing group	:	Not dangerous goods
14.5 Environmental hazards	:	Not dangerous goods

14.6 Special precautions for user

See section 6 - 8.

Additional information	:	Not dangerous cargo. Keep dry. Keep away from foodstuffs, acids and alkalis.

14.7 Maritime transport in bulk according to IMO instruments

Product is not transported by us in bulk.

SECTION 15: Regulatory information

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

Directive 2012/18/EU on the control of major-accident hazards involving dangerous substances.
not applicable

REACH - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, preparations and articles (Annex XVII)
Conditions of restriction for the following entries should be considered: 56, 74

This product contains substances subject to EU Regulation 1907/2006 (REACH), Annex XVII.

4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate
CAS-No.: 101-68-8, EC-No.: 202-966-0
Subject to REACH Annex XVII, No. 56, 74

o-(p-isocyanatobenzyl)phenyl isocyanate; diphenylmethane-2,4'-diisocyanate
CAS-No.: 5873-54-1, EC-No.: 227-534-9
Subject to REACH Annex XVII, No. 56, 74

2,2'-methylenediphenyl diisocyanate; diphenylmethane-2,2'-diisocyanate
CAS-No.: 2536-05-2, EC-No.: 219-799-4
Subject to REACH Annex XVII, No. 56, 74

TA Luft List (Germany)
Type: 5.2.1 Total dust
Fraction of other substances: 0,05 %

Type: 5.2.4 Inorganic substances in gaseous form
portion Class 3: < 0,01 %

Type: 5.2.5 Organic Substances
portion Class 1: 99,92 %

Fraction of other substances: 0,03 %

Water contaminating class (Germany)
1 slightly hazardous to water
Classification according to AwSV, Annex 1 (5.2)

Any existing national regulations on the handling of isocyanates must be observed.

Other regulations
Take note of Law on the protection of mothers at work, in education and in studies (Maternity Protection Act - MuSchG).
Take note of Directive 94/33/EC on the protection of young people at work or stricter national regulations, where applicable.

15.2 Chemical Safety Assessment

A Chemical Safety Assessment has been carried out for:
4,4'-methylenediphenyl diisocyanate; diphenylmethane-4,4'-diisocyanate

SECTION 16: Other information

Full text of the hazard statements of the CLP classification (1272/2008/CE) referred to under sections 2, 3 and 10.

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.

ISOPA directives for safe loading/unloading, transport and storage of TDI and MDI. See ISOPA website: www.isopa.org (Product Stewardship „Walk the Talk“).

Safety precautions for handling freshly molded polyurethane parts:

Depending on the production parameters, any uncovered surfaces of freshly molded polyurethane parts using this raw material may contain traces of substances (e. g. starting and reaction products, catalysts, release agents) with hazardous characteristics. Skin contact with traces of these substances must be avoided. Therefore, during demolding or other handling of fresh molded parts, protective gloves tested according to DIN-EN 374 (e.g. nitrile rubber >= 0,35 mm thick, breakthrough time >= 480 min, or according to recommendations from glove makers thinner gloves that need to be changed in compliance with breakthrough times more frequently) must be used. Depending on formulation and processing conditions, the requirements may be different from handling of the pure substances. Closed protective clothing is required for the protection of other areas of skin.