DESMODUR VL

Version 12.0 Revision Date 27.08.2019 Print Date 28.08.2019

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

1.1 Product identifier

DESMODUR VL

Material number: 00410063

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

Use:
Hardener for coating materials or adhesives
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-CTO-HSEQ-PSRA-PSI
D-51365 LEVERKUSEN

Tel.: +49 214 6009 4068
e-mail: ProductSafetyEMLA@covestro.com

1.4 Emergency telephone number

In case of emergency: +49 214 30 99300 (Safety Desk)
National Chemical Emergency Centre - UK
Tel: +44 1865 407 333

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)
Specific target organ toxicity (repeated exposure), Category 2 (H373)

2.2 Label elements

Danger

Hazardous components which must be listed on the label
diphenylmethane-diisocyanate, isomers and homologues

diphenylmethane-4,4'-diisocyanate
Diphenylmethane-2,4'-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/ fume/ gas/ mist/ vapours/ spray.
P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/ protective clothing/ eye protection/ face 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.

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

polyisocyanate based on diphenylmethane diisocyanate

Hazardous components

diphenylmethane-diisocyanate, isomers and homologues
Concentration [wt.-%]: ca. 80
Index-No.: 615-005-00-9
CAS-No.: 9016-87-9
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 STOT RE 2 Inhalative H373
Specific threshold concentration:

Eye Irrit. 2	H319	>= 5 %
Skin Irrit. 2	H315	>= 5 %
Resp. Sens. 1	H334	>= 0.1 %
STOT SE 3	H335	>= 5 %

diphenylmethane-4,4'-diisocyanate
Concentration [wt.-%]: ca. 10
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 STOT RE 2 Inhalative H373
Specific threshold concentration:

Eye Irrit. 2	H319	>= 5 %
Skin Irrit. 2	H315	>= 5 %
Resp. Sens. 1	H334	>= 0.1 %

STOT SE 3	H335	>= 5 %

Diphenylmethane-2,4'-diisocyanate
Concentration [wt.-%]: ca. 10
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 STOT RE 2 Inhalative H373
Specific threshold concentration:

Eye Irrit. 2	H319	>= 5 %
Skin Irrit. 2	H315	>= 5 %
Resp. Sens. 1	H334	>= 0.1 %
STOT SE 3	H335	>= 5 %

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.

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. Exhaust ventilation necessary if product is sprayed.

Solid products: Avoid formation and deposition of dust.

The threshold limit values noted in section 8 must be monitored.

In all areas where isocyanate aerosols and/or vapor concentrations are produced in elevated concentrations, exhaust ventilation must be provided in such a way that the workplace exposure limits (WEL) is not exceeded. The air should be drawn away from the personnel handling the product

Products containing solvent: Explosion protection required.

The personal protective measures described in section 8 must be observed. The precautions required in the

handling of isocyanates must be taken. Avoid contact with skin and eyes and the inhalation of vapor.

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.

7.2 Conditions for safe storage, including any incompatibilities

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

UK Workplace Exposure Limits (WEL), per EH40 document (Health & Safety Executive). If no UK value exists, EU exposure limits given where available.

8.1 Control parameters

Components with workplace control parameters

Substance	CAS-No.	Basis	Type	Value	Ceiling Limit Value	Remarks
diphenylmethane-4,4'-diisocyanate	101-68-8	EH40 WEL	STEL	0.07 mg/m3		, measured as NCO
diphenylmethane-4,4'-diisocyanate	101-68-8	EH40 WEL	TWA	0.02 mg/m3		, measured as NCO
diphenylmethane-diisocyanate, isomers and homologues	9016-87-9	EH40 WEL	STEL	0.07 mg/m3		, measured as NCO
diphenylmethane-diisocyanate, isomers and homologues	9016-87-9	EH40 WEL	TWA	0.02 mg/m3		, measured as NCO
Diphenylmethane-2,4'-diisocyanate	5873-54-1	EH40 WEL	STEL	0.07 mg/m3		, measured as NCO
Diphenylmethane-2,4'-diisocyanate	5873-54-1	EH40 WEL	TWA	0.02 mg/m3		, measured as NCO
2,2'-Methylenediphenyl diisocyanate	2536-05-2	EH40 WEL	STEL	0.07 mg/m3		, measured as NCO
2,2'-Methylenediphenyl diisocyanate	2536-05-2	EH40 WEL	TWA	0.02 mg/m3		, measured as NCO

Exposition assessment value (EBW) per TRGS 430:Polyisocyanate content (MDI oligomers and/or prepolymers) 45 %. Use an exposition assessment value of 0,05 mg/m³.

The product may contain traces of phenylisocyanate.

Derived No Effect Level (DNEL)

diphenylmethane-diisocyanate, isomers and homologues

Value type	Route of exposure	Health Effects	Value	Remarks
				not required

diphenylmethane-4,4'-diisocyanate

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

Diphenylmethane-2,4'-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)

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	

Diphenylmethane-2,4'-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.
For solvent free products:
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

Appearance:	liquid	
Colour:	brown	
Odour:	earthy, musty	
Odour Threshold:	not established	
pH:	not applicable	
Pour point:	ca. -30 °C	ISO 3016
Boiling point/boiling range:	> 300 °C at 1,013 hPa	DIN 53171
Flash point:	ca. 229 °C	DIN EN 22719
Evaporation rate:	not established	
Flammability (solid, gas):	not applicable	
Burning number:	not applicable	

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:	
	ca. 11 hPa at 20 °C	EG A4
	ca. 20 hPa at 50 °C	EG A4
	ca. 22 hPa at 55 °C	EG A4
Vapour density:	not established	
Density:	ca. 1.23 g/cm³ at 20 °C	DIN 51757
Miscibility with water:	immiscible at 15 °C	
Surface tension:	not established	
Partition coefficient (n−octanol/water):	not established	
Auto-ignition temperature:	not applicable	
Ignition temperature:	> 500 °C	DIN 51794
Decomposition temperature:	not established	
Viscosity, dynamic:	ca. 145 mPa.s at 20 °C	DIN 53019
Explosive properties:	not established	
Dust explosion class:	not applicable	
Oxidising properties:	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.

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 toxicological effects

Acute toxicity, oral
diphenylmethane-diisocyanate, isomers and homologues
LD50 rat, male/female: > 10,000 mg/kg
Method: OECD Test Guideline 401

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.

Diphenylmethane-2,4'-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
diphenylmethane-diisocyanate, isomers and homologues
LD50 rabbit, male/female: > 9,400 mg/kg
Method: OECD Test Guideline 402

diphenylmethane-4,4'-diisocyanate
LD50 rabbit, male/female: > 9,400 mg/kg
Method: OECD Test Guideline 402
Studies of a comparable product.

Diphenylmethane-2,4'-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

diphenylmethane-diisocyanate, isomers and homologues
LC50 rat, male/female: 0.31 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

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

Diphenylmethane-2,4'-diisocyanate
LC50 rat, male: 0.387 mg/l, 4 h
Test atmosphere: dust/mist
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
diphenylmethane-diisocyanate, isomers and homologues
Species: rabbit
Result: slight irritant
Method: OECD Test Guideline 404

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

Diphenylmethane-2,4'-diisocyanate
Species: rabbit
Result: irritating
Classification: Causes skin irritation.
Method: OECD Test Guideline 404
Toxicological studies of a comparable product.

Primary mucosae irritation
diphenylmethane-diisocyanate, isomers and homologues
Species: rabbit
Result: non-irritant
Method: OECD Test Guideline 405
Toxicological studies of a comparable product.

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

Diphenylmethane-2,4'-diisocyanate
Species: rabbit
Result: non-irritant
Method: OECD Test Guideline 405
Toxicological studies of a comparable product.

Species: Human experience
Result: irritating

Sensitisation
diphenylmethane-diisocyanate, isomers and homologues
Skin sensitisation according to Magnusson/Kligmann (maximizing 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
Toxicological studies of a comparable product.

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

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.

Diphenylmethane-2,4'-diisocyanate
Skin sensitisation according to Buehler (epicutaneous test):
Species: Guinea pig
Result: negative
Classification: Does not cause skin sensitization.
Method: OECD Test Guideline 406
Toxicological studies of a comparable product.

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

Respiratory sensitization
Species: Guinea pig
Result: positive
Classification: May cause sensitization by inhalation.
Toxicological studies of a comparable product.

Subacute, subchronic and prolonged toxicity
diphenylmethane-diisocyanate, isomers and homologues
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.

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.

Diphenylmethane-2,4'-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
diphenylmethane-diisocyanate, isomers and homologues
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.

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.

Diphenylmethane-2,4'-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
diphenylmethane-diisocyanate, isomers and homologues
No data available.

diphenylmethane-4,4'-diisocyanate
No data available.

Diphenylmethane-2,4'-diisocyanate
No data available.

Reproductive toxicity/Teratogenicity
diphenylmethane-diisocyanate, isomers and homologues
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 period: 20 d
Test substance: as aerosol
Method: OECD Test Guideline 414
NOAEL (developmental toxicity): 4 mg/m3
Did not show teratogenic effects in animal experiments.

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 period: 20 d
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.

Diphenylmethane-2,4'-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 period: 20 d
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.

Genotoxicity in vitro
diphenylmethane-diisocyanate, isomers and homologues
Test type: Salmonella/microsome test (Ames test)
Test system: Salmonella typhimurium
Metabolic activation: with/without
Result: negative
Method: OECD Test Guideline 471

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.

Diphenylmethane-2,4'-diisocyanate
Test type: Salmonella/microsome test (Ames test)
Test system: Salmonella typhimurium
Metabolic activation: with/without
Result: negative
Method: OECD Test Guideline 471

Genotoxicity in vivo
diphenylmethane-diisocyanate, isomers and homologues
Test type: Micronucleus test
Species: rat, male
Application Route: Inhalative (exposure period: 3x1h/day over 3 weeks)
Result: negative
Method: OECD Test Guideline 474
Studies of a comparable product.

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

Diphenylmethane-2,4'-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
Toxicological studies of a comparable product.

STOT evaluation – one-time exposure
diphenylmethane-diisocyanate, isomers and homologues
Route of exposure: Inhalative
Target Organs: Respiratory Tract
May cause respiratory irritation.

diphenylmethane-4,4'-diisocyanate
Route of exposure: Inhalative
Target Organs: Respiratory Tract
May cause respiratory irritation.

Diphenylmethane-2,4'-diisocyanate
Route of exposure: Inhalative
Target Organs: Respiratory Tract
May cause respiratory irritation.

STOT evaluation – repeated exposure
diphenylmethane-diisocyanate, isomers and homologues
Route of exposure: Inhalative
Target Organs: Respiratory Tract
May cause damage to organs through prolonged or repeated exposure.

diphenylmethane-4,4'-diisocyanate
Route of exposure: Inhalative
Target Organs: Respiratory Tract
May cause damage to organs through prolonged or repeated exposure.

Diphenylmethane-2,4'-diisocyanate
Route of exposure: Inhalative
Target Organs: Respiratory Tract
May cause damage to organs through prolonged or repeated exposure.

Aspiration toxicity

diphenylmethane-diisocyanate, isomers and homologues
Based on available data, the classification criteria are not met.

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

Diphenylmethane-2,4'-diisocyanate
Based on available data, the classification criteria are not met.

CMR Assessment
diphenylmethane-diisocyanate, isomers and homologues
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.

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.

Diphenylmethane-2,4'-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
diphenylmethane-diisocyanate, isomers and homologues
Acute effects: Harmful if inhaled. The product causes irritation of eyes, skin and mucous membranes.
Sensitization: May cause sensitization by inhalation and skin contact.

diphenylmethane-4,4'-diisocyanate
Acute effects: Harmful if inhaled. The product causes irritation of eyes, skin and mucous membranes.
Sensitization: May cause sensitization by inhalation and skin contact.

Diphenylmethane-2,4'-diisocyanate
Acute effects: Harmful if inhaled. The product causes irritation of eyes, skin and mucous membranes.
Sensitization: May cause sensitization by inhalation and skin contact.

Additional information
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.

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.

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
diphenylmethane-diisocyanate, isomers and homologues
LC50 > 1,000 mg/l
Test type: Acute Fish toxicity
Species: Danio rerio (zebra fish)
Exposure duration: 96 h
Method: OECD Test Guideline 203

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.

Diphenylmethane-2,4'-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
diphenylmethane-diisocyanate, isomers and homologues
Study scientifically not justified.

diphenylmethane-4,4'-diisocyanate
Study scientifically not justified.

Diphenylmethane-2,4'-diisocyanate
Study scientifically not justified.

Acute toxicity for daphnia
diphenylmethane-diisocyanate, isomers and homologues
EC50 > 1,000 mg/l
Test type: static test
Species: Daphnia magna (Water flea)
Exposure duration: 24 h
Method: OECD Test Guideline 202

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.

Diphenylmethane-2,4'-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
diphenylmethane-diisocyanate, isomers and homologues
NOEC (Reproduction) > 10 mg/l
Species: Daphnia magna (Water flea)
Exposure duration: 21 d
Method: OECD Test Guideline 202

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.

Diphenylmethane-2,4'-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
diphenylmethane-diisocyanate, isomers and homologues
ErC50 > 1,640 mg/l
Test type: Growth inhibition
Species: scenedesmus subspicatus
Exposure duration: 72 h
Method: OECD Test Guideline 201

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.

Diphenylmethane-2,4'-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
diphenylmethane-diisocyanate, isomers and homologues
EC50 > 100 mg/l
Test type: Respiration inhibition
Species: activated sludge
Exposure duration: 3 h
Method: OECD Test Guideline 209

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.

Diphenylmethane-2,4'-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
diphenylmethane-diisocyanate, isomers and homologues
NOEC (mortality) > 1,000 mg/kg
Species: Eisenia fetida (earthworms)
Exposure duration: 14 d
Method: OECD Test Guideline 207

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.

Diphenylmethane-2,4'-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
diphenylmethane-diisocyanate, isomers and homologues
NOEC (seedling emergence) > 1,000 mg/kg
Species: Avena sativa (oats)
Exposure duration: 14 d
Method: OECD Test Guideline 208

NOEC (Growth rate) > 1,000 mg/kg
Species: Avena sativa (oats)
Exposure duration: 14 d
Method: OECD Test Guideline 208

NOEC (seedling emergence) > 1,000 mg/kg
Species: Lactuca sativa (lettuce)
Exposure duration: 14 d
Method: OECD Test Guideline 208

NOEC (Growth rate) > 1,000 mg/kg
Species: Lactuca sativa (lettuce)
Exposure duration: 14 d
Method: OECD Test Guideline 208

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.

Diphenylmethane-2,4'-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
diphenylmethane-diisocyanate, isomers and homologues
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.

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.

Diphenylmethane-2,4'-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
diphenylmethane-diisocyanate, isomers and homologues
Test type: aerobic
Inoculum: activated sludge
Biodegradation: 0 %, 28 d, i.e. not inherently degradable
Method: OECD Test Guideline 302 C
According to the results of tests of biodegradability this product is not readily biodegradable.

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

Diphenylmethane-2,4'-diisocyanate
Biodegradation: 0 %, 28 d, i.e. not inherently degradable
Method: OECD Test Guideline 302 C
Studies of a comparable product.

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

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.

Diphenylmethane-2,4'-diisocyanate
Test type: Hydrolysis
Half life: 20 h at 25 °C
The substance hydrolyzes rapidly in water.
Studies of a comparable product.

Photodegradation
diphenylmethane-diisocyanate, isomers and homologues
Test type: Phototransformation in air
Temperature: 25 °C
sensitizer: OH-radicals
Concentration sensibilisator: 500,000 1/cm3
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.
Studies of a comparable product.

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.

Diphenylmethane-2,4'-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)
diphenylmethane-4,4'-diisocyanate
Calculated value = 0.0229 Pa*m3/mol
The substance has to be scored as being slightly volatile from water.

Diphenylmethane-2,4'-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
diphenylmethane-diisocyanate, isomers and homologues
Bioconcentration factor (BCF): < 14
Species: Cyprinus carpio (Carp)
Exposure duration: 42 d
Concentration: 0.2 mg/l
Method: OECD Test Guideline 305 C
An accumulation in aquatic organisms is not to be expected.
The substance hydrolyzes rapidly in water.
Studies of hydrolysis products.

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.

Diphenylmethane-2,4'-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.
Studies of a comparable product.

12.4 Mobility in soil

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

Diphenylmethane-2,4'-diisocyanate
Adsorption/Soil
not applicable

Environmental distribution
diphenylmethane-diisocyanate, isomers and homologues
no data available

diphenylmethane-4,4'-diisocyanate
no data available

Diphenylmethane-2,4'-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 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.

None disposal into waste water.

SECTION 14: Transport information

ADR/RID

14.1 UN 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	:	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	:	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	:	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 Marine pollutant	:	Not dangerous goods

14.6 Special precautions for user

See section 6 - 8.

Additional information	:	Not dangerous cargo.

Keep dry.
Avoid heat above +50 °C. Avoid temperatures below +10 °C.
Keep away from foodstuffs, acids and alkalis.

14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code

Not applicable.

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: 3, 56, 56

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

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

Diphenylmethane-2,4'-diisocyanate
CAS-No.: 5873-54-1, EC-No.: 227-534-9
Subject to REACH Annex XVII, No. 56

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

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

Any existing national regulations on the handling of isocyanates must be observed.
Products containing solvent:
Any existing national regulations on the handling of solvents must be observed.

Other regulations
Take note of Directive 92/85/EEC regarding maternity protection or stricter national regulations, where applicable.
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:
diphenylmethane-4,4'-diisocyanate
Diphenylmethane-2,4'-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.

The product is used mainly as a hardener in coating materials or adhesives. The handling of polyurethane raw materials containing reactive polyisocyanates and residual monomeric MDI requires appropriate protective measures referred to in this safety data sheet. These products may therefore be used only in

industrial or trade applications. They are not suitable for use in homeworker (DIY) applications.

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

Abbreviations and acronyms

ADN	Accord européen relatif au transport international des marchandises Dangereuses par voie de Navigation intérieure
ADR	Accord européen relatif au transport international des marchandises Dangereuses par Route
ANSI	American National Standards Institute
ASTM	American Society of Testing and Materials (US)
ATE	Acute Toxic Estimate
AwSv	Verordnung über Anlagen zum Umgang mit wassergefährdenden Stoffen
BCF	Bioconcentration Factor
CAS	Chemical Abstract Service
CLP	Regulation on Classification, Labelling and Packaging of Substances and Mixtures
CMR	Cancerogenic Mutagenic Reprotoxic
DIN	Deutsches Institut für Normung
DNEL	Derived No-Effect Level
EC…	Effect Concentration ... %
EWC	European Waste Catalogue
IATA	International Air Transport Association
IBC	Intermediate Bulk Container
ICAO	International Civil Aviation Organization
IMDG	International Maritime Dangerous Goods
IMO	International Maritime Organization
ISO	International Organization for Standardization
IUPAC	International Union of Pure and Applied Chemistry
LOAEL	Lowest Observable Adverse Effect Level
LC…	Lethal Concentration, ...%
LD…	Lethal Dose, ...%
MARPOL	International Convention for the Prevention of Pollution From Ships
NOAEL	No Observed Adverse Effect Level
NOEL/NOEC	No Observed Effect Level/Concentration
OECD	Organisation for Economic Co-operation and Development
PBT	persistent, bioaccumulative, toxic
PNEC	Predicted No-Effect Concentration
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
RID	Règlement concernant le transport International ferroviaire de marchandises Dangereuses
STOT	Specific Target Organ Toxicity
TRGS	Technische Regeln für Gefahrstoffe
vPvB	very Persistent, very Bioaccumulative
WGK	Wassergefährdungsklasse

Changes since the last version are highlighted in the margin. This version replaces all previous versions.

Further information

Classification of the mixture:	Classification procedure:
Acute Tox. 4 H332	Calculation method
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

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Annex

The operational conditions and the implementation of Risk Management Measures (RMM) are dependent on the following priority-/lead substances for the respective exposure routes:

Lead substance(s), aquatic environment:
Not relevant

Lead substance(s), ozone layer:
Not relevant

Priority substance(s), Health:
diphenylmethane-4,4'-diisocyanate

Local effects, Skin:
diphenylmethane-4,4'-diisocyanate

Local effects, Inhalation:
diphenylmethane-4,4'-diisocyanate

Local effects, Eyes:
diphenylmethane-4,4'-diisocyanate

Exposure Scenario

Number	Title
ES1	Formulation or re-packing
ES2	Use at industrial sites; Use as an intermediate.
ES3	Use at industrial sites; Use in coatings.
ES4	Use at industrial sites; Adhesives, sealants.
ES5	Use at industrial sites; Elastomers; Thermoplastic polyurethane; Polyamide, polyimide & synthetic fibres; Manufacturing of other Polymers.
ES6	Use at industrial sites; Cleaning; with Aprotic Polar Solvents below 40°C.
ES7	Use at industrial sites; Cleaning; with Aprotic Polar Solvents above 40°C.
ES8	Use at industrial sites; Cleaning; without Aprotic Polar Solvents.
ES9	Widespread use by professional workers; Use in coatings.
ES10	Widespread use by professional workers; Adhesives, sealants.
ES11	Widespread use by professional workers; Cleaning; without Aprotic Polar Solvents.
ES12	Consumer use; Coatings and paints, thinners, paint removers (PC9a).
ES13	Consumer use; Adhesives, sealants (PC1).

ES1: Formulation or re-packing

1.1. Title section

Exposure Scenario name	:	Distribution of substance, (including resin manufacture)
Structured Short Title	:	Formulation or re-packing

Worker		
CS1	**Distribution of substance, (including resin manufacture)** [MDI]	PROC1
CS2	**Distribution of substance, (including resin manufacture)** [MDI]	PROC2
CS3	**Distribution of substance, (including resin manufacture)** [MDI]	PROC3
CS4	**Distribution of substance, (including resin manufacture)** [MDI]	PROC4
CS5	**Distribution of substance, (including resin manufacture)** [MDI]	PROC5
CS6	**Distribution of substance, (including resin manufacture)** [MDI]	PROC8a
CS7	**Distribution of substance, (including resin manufacture)** [MDI]	PROC8b
CS8	**Distribution of substance, (including resin manufacture)** [MDI]	PROC9
CS9	**Distribution of substance, (including resin manufacture)** [MDI]	PROC15

1.2. Conditions of use affecting exposure

1.2.1. Control of worker exposure: Use in closed process, no likelihood of exposure (PROC1) [MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).		

Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
Handle substance within a closed system.

Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	240 cm² (palm of one hand)
Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

1.2.2. Control of worker exposure: Use in closed, continuous process with occasional controlled exposure (PROC2)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day

Frequency of use	:	5 days/week

Technical and organisational conditions and measures

These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying:
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
Clear spills immediately.
Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.

These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C:
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
Handle substance within a predominantly closed system provided with extract ventilation.
Handle in a fume cupboard or under extract ventilation.
Clear spills immediately.
Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
Ensure control measures are regularly inspected and maintained.

Conditions and measures related to personal protection, hygiene and health evaluation

These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying:
Do not inhale vapours / aerosols.
Ensure that direct skin contact is avoided.
Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training.
Wash off any skin contamination immediately.
Use suitable eye protection.
Wear suitable coveralls to prevent exposure to the skin.
The use of latex gloves is not supported.

These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C:
Do not inhale vapours / aerosols.
Ensure that direct skin contact is avoided.
Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training.
Wash off any skin contamination immediately.
Use suitable eye protection.
Wear suitable coveralls to prevent exposure to the skin.
The use of latex gloves is not supported.
Wear a full face respirator conforming to EN136.
Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure

Exposed skin area	:	480 cm² (palms of both hands)
Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

1.2.3. Control of worker exposure: Use in closed batch process (synthesis or formulation) (PROC3) [MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid

Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week

Technical and organisational conditions and measures
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.

Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	240 cm² (palm of one hand)
Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

1.2.4. Control of worker exposure: Use in batch and other process (synthesis) where opportunity for exposure arises (PROC4)
[MDI]

Product (article) characteristics		
Concentration of the Substance in	:	<= 100%

Mixture/Article		
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.		
Local exhaust ventilation is required. Provide extract ventilation to points where emissions occur. Provide extract ventilation to material transfer points and other openings.		
Conditions and measures related to personal protection, hygiene and health evaluation		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.		
Other conditions affecting workers exposure		
Exposed skin area	:	480 cm² (palms of both hands)
Indoor or outdoor use	:	Indoor
Temperature	:	50 °C

1.2.5. Control of worker exposure: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/ or significant contact) (PROC5)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
Duration of the acitivity	:	1 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.		
Local exhaust ventilation is required. Provide extract ventilation to points where emissions occur. Provide extract ventilation to material transfer points and other openings. Ensure control measures are regularly inspected and maintained.		
Conditions and measures related to personal protection, hygiene and health evaluation		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.		

Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	480 cm² (palms of both hands)
Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

1.2.6. Control of worker exposure: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities (PROC8a)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid

Amount used, frequency and duration of use (or from service life)		
Duration of the acitivity	:	1 hours/day
Remarks	:	daily or less, ,, Short term
Frequency of use	:	5 days/week

Technical and organisational conditions and measures
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.

Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents

BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	960 cm² (both hands)
Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

1.2.7. Control of worker exposure: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities (PROC8b)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid

Amount used, frequency and duration of use (or from service life)		
Duration of the acitivity	:	1 hours/day
Remarks	:	daily or less, ,, Short term
Frequency of use	:	5 days/week

Technical and organisational conditions and measures
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
Handle substance within a closed system.

Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying:

Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	960 cm² (both hands)
Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

1.2.8. Control of worker exposure: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) (PROC9)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week

Technical and organisational conditions and measures
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.

Ensure control measures are regularly inspected and maintained.
Local exhaust ventilation is required. Provide extract ventilation to points where emissions occur. Provide extract ventilation to material transfer points and other openings. Ensure control measures are regularly inspected and maintained.
Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	480 cm² (palms of both hands)
Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

1.2.9. Control of worker exposure: Use as laboratory reagent (PROC15)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).		

Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
With Local exhaust ventilation (LEV) : Local exhaust ventilation is required. Provide extract ventilation to points where emissions occur. OR Provide extract ventilation to material transfer points and other openings. OR Handle in a fume cupboard or under extract ventilation.
Without Local exhaust ventilation (LEV) : Ensure the ventilation system is regularly maintained and tested.

Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.
Without Local exhaust ventilation (LEV) : Wear suitable respiratory protection.

Other conditions affecting workers exposure		
Exposed skin area	:	240 cm² (palm of one hand)
Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

1.3. Exposure estimation and reference to its source

1.3.1. Worker exposure: Use in closed process, no likelihood of exposure (PROC1) [MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.0013 mg/m³ (EasyTRA, v4.1)	0.026	General ventilation: 30%, Closed system, Efficiency: 90%
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

1.3.2. Worker exposure: Use in closed, continuous process with occasional controlled exposure (PROC2) [MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.013 mg/m³ (EasyTRA, v4.1)	0.26	General ventilation: 30%
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

1.3.3. Worker exposure: Use in closed batch process (synthesis or formulation) (PROC3) [MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.013 mg/m³ (EasyTRA, v4.1)	0.26	General ventilation: 30%
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

1.3.4. Worker exposure: Use in batch and other process (synthesis) where opportunity for exposure arises (PROC4) [MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.0006 mg/m³ (EasyTRA, v4.1)	0.012	General ventilation: 30%, LEV: 90% efficiency, Respirator: 90% protection
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation

Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

1.3.5. Worker exposure: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/ or significant contact) (PROC5)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.000847 mg/m³ (EasyTRA, v4.1)	0.01694	General ventilation: 30%, LEV: 90% efficiency
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

1.3.6. Worker exposure: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities (PROC8a)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.0036 mg/m³ (EasyTRA, v4.1)	0.072	General ventilation: 30%
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

1.3.7. Worker exposure: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities (PROC8b)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.00364 mg/m³ (EasyTRA, v4.1)	0.0728	General ventilation: 30%, Closed system, 99% efficiency
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

1.3.8. Worker exposure: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) (PROC9)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.004766 mg/m³ (EasyTRA,	0.095324	General ventilation: 30%,

	v4.1)		LEV: 90% efficiency
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

1.3.9. Worker exposure: Use as laboratory reagent (PROC15) [MDI]

Exposure route	**Exposure level**	**RCR**	**Remarks**
long term, inhalative, local,	0.00558 mg/m³ (EasyTRA, v4.1)	0.1116	General ventilation: 30%, AND, LEV: 90% efficiency, OR, Respirator: 90% protection
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

1.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

MDI
The risk management measures given in this exposure scenario apply to the specified substance in a concentration as indicated in the scenario. The concentration of the substance in the product may differ. A downstream user should evaluate if the risk management measures may be adapted accordingly.
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.
Further information on the assumptions contained in this Exposure Scenario can be found at: www.ISOPA.org

ES2: Use at industrial sites; Use as an intermediate.

2.1. Title section

Exposure Scenario name	:	Use as an intermediate
Structured Short Title	:	Use at industrial sites; Use as an intermediate.

Worker		
CS1	**Use as an intermediate** [MDI]	PROC1
CS2	**Use as an intermediate** [MDI]	PROC2
CS3	**Use as an intermediate** [MDI]	PROC3
CS4	**Use as an intermediate** [MDI]	PROC4
CS5	**Use as an intermediate** [MDI]	PROC5
CS6	**Use as an intermediate** [MDI]	PROC8a
CS7	**Use as an intermediate** [MDI]	PROC8b
CS8	**Use as an intermediate** [MDI]	PROC9
CS9	**Use as an intermediate** [MDI]	PROC15

2.2. Conditions of use affecting exposure

2.2.1. Control of worker exposure: Use in closed process, no likelihood of exposure (PROC1) [MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).		

Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
Handle substance within a closed system.

Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	240 cm² (palm of one hand)
Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

2.2.2. Control of worker exposure: Use in closed, continuous process with occasional controlled exposure (PROC2)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day

Frequency of use	:	5 days/week

Technical and organisational conditions and measures

These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying:
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
Clear spills immediately.
Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.

These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C:
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
Handle substance within a predominantly closed system provided with extract ventilation.
Handle in a fume cupboard or under extract ventilation.
Clear spills immediately.
Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
Ensure control measures are regularly inspected and maintained.

Conditions and measures related to personal protection, hygiene and health evaluation

These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying:
Do not inhale vapours / aerosols.
Ensure that direct skin contact is avoided.
Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training.
Wash off any skin contamination immediately.
Use suitable eye protection.
Wear suitable coveralls to prevent exposure to the skin.
The use of latex gloves is not supported.

These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C:
Do not inhale vapours / aerosols.
Ensure that direct skin contact is avoided.
Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training.
Wash off any skin contamination immediately.
Use suitable eye protection.
Wear suitable coveralls to prevent exposure to the skin.
The use of latex gloves is not supported.
Wear a full face respirator conforming to EN136.
Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure

Exposed skin area	:	480 cm² (palms of both hands)
Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

2.2.3. Control of worker exposure: Use in closed batch process (synthesis or formulation) (PROC3) [MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid

Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week

Technical and organisational conditions and measures
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.

Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	240 cm² (palm of one hand)
Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

2.2.4. Control of worker exposure: Use in batch and other process (synthesis) where opportunity for exposure arises (PROC4)
[MDI]

Product (article) characteristics		
Concentration of the Substance in	:	<= 100%

Mixture/Article		
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.		
With Local exhaust ventilation (LEV) AND With respiratory protection : Local exhaust ventilation is required. Provide extract ventilation to points where emissions occur. Provide extract ventilation to material transfer points and other openings.		
Conditions and measures related to personal protection, hygiene and health evaluation		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.		
Other conditions affecting workers exposure		

Exposed skin area	:	480 cm² (palms of both hands)
Indoor or outdoor use	:	Indoor
Temperature	:	50 °C

2.2.5. Control of worker exposure: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/ or significant contact) (PROC5)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
Duration of the acitivity	:	1 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.		
Local exhaust ventilation is required. Provide extract ventilation to points where emissions occur. Provide extract ventilation to material transfer points and other openings. Ensure control measures are regularly inspected and maintained.		
Conditions and measures related to personal protection, hygiene and health evaluation		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided.		

Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	480 cm² (palms of both hands)
Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

2.2.6. Control of worker exposure: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities (PROC8a)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
Duration of the acitivity	:	1 hours/day
Remarks	:	daily or less, ,, Short term
Frequency of use	:	5 days/week

Technical and organisational conditions and measures
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
Ensure control measures are regularly inspected and maintained.

Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training.

Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	960 cm² (both hands)
Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

2.2.7. Control of worker exposure: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities (PROC8b)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
Duration of the acitivity	:	8 hours/day
Remarks	:	daily or less, ,, Short term
Frequency of use	:	5 days/week

Technical and organisational conditions and measures
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.

Handle substance within a closed system.
Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.
Other conditions affecting workers exposure

Exposed skin area	:	960 cm² (both hands)
Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

2.2.8. Control of worker exposure: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) (PROC9)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric		

substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
Local exhaust ventilation is required. Provide extract ventilation to points where emissions occur. Provide extract ventilation to material transfer points and other openings. Ensure control measures are regularly inspected and maintained.

Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	480 cm² (palms of both hands)
Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

2.2.9. Control of worker exposure: Use as laboratory reagent (PROC15) [MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week

Technical and organisational conditions and measures
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
With Local exhaust ventilation (LEV) : Local exhaust ventilation is required. Provide extract ventilation to points where emissions occur. OR Provide extract ventilation to material transfer points and other openings. or Handle in a fume cupboard or under extract ventilation.
Without Local exhaust ventilation (LEV) : Ensure the ventilation system is regularly maintained and tested.
Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.
Without Local exhaust ventilation (LEV) : Wear suitable respiratory protection.
Other conditions affecting workers exposure

Exposed skin area	:	240 cm² (palm of one hand)
Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

2.3. Exposure estimation and reference to its source

2.3.1. Worker exposure: Use in closed process, no likelihood of exposure (PROC1) [MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.0013 mg/m³ (EasyTRA, v4.1)	0.026	General ventilation: 30%, Closed system, Efficiency: 90%
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

2.3.2. Worker exposure: Use in closed, continuous process with occasional controlled exposure (PROC2) [MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.013 mg/m³ (EasyTRA, v4.1)	0.26	General ventilation: 30%
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

2.3.3. Worker exposure: Use in closed batch process (synthesis or formulation) (PROC3) [MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.013 mg/m³ (EasyTRA, v4.1)	0.26	General ventilation: 30%
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

2.3.4. Worker exposure: Use in batch and other process (synthesis) where opportunity for exposure arises (PROC4) [MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.0006 mg/m³ (EasyTRA, v4.1)	0.012	General ventilation: 30%, Respirator: 98% protection
long term, inhalative, local,	0.0006 mg/m³ (EasyTRA, v4.1)	0.012	General ventilation: 30%, LEV: 90% efficiency, AND,

			Respirator: 90% protection
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

2.3.5. Worker exposure: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/ or significant contact) (PROC5)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.000847 mg/m³ (EasyTRA, v4.1)	0.01694	General ventilation: 30%, LEV: 90% efficiency
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

2.3.6. Worker exposure: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities (PROC8a)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.0036 mg/m³ (EasyTRA, v4.1)	0.072	General ventilation: 30%
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

2.3.7. Worker exposure: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities (PROC8b)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.0036 mg/m³ (EasyTRA, v4.1)	0.072	General ventilation: 30%, Closed system, 99% efficiency
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

2.3.8. Worker exposure: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) (PROC9)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.004766 mg/m³ (EasyTRA, v4.1)	0.095324	General ventilation: 30%, LEV: 90% efficiency
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

2.3.9. Worker exposure: Use as laboratory reagent (PROC15)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.00558 mg/m³ (EasyTRA, v4.1)	0.1116	General ventilation: 30%, LEV: 90% efficiency, OR, Respirator: 90% protection
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

2.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

MDI
The risk management measures given in this exposure scenario apply to the specified substance in a concentration as indicated in the scenario. The concentration of the substance in the product may differ. A downstream user should evaluate if the risk management measures may be adapted accordingly.
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.
Further information on the assumptions contained in this Exposure Scenario can be found at: www.ISOPA.org

ES3: Use at industrial sites; Use in coatings.

3.1. Title section

Exposure Scenario name	:	Use in coatings
Structured Short Title	:	Use at industrial sites; Use in coatings.

Worker		
CS1	**Use in coatings** [MDI]	PROC1
CS2	**Use in coatings** [MDI]	PROC2
CS3	**Use in coatings** [MDI]	PROC3
CS4	**Use in coatings** [MDI]	PROC4
CS5	**Use in coatings** [MDI]	PROC5
CS6	**Use in coatings** [MDI]	PROC7
CS7	**Use in coatings** [MDI]	PROC8a
CS8	**Use in coatings** [MDI]	PROC8b
CS9	**Use in coatings** [MDI]	PROC9
CS10	**Use in coatings** [MDI]	PROC10
CS11	**Use in coatings** [MDI]	PROC13
CS12	**Use in coatings** [MDI]	PROC15

3.2. Conditions of use affecting exposure

3.2.1. Control of worker exposure: Use in closed process, no likelihood of exposure (PROC1) [MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day

Frequency of use	:	5 days/week

Technical and organisational conditions and measures

These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying:
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
Clear spills immediately.
Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.

These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C:
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
Handle substance within a predominantly closed system provided with extract ventilation.
Handle in a fume cupboard or under extract ventilation.
Clear spills immediately.
Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
Ensure control measures are regularly inspected and maintained.

Handle substance within a closed system.

Conditions and measures related to personal protection, hygiene and health evaluation

These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying:
Do not inhale vapours / aerosols.
Ensure that direct skin contact is avoided.
Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training.
Wash off any skin contamination immediately.
Use suitable eye protection.
Wear suitable coveralls to prevent exposure to the skin.
The use of latex gloves is not supported.

These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C:
Do not inhale vapours / aerosols.
Ensure that direct skin contact is avoided.
Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training.
Wash off any skin contamination immediately.
Use suitable eye protection.
Wear suitable coveralls to prevent exposure to the skin.
The use of latex gloves is not supported.
Wear a full face respirator conforming to EN136.
Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure

Exposed skin area	:	240 cm² (palm of one hand)
Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

3.2.2. Control of worker exposure: Use in closed, continuous process with occasional controlled exposure (PROC2)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 60%
Molar Mass	:	250 g/mol

Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.		
Conditions and measures related to personal protection, hygiene and health evaluation		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.		
Other conditions affecting workers exposure		
Exposed skin area	:	480 cm² (palms of both hands)
Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

3.2.3. Control of worker exposure: Use in closed batch process (synthesis or formulation) (PROC3) [MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.		
Conditions and measures related to personal protection, hygiene and health evaluation		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.		
Other conditions affecting workers exposure		
Exposed skin area	:	240 cm² (palm of one hand)
Indoor or outdoor use	:	Indoor

Temperature	:	23 °C

3.2.4. Control of worker exposure: Use in batch and other process (synthesis) where opportunity for exposure arises (PROC4)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.		
Local exhaust ventilation is required. Provide extract ventilation to points where emissions occur. Provide extract ventilation to material transfer points and other openings.		
Conditions and measures related to personal protection, hygiene and health evaluation		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.		

Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	480 cm² (palms of both hands)
Indoor or outdoor use	:	Indoor
Temperature	:	50 °C

3.2.5. Control of worker exposure: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/ or significant contact) (PROC5)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 60%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
Duration of the acitivity	:	1 hours/day
Frequency of use	:	5 days/week

Technical and organisational conditions and measures
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
Ensure control measures are regularly inspected and maintained. Local exhaust ventilation is required. Provide extract ventilation to points where emissions occur. Provide extract ventilation to material transfer points and other openings.

Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin.

The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	480 cm² (palms of both hands)
Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

3.2.6. Control of worker exposure: Industrial spraying (PROC7)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 60%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week

Technical and organisational conditions and measures
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
Ensure control measures are regularly inspected and maintained. Local exhaust ventilation is required. Handle substance within a predominantly closed system provided with extract ventilation. Provide extract ventilation to points where emissions occur. Provide extract ventilation to material transfer points and other openings.

Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.
General advice Irrespective of the stated risk management measures respiratory protection is generally recommended for spraying applications.

Other conditions affecting workers exposure		
Exposed skin area	:	1500 cm² (both hands and forearms)
Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

3.2.7. Control of worker exposure: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities (PROC8a)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 60%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
Duration of the acitivity	:	1 hours/day
Remarks	:	daily or less, ,, Short term
Frequency of use	:	5 days/week

Technical and organisational conditions and measures
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately.

Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.
Other conditions affecting workers exposure

Exposed skin area	:	960 cm² (both hands)
Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

3.2.8. Control of worker exposure: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities (PROC8b)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 60%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
Duration of the acitivity	:	1 hours/day
Remarks	:	daily or less, ,, Short term

Frequency of use	:	5 days/week

Technical and organisational conditions and measures

These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying:
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
Clear spills immediately.
Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.

These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C:
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
Handle substance within a predominantly closed system provided with extract ventilation.
Handle in a fume cupboard or under extract ventilation.
Clear spills immediately.
Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
Ensure control measures are regularly inspected and maintained.

Handle in semi-closed process with occasional controlled exposure.

Conditions and measures related to personal protection, hygiene and health evaluation

These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying:
Do not inhale vapours / aerosols.
Ensure that direct skin contact is avoided.
Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training.
Wash off any skin contamination immediately.
Use suitable eye protection.
Wear suitable coveralls to prevent exposure to the skin.
The use of latex gloves is not supported.

These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C:
Do not inhale vapours / aerosols.
Ensure that direct skin contact is avoided.
Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training.
Wash off any skin contamination immediately.
Use suitable eye protection.
Wear suitable coveralls to prevent exposure to the skin.
The use of latex gloves is not supported.
Wear a full face respirator conforming to EN136.
Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure

Exposed skin area	:	960 cm² (both hands)
Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

3.2.9. Control of worker exposure: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) (PROC9)
[MDI]

Product (article) characteristics

Concentration of the Substance in Mixture/Article	:	<= 60%
Molar Mass	:	250 g/mol

Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.		
Ensure control measures are regularly inspected and maintained. Local exhaust ventilation is required. Provide extract ventilation to points where emissions occur. Provide extract ventilation to material transfer points and other openings.		
Conditions and measures related to personal protection, hygiene and health evaluation		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.		
Other conditions affecting workers exposure		
Exposed skin area	:	480 cm² (palms of both hands)
Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

3.2.10. Control of worker exposure: Roller application or brushing (PROC10) [MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 60%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.		
Conditions and measures related to personal protection, hygiene and health evaluation		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.		
Other conditions affecting workers exposure		
Exposed skin area	:	960 cm² (both hands)

Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

3.2.11. Control of worker exposure: Treatment of articles by dipping and pouring (PROC13) [MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 60%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.		
Conditions and measures related to personal protection, hygiene and health evaluation		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.		

Other conditions affecting workers exposure		
Exposed skin area	:	480 cm² (palms of both hands)
Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

3.2.12. Control of worker exposure: Use as laboratory reagent (PROC15) [MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.		
With Local exhaust ventilation (LEV) AND Without respiratory protection : Local exhaust ventilation is required. Provide extract ventilation to points where emissions occur. OR Provide extract ventilation to material transfer points and other openings. or Handle in a fume cupboard or under extract ventilation.		
With respiratory protection AND Without Local exhaust ventilation (LEV) : Ensure the ventilation system is regularly maintained and tested.		
Conditions and measures related to personal protection, hygiene and health evaluation		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric		

substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.
With respiratory protection AND Without Local exhaust ventilation (LEV) : Wear suitable respiratory protection.

Other conditions affecting workers exposure		
Exposed skin area	:	240 cm² (palm of one hand)
Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

3.3. Exposure estimation and reference to its source

3.3.1. Worker exposure: Use in closed process, no likelihood of exposure (PROC1) [MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.00092 mg/m³ (EasyTRA, v4.1)	0.0184	General ventilation: 30%, Closed system, Efficiency: 90%
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

3.3.2. Worker exposure: Use in closed, continuous process with occasional controlled exposure (PROC2) [MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.00921 mg/m³ (EasyTRA, v4.1)	0.1842	General ventilation: 30%
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

3.3.3. Worker exposure: Use in closed batch process (synthesis or formulation) (PROC3)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.00921 mg/m³ (EasyTRA, v4.1)	0.1842	General ventilation: 30%
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

3.3.4. Worker exposure: Use in batch and other process (synthesis) where opportunity for exposure arises (PROC4)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.0006 mg/m³ (EasyTRA, v4.1)	0.012	General ventilation: 30%, LEV: 90% efficiency, Respirator: 90% protection
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

3.3.5. Worker exposure: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/ or significant contact) (PROC5)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.00011 mg/m³ (EasyTRA, v4.1)	0.0022	General ventilation: 30%, LEV: 90% efficiency
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

3.3.6. Worker exposure: Industrial spraying (PROC7)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.01022 mg/m³ (EasyTRA, v4.1)	0.2044	General ventilation: 30%, LEV: 95% efficiency

Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

3.3.7. Worker exposure: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities (PROC8a)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.0036 mg/m³ (EasyTRA, v4.1)	0.072	General ventilation: 30%
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

3.3.8. Worker exposure: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities (PROC8b)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.00364 mg/m³ (EasyTRA, v4.1)	0.0728	General ventilation: 30%, Closed system, 99% efficiency
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

3.3.9. Worker exposure: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) (PROC9)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.004766 mg/m³ (EasyTRA, v4.1)	0.095324	General ventilation: 30%, LEV: 90% efficiency
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

3.3.10. Worker exposure: Roller application or brushing (PROC10)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.017 mg/m³ (EasyTRA, v4.1)	0.340	General ventilation: 30%
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

3.3.11. Worker exposure: Treatment of articles by dipping and pouring (PROC13) [MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.017 mg/m³ (EasyTRA, v4.1)	0.340	General ventilation: 30%
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

3.3.12. Worker exposure: Use as laboratory reagent (PROC15) [MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.00558 mg/m³ (EasyTRA, v4.1)	0.1116	General ventilation: 30%, LEV: 90% efficiency, OR, Respirator: 90% protection
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

3.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

MDI
The risk management measures given in this exposure scenario apply to the specified substance in a concentration as indicated in the scenario. The concentration of the substance in the product may differ. A downstream user should evaluate if the risk management measures may be adapted accordingly.
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.
Further information on the assumptions contained in this Exposure Scenario can be found at: www.ISOPA.org

ES4: Use at industrial sites; Adhesives, sealants.

4.1. Title section

Exposure Scenario name	:	Adhesives, sealants
Structured Short Title	:	Use at industrial sites; Adhesives, sealants.

Worker		
CS1	**Adhesives, sealants** [MDI]	PROC1
CS2	**Adhesives, sealants** [MDI]	PROC2
CS3	**Adhesives, sealants** [MDI]	PROC3
CS4	**Adhesives, sealants** [MDI]	PROC4
CS5	**Adhesives, sealants** [MDI]	PROC5
CS6	**Adhesives, sealants** [MDI]	PROC7
CS7	**Adhesives, sealants** [MDI]	PROC8a
CS8	**Adhesives, sealants** [MDI]	PROC8b
CS9	**Adhesives, sealants** [MDI]	PROC9
CS10	**Adhesives, sealants** [MDI]	PROC10
CS11	**Adhesives, sealants** [MDI]	PROC13
CS12	**Adhesives, sealants** [MDI]	PROC14
CS13	**Adhesives, sealants** [MDI]	PROC15

4.2. Conditions of use affecting exposure

4.2.1. Control of worker exposure: Use in closed process, no likelihood of exposure (PROC1) [MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid

Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week

Technical and organisational conditions and measures
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
Handle substance within a closed system.

Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	240 cm² (palm of one hand)
Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

4.2.2. Control of worker exposure: Use in closed, continuous process with occasional controlled exposure (PROC2)
[MDI]

Product (article) characteristics

Concentration of the Substance in Mixture/Article	:	<= 60%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.		
Conditions and measures related to personal protection, hygiene and health evaluation		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.		
Other conditions affecting workers exposure		
Exposed skin area	:	480 cm² (palms of both hands)
Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

4.2.3. Control of worker exposure: Use in closed batch process (synthesis or formulation) (PROC3) [MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.		
Conditions and measures related to personal protection, hygiene and health evaluation		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.		
Other conditions affecting workers exposure		
Exposed skin area	:	240 cm² (palm of one hand)

Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

4.2.4. Control of worker exposure: Use in batch and other process (synthesis) where opportunity for exposure arises (PROC4)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 60%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.		
Local exhaust ventilation is required. Provide extract ventilation to points where emissions occur. Provide extract ventilation to material transfer points and other openings.		
Conditions and measures related to personal protection, hygiene and health evaluation		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection.		

Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	480 cm² (palms of both hands)
Indoor or outdoor use	:	Indoor
Temperature	:	50 °C

4.2.5. Control of worker exposure: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/ or significant contact) (PROC5)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 60%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
Duration of the acitivity	:	1 hours/day
Frequency of use	:	5 days/week

Technical and organisational conditions and measures
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
Ensure control measures are regularly inspected and maintained. Local exhaust ventilation is required. Provide extract ventilation to points where emissions occur. Provide extract ventilation to material transfer points and other openings.

Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately.

Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	480 cm² (palms of both hands)
Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

4.2.6. Control of worker exposure: Industrial spraying (PROC7)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 60%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		

These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
Ensure control measures are regularly inspected and maintained. Local exhaust ventilation is required. Handle substance within a predominantly closed system provided with extract ventilation.

Provide extract ventilation to points where emissions occur. Provide extract ventilation to material transfer points and other openings.
Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.
General advice Irrespective of the stated risk management measures respiratory protection is generally recommended for spraying applications.

Other conditions affecting workers exposure		
Exposed skin area	:	1500 cm² (both hands and forearms)
Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

4.2.7. Control of worker exposure: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities (PROC8a)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 60%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
Duration of the acitivity	:	1 hours/day
Remarks	:	daily or less, Short term
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric		

substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.
Other conditions affecting workers exposure

Exposed skin area	:	960 cm² (both hands)
Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

4.2.8. Control of worker exposure: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities (PROC8b)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 60%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
Duration of the acitivity	:	1 hours/day

Remarks	:	daily or less, Short term
Frequency of use	:	5 days/week

Technical and organisational conditions and measures
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
Handle substance within a closed system.

Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	960 cm² (both hands)
Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

4.2.9. Control of worker exposure: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) (PROC9)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 60%

Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid

Amount used, frequency and duration of use (or from service life)

General exposures	:	8 hours/day
Frequency of use	:	5 days/week

Technical and organisational conditions and measures

These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying:
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
Clear spills immediately.
Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.

These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C:
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
Handle substance within a predominantly closed system provided with extract ventilation.
Handle in a fume cupboard or under extract ventilation.
Clear spills immediately.
Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
Ensure control measures are regularly inspected and maintained.

Ensure control measures are regularly inspected and maintained.
Local exhaust ventilation is required.
Provide extract ventilation to points where emissions occur.
Provide extract ventilation to material transfer points and other openings.

Conditions and measures related to personal protection, hygiene and health evaluation

These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying:
Do not inhale vapours / aerosols.
Ensure that direct skin contact is avoided.
Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training.
Wash off any skin contamination immediately.
Use suitable eye protection.
Wear suitable coveralls to prevent exposure to the skin.
The use of latex gloves is not supported.

These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C:
Do not inhale vapours / aerosols.
Ensure that direct skin contact is avoided.
Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training.
Wash off any skin contamination immediately.
Use suitable eye protection.
Wear suitable coveralls to prevent exposure to the skin.
The use of latex gloves is not supported.
Wear a full face respirator conforming to EN136.
Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure

Exposed skin area	:	480 cm² (palms of both hands)
Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

4.2.10. Control of worker exposure: Roller application or brushing (PROC10) [MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 60%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.		
Conditions and measures related to personal protection, hygiene and health evaluation		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.		
Other conditions affecting workers exposure		

Exposed skin area	:	960 cm² (both hands)
Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

4.2.11. Control of worker exposure: Treatment of articles by dipping and pouring (PROC13) [MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 60%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.		
Conditions and measures related to personal protection, hygiene and health evaluation		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136.		

Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	480 cm² (palms of both hands)
Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

4.2.12. Control of worker exposure: Production of preparations or articles by tabletting, compression, extrusion, pelletisation (PROC14)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 60%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week

Technical and organisational conditions and measures
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.

Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols.

Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	480 cm² (palms of both hands)
Indoor or outdoor use	:	Indoor
Temperature	:	50 °C

4.2.13. Control of worker exposure: Use as laboratory reagent (PROC15) [MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		

These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
With Local exhaust ventilation (LEV) : Local exhaust ventilation is required. Provide extract ventilation to points where emissions occur. OR Provide extract ventilation to material transfer points and other openings. or Handle in a fume cupboard or under extract ventilation.
Without Local exhaust ventilation (LEV) AND

With respiratory protection : Ensure the ventilation system is regularly maintained and tested.
Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.
Without Local exhaust ventilation (LEV) AND With respiratory protection : Wear suitable respiratory protection.

Other conditions affecting workers exposure		
Exposed skin area	:	240 cm² (palm of one hand)
Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

4.3. Exposure estimation and reference to its source

4.3.1. Worker exposure: Use in closed process, no likelihood of exposure (PROC1) [MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.00092 mg/m³ (EasyTRA, v4.1)	0.0184	General ventilation: 30%, Closed system, Efficiency: 90%
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

4.3.2. Worker exposure: Use in closed, continuous process with occasional controlled exposure (PROC2) [MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.00921 mg/m³ (EasyTRA, v4.1)	0.1842	General ventilation: 30%
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

4.3.3. Worker exposure: Use in closed batch process (synthesis or formulation) (PROC3) [MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.00921 mg/m³ (EasyTRA, v4.1)	0.1842	General ventilation: 30%
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

4.3.4. Worker exposure: Use in batch and other process (synthesis) where opportunity for exposure arises (PROC4) [MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.0006 mg/m³ (EasyTRA, v4.1)	0.012	General ventilation: 30%, LEV: 90% efficiency, Respirator: 90% protection
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

4.3.5. Worker exposure: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/ or significant contact) (PROC5) [MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.00011 mg/m³ (EasyTRA, v4.1)	0.0022	General ventilation: 30%, LEV: 90% efficiency
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
*

Qualitative approach used to conclude safe use.

4.3.6. Worker exposure: Industrial spraying (PROC7)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.01022 mg/m³ (EasyTRA, v4.1)	0.2044	General ventilation: 30%, LEV: 95% efficiency
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

4.3.7. Worker exposure: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities (PROC8a)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.0036 mg/m³ (EasyTRA, v4.1)	0.072	General ventilation: 30%
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

4.3.8. Worker exposure: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities (PROC8b)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.00364 mg/m³ (EasyTRA, v4.1)	0.0728	General ventilation: 30%, Closed system, 99% efficiency
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

4.3.9. Worker exposure: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) (PROC9)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.004766 mg/m³ (EasyTRA, v4.1)	0.095324	General ventilation: 30%, LEV: 90% efficiency
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

4.3.10. Worker exposure: Roller application or brushing (PROC10)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.017 mg/m³ (EasyTRA, v4.1)	0.340	General ventilation: 30%
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

4.3.11. Worker exposure: Treatment of articles by dipping and pouring (PROC13)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.017 mg/m³ (EasyTRA, v4.1)	0.340	General ventilation: 30%
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

4.3.12. Worker exposure: Production of preparations or articles by tabletting, compression, extrusion, pelletisation (PROC14)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.00576 mg/m³ (EasyTRA, v4.1)	0.1152	General ventilation: 30%
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

4.3.13. Worker exposure: Use as laboratory reagent (PROC15)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.00558 mg/m³ (EasyTRA, v4.1)	0.1116	General ventilation: 30%, LEV: 90% efficiency, OR, Respirator: 90% protection

Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

4.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

MDI
The risk management measures given in this exposure scenario apply to the specified substance in a concentration as indicated in the scenario. The concentration of the substance in the product may differ. A downstream user should evaluate if the risk management measures may be adapted accordingly.
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.
Further information on the assumptions contained in this Exposure Scenario can be found at: www.ISOPA.org

ES5: Use at industrial sites; Elastomers; Thermoplastic polyurethane; Polyamide, polyimide & synthetic fibres; Manufacturing of other Polymers.

5.1. Title section

Exposure Scenario name	:	Elastomers, Thermoplastic polyurethane, Polyamide, polyimide & synthetic fibres, Manufacturing of other Polymers
Structured Short Title	:	Use at industrial sites; Elastomers; Thermoplastic polyurethane; Polyamide, polyimide & synthetic fibres; Manufacturing of other Polymers.

Worker		
CS1	**Elastomers, Thermoplastic polyurethane, Polyamide, polyimide & synthetic fibres, Manufacturing of other Polymers** [MDI]	PROC1
CS2	**Elastomers, Thermoplastic polyurethane, Polyamide, polyimide & synthetic fibres, Manufacturing of other Polymers** [MDI]	PROC2
CS3	**Elastomers, Thermoplastic polyurethane, Polyamide, polyimide & synthetic fibres, Manufacturing of other Polymers** [MDI]	PROC3
CS4	**Elastomers, Thermoplastic polyurethane, Polyamide, polyimide & synthetic fibres, Manufacturing of other Polymers** [MDI]	PROC4
CS5	**Elastomers, Thermoplastic polyurethane, Polyamide, polyimide & synthetic fibres, Manufacturing of other Polymers** [MDI]	PROC5
CS6	**Elastomers, Thermoplastic polyurethane, Polyamide, polyimide & synthetic fibres, Manufacturing of other Polymers** [MDI]	PROC7
CS7	**Elastomers, Thermoplastic polyurethane, Polyamide, polyimide & synthetic fibres, Manufacturing of other Polymers** [MDI]	PROC8a
CS8	**Elastomers, Thermoplastic polyurethane, Polyamide, polyimide & synthetic fibres, Manufacturing of other Polymers** [MDI]	PROC8b
CS9	**Elastomers, Thermoplastic polyurethane, Polyamide, polyimide & synthetic fibres, Manufacturing of other Polymers** [MDI]	PROC9
CS10	**Elastomers, Thermoplastic polyurethane, Polyamide, polyimide & synthetic fibres, Manufacturing of other Polymers** [MDI]	PROC10
CS11	**Elastomers, Thermoplastic polyurethane, Polyamide, polyimide & synthetic fibres, Manufacturing of other Polymers** [MDI]	PROC14
CS12	**Elastomers, Thermoplastic polyurethane, Polyamide, polyimide & synthetic fibres, Manufacturing of other Polymers** [MDI]	PROC15

5.2. Conditions of use affecting exposure

5.2.1. Control of worker exposure: Use in closed process, no likelihood of exposure (PROC1) [MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.		
Handle substance within a closed system.		
Conditions and measures related to personal protection, hygiene and health evaluation		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.		
Other conditions affecting workers exposure		
Exposed skin area	:	240 cm² (palm of one hand)

Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

5.2.2. Control of worker exposure: Use in closed, continuous process with occasional controlled exposure (PROC2)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.		
Conditions and measures related to personal protection, hygiene and health evaluation		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion		

activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	480 cm² (palms of both hands)
Indoor or outdoor use	:	Indoor
Temperature	:	100 °C

5.2.3. Control of worker exposure: Use in closed batch process (synthesis or formulation) (PROC3) [MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid

Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week

Technical and organisational conditions and measures
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.

Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training.

Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	240 cm² (palm of one hand)
Indoor or outdoor use	:	Indoor
Temperature	:	100 °C

5.2.4. Control of worker exposure: Use in batch and other process (synthesis) where opportunity for exposure arises (PROC4)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week

Technical and organisational conditions and measures
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
Local exhaust ventilation is required. Provide extract ventilation to points where emissions occur. Provide extract ventilation to material transfer points and other openings.
Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training.

Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	480 cm² (palms of both hands)
Indoor or outdoor use	:	Indoor
Temperature	:	100 °C

5.2.5. Control of worker exposure: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/ or significant contact) (PROC5)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
Duration of the acitivity	:	1 hours/day
Frequency of use	:	5 days/week

Technical and organisational conditions and measures
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
Ensure control measures are regularly inspected and maintained.

Local exhaust ventilation is required. Provide extract ventilation to points where emissions occur. Provide extract ventilation to material transfer points and other openings.
Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	480 cm² (palms of both hands)
Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

5.2.6. Control of worker exposure: Industrial spraying (PROC7)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		

These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.

These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
Local exhaust ventilation is required. Handle substance within a predominantly closed system provided with extract ventilation. Provide extract ventilation to points where emissions occur. Provide extract ventilation to material transfer points and other openings.

Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.
General advice Irrespective of the stated risk management measures respiratory protection is generally recommended for spraying applications.

Other conditions affecting workers exposure		
Exposed skin area	:	1500 cm² (both hands and forearms)
Indoor or outdoor use	:	Indoor
Temperature	:	100 °C

5.2.7. Control of worker exposure: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities (PROC8a)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid

Amount used, frequency and duration of use (or from service life)		
Duration of the acitivity	:	1 hours/day
Remarks	:	daily or less, ,, Short term
Frequency of use	:	5 days/week

Technical and organisational conditions and measures

These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying:
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
Clear spills immediately.
Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.

These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C:
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
Handle substance within a predominantly closed system provided with extract ventilation.
Handle in a fume cupboard or under extract ventilation.
Clear spills immediately.
Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
Ensure control measures are regularly inspected and maintained.

Conditions and measures related to personal protection, hygiene and health evaluation

These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying:
Do not inhale vapours / aerosols.
Ensure that direct skin contact is avoided.
Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training.
Wash off any skin contamination immediately.
Use suitable eye protection.
Wear suitable coveralls to prevent exposure to the skin.
The use of latex gloves is not supported.

These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C:
Do not inhale vapours / aerosols.
Ensure that direct skin contact is avoided.
Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training.
Wash off any skin contamination immediately.
Use suitable eye protection.
Wear suitable coveralls to prevent exposure to the skin.
The use of latex gloves is not supported.
Wear a full face respirator conforming to EN136.
Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	960 cm² (both hands)
Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

5.2.8. Control of worker exposure: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities (PROC8b)
[MDI]

Product (article) characteristics

Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
Duration of the acitivity	:	1 hours/day
Remarks	:	daily or less, ,, Short term
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.		
Handle substance within a closed system.		
Conditions and measures related to personal protection, hygiene and health evaluation		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.		
Other conditions affecting workers exposure		
Exposed skin area	:	960 cm² (both hands)
Indoor or outdoor use	:	Indoor

Temperature	:	23 °C

5.2.9. Control of worker exposure: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) (PROC9)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.		
Local exhaust ventilation is required. Provide extract ventilation to points where emissions occur. Provide extract ventilation to material transfer points and other openings.		
Conditions and measures related to personal protection, hygiene and health evaluation		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.		

Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	480 cm² (palms of both hands)
Indoor or outdoor use	:	Indoor
Temperature	:	100 °C

5.2.10. Control of worker exposure: Roller application or brushing (PROC10) [MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week

Technical and organisational conditions and measures
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.

Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols.

Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	960 cm² (both hands)
Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

5.2.11. Control of worker exposure: Production of preparations or articles by tabletting, compression, extrusion, pelletisation (PROC14)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week

Technical and organisational conditions and measures
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.

Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection.

Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	480 cm² (palms of both hands)
Indoor or outdoor use	:	Indoor
Temperature	:	100 °C

5.2.12. Control of worker exposure: Use as laboratory reagent (PROC15) [MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		

These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
With Local exhaust ventilation (LEV) : Local exhaust ventilation is required. Provide extract ventilation to points where emissions occur.

OR Provide extract ventilation to material transfer points and other openings. or Handle in a fume cupboard or under extract ventilation.
Without Local exhaust ventilation (LEV) AND With respiratory protection : Ensure the ventilation system is regularly maintained and tested.

Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.
Without Local exhaust ventilation (LEV) AND With respiratory protection : Wear suitable respiratory protection.

Other conditions affecting workers exposure		
Exposed skin area	:	240 cm² (palm of one hand)
Indoor or outdoor use	:	Indoor
Temperature	:	23 °C

5.3. Exposure estimation and reference to its source

5.3.1. Worker exposure: Use in closed process, no likelihood of exposure (PROC1) [MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.00092 mg/m³ (EasyTRA, v4.1)	0.0184	General ventilation: 30%, Closed system, Efficiency: 90%
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation

Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

5.3.2. Worker exposure: Use in closed, continuous process with occasional controlled exposure (PROC2) [MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.00921 mg/m³ (EasyTRA, v4.1)	0.1842	General ventilation: 30%, Respirator: 90% protection
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

5.3.3. Worker exposure: Use in closed batch process (synthesis or formulation) (PROC3) [MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.00921 mg/m³ (EasyTRA, v4.1)	0.1842	General ventilation: 30%, Respirator: 90% protection
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

5.3.4. Worker exposure: Use in batch and other process (synthesis) where opportunity for exposure arises (PROC4) [MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.0006 mg/m³ (EasyTRA, v4.1)	0.012	General ventilation: 30%, LEV: 90% efficiency, Respirator: 90% protection
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

5.3.5. Worker exposure: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/ or significant contact) (PROC5) [MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.00011 mg/m³ (EasyTRA, v4.1)	0.0022	General ventilation: 30%, LEV: 90% efficiency
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

5.3.6. Worker exposure: Industrial spraying (PROC7)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.01022 mg/m³ (EasyTRA, v4.1)	0.2044	General ventilation: 30%, LEV: 95% efficiency, Respirator: 90% protection
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

5.3.7. Worker exposure: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities (PROC8a)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.0036 mg/m³ (EasyTRA, v4.1)	0.072	General ventilation: 30%
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

5.3.8. Worker exposure: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities (PROC8b)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.00364 mg/m³ (EasyTRA, v4.1)	0.0728	General ventilation: 30%, Closed system, 99% efficiency
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

5.3.9. Worker exposure: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) (PROC9)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.004766 mg/m³ (EasyTRA, v4.1)	0.095324	General ventilation: 30%, LEV: 90% efficiency, Respirator: 90% protection
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

5.3.10. Worker exposure: Roller application or brushing (PROC10)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.017 mg/m³ (EasyTRA, v4.1)	0.340	General ventilation: 30%
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

5.3.11. Worker exposure: Production of preparations or articles by tabletting, compression, extrusion, pelletisation (PROC14)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.00576 mg/m³ (EasyTRA, v4.1)	0.1152	General ventilation: 30%, Respirator: 90% protection
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

5.3.12. Worker exposure: Use as laboratory reagent (PROC15)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.00558 mg/m³ (EasyTRA, v4.1)	0.1116	General ventilation: 30%, LEV: 90% efficiency, OR, Respirator: 90% protection
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

5.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

MDI
The risk management measures given in this exposure scenario apply to the specified substance in a concentration as indicated in the scenario. The concentration of the substance in the product may differ. A downstream user should evaluate if the risk management measures may be adapted accordingly.
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.
Further information on the assumptions contained in this Exposure Scenario can be found at: www.ISOPA.org

ES6: Use at industrial sites; Cleaning; with Aprotic Polar Solvents below 40°C.

6.1. Title section

Exposure Scenario name	:	Cleaning, with Aprotic Polar Solvents below 40°C
Structured Short Title	:	Use at industrial sites; Cleaning; with Aprotic Polar Solvents below 40°C.

Worker		
CS1	**Cleaning, with Aprotic Polar Solvents below 40°C** [MDI]	PROC3
CS2	**Cleaning, with Aprotic Polar Solvents below 40°C** [MDI]	PROC4
CS3	**Cleaning, with Aprotic Polar Solvents below 40°C** [MDI]	PROC5
CS4	**Cleaning, with Aprotic Polar Solvents below 40°C** [MDI]	PROC8a, PROC10
CS5	**Cleaning, with Aprotic Polar Solvents below 40°C** [MDI]	PROC13
CS6	**Cleaning, with Aprotic Polar Solvents below 40°C** [MDI]	PROC15

6.2. Conditions of use affecting exposure

6.2.1. Control of worker exposure: Use in closed batch process (synthesis or formulation) (PROC3) [MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	1 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		

These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C:
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
Handle substance within a predominantly closed system provided with extract ventilation.
Handle in a fume cupboard or under extract ventilation.
Clear spills immediately.
Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
Ensure control measures are regularly inspected and maintained.

Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	240 cm² (palm of one hand)
Indoor or outdoor use	:	Indoor
Temperature	:	40 °C

6.2.2. Control of worker exposure: Use in batch and other process (synthesis) where opportunity for exposure arises (PROC4)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	1 hours/day
Frequency of use	:	5 days/week

Technical and organisational conditions and measures
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
Local exhaust ventilation is required. Provide extract ventilation to points where emissions occur. Provide extract ventilation to material transfer points and other openings.

Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents

BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	480 cm² (palms of both hands)
Indoor or outdoor use	:	Indoor
Temperature	:	40 °C

6.2.3. Control of worker exposure: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/ or significant contact) (PROC5)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid

Amount used, frequency and duration of use (or from service life)		
General exposures	:	1 hours/day
Frequency of use	:	5 days/week

Technical and organisational conditions and measures
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
Local exhaust ventilation is required. Provide extract ventilation to points where emissions occur. Provide extract ventilation to material transfer points and other openings.

Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately.

Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	480 cm² (palms of both hands)
Indoor or outdoor use	:	Indoor
Temperature	:	40 °C

6.2.4. Control of worker exposure: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities (PROC8a) / Roller application or brushing (PROC10) [MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	1 hours/day
Frequency of use	:	5 days/week

Technical and organisational conditions and measures
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
With Local exhaust ventilation (LEV) : Local exhaust ventilation is required. Provide extract ventilation to points where emissions occur. OR Provide extract ventilation to material transfer points and other openings.
Without Local exhaust ventilation (LEV) : Ensure the ventilation system is regularly maintained and tested.
Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided.

Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	960 cm² (both hands)
Indoor or outdoor use	:	Indoor
Temperature	:	40 °C

6.2.5. Control of worker exposure: Treatment of articles by dipping and pouring (PROC13) [MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	1 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		

These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
With Local exhaust ventilation (LEV) : Local exhaust ventilation is required. Provide extract ventilation to points where emissions occur. OR Provide extract ventilation to material transfer points and other openings.
Without Local exhaust ventilation (LEV) : Ensure the ventilation system is regularly maintained and tested.

Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols.

Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	480 cm² (palms of both hands)
Indoor or outdoor use	:	Indoor
Temperature	:	40 °C

6.2.6. Control of worker exposure: Use as laboratory reagent (PROC15) [MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid

Amount used, frequency and duration of use (or from service life)		
General exposures	:	1 hours/day
Frequency of use	:	5 days/week

Technical and organisational conditions and measures
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
With Local exhaust ventilation (LEV) : Local exhaust ventilation is required. Provide extract ventilation to points where emissions occur. OR Provide extract ventilation to material transfer points and other openings.
Without Local exhaust ventilation (LEV) : Ensure the ventilation system is regularly maintained and tested.

Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C:

Do not inhale vapours / aerosols.
Ensure that direct skin contact is avoided.
Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training.
Wash off any skin contamination immediately.
Use suitable eye protection.
Wear suitable coveralls to prevent exposure to the skin.
The use of latex gloves is not supported.
Wear a full face respirator conforming to EN136.
Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	240 cm² (palm of one hand)
Indoor or outdoor use	:	Indoor
Temperature	:	40 °C

6.3. Exposure estimation and reference to its source

6.3.1. Worker exposure: Use in closed batch process (synthesis or formulation) (PROC3) [MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.00023 mg/m³ (EasyTRA, v4.1)	0.0046	General ventilation: 30%
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

6.3.2. Worker exposure: Use in batch and other process (synthesis) where opportunity for exposure arises (PROC4) [MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.00023 mg/m³ (EasyTRA, v4.1)	0.0046	General ventilation: 30%, LEV: 90% efficiency
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

6.3.3. Worker exposure: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/ or significant contact) (PROC5) [MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.00023 mg/m³ (EasyTRA, v4.1)	0.0046	General ventilation: 30%, LEV: 90% efficiency
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

6.3.4. Worker exposure: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities (PROC8a) / Roller application or brushing (PROC10) [MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.00023 mg/m³ (EasyTRA, v4.1)	0.0046	General ventilation: 30%, LEV: 90% efficiency, OR, Respirator: 90% protection
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

6.3.5. Worker exposure: Treatment of articles by dipping and pouring (PROC13) [MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.00023 mg/m³ (EasyTRA, v4.1)	0.0046	General ventilation: 30%, LEV: 90% efficiency, OR, Respirator: 90% protection
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

6.3.6. Worker exposure: Use as laboratory reagent (PROC15) [MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.00023 mg/m³ (EasyTRA, v4.1)	0.0046	General ventilation: 30%, LEV: 90% efficiency, OR, Respirator: 90% protection
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

6.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

MDI

The risk management measures given in this exposure scenario apply to the specified substance in a concentration as indicated in the scenario. The concentration of the substance in the product may differ. A downstream user should evaluate if the risk management measures may be adapted accordingly.
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.
Further information on the assumptions contained in this Exposure Scenario can be found at: www.ISOPA.org

ES7: Use at industrial sites; Cleaning; with Aprotic Polar Solvents above 40°C.

7.1. Title section

Exposure Scenario name	:	Cleaning, with Aprotic Polar Solvents above 40°C
Structured Short Title	:	Use at industrial sites; Cleaning; with Aprotic Polar Solvents above 40°C.

Worker		
CS1	**Cleaning, with Aprotic Polar Solvents above 40°C** [MDI]	PROC1

7.2. Conditions of use affecting exposure

7.2.1. Control of worker exposure: Use in closed process, no likelihood of exposure (PROC1) [MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
Duration of the acitivity	:	1 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		

Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
Handle substance within a predominantly closed system provided with extract ventilation.
Handle in a fume cupboard or under extract ventilation.
Clear spills immediately.
Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
Ensure control measures are regularly inspected and maintained.

Handle substance within a closed system.

Conditions and measures related to personal protection, hygiene and health evaluation

Do not inhale vapours / aerosols.
Ensure that direct skin contact is avoided.
Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training.
Wash off any skin contamination immediately.
Use suitable eye protection.
Wear suitable coveralls to prevent exposure to the skin.
The use of latex gloves is not supported.
Wear a full face respirator conforming to EN136.
Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	240 cm² (palm of one hand)
Indoor or outdoor use	:	Indoor
Temperature	:	41 °C

7.3. Exposure estimation and reference to its source

7.3.1. Worker exposure: Use in closed process, no likelihood of exposure (PROC1) [MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.00023 mg/m³ (EasyTRA, v4.1)	0.0046	General ventilation: 30%, Respirator: 90% protection, Closed system, Efficiency: 90%
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

7.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

MDI
The risk management measures given in this exposure scenario apply to the specified substance in a concentration as indicated in the scenario. The concentration of the substance in the product may differ. A downstream user should evaluate if the risk management measures may be adapted accordingly.
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.
Further information on the assumptions contained in this Exposure Scenario can be found at: www.ISOPA.org

ES8: Use at industrial sites; Cleaning; without Aprotic Polar Solvents.

8.1. Title section

Exposure Scenario name	:	Cleaning, without Aprotic Polar Solvents
Structured Short Title	:	Use at industrial sites; Cleaning; without Aprotic Polar Solvents.

Worker		
CS1	**Cleaning, without Aprotic Polar Solvents** [MDI]	PROC1
CS2	**Cleaning, without Aprotic Polar Solvents** [MDI]	PROC3
CS3	**Cleaning, without Aprotic Polar Solvents** [MDI]	PROC4
CS4	**Cleaning, without Aprotic Polar Solvents** [MDI]	PROC5
CS5	**Cleaning, without Aprotic Polar Solvents** [MDI]	PROC8a
CS6	**Cleaning, without Aprotic Polar Solvents** [MDI]	PROC10
CS7	**Cleaning, without Aprotic Polar Solvents** [MDI]	PROC13
CS8	**Cleaning, without Aprotic Polar Solvents** [MDI]	PROC15

8.2. Conditions of use affecting exposure

8.2.1. Control of worker exposure: Use in closed process, no likelihood of exposure (PROC1) [MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	1 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		

These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying:
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
Clear spills immediately.
Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.

These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
Local exhaust ventilation is required.

Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	240 cm² (palm of one hand)
Indoor or outdoor use	:	Indoor

8.2.2. Control of worker exposure: Use in closed batch process (synthesis or formulation) (PROC3) [MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	1 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		

These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.

Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	240 cm² (palm of one hand)
Indoor or outdoor use	:	Indoor

8.2.3. Control of worker exposure: Use in batch and other process (synthesis) where opportunity for exposure arises (PROC4)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	1 hours/day

Frequency of use	:	5 days/week

Technical and organisational conditions and measures

These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying:
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
Clear spills immediately.
Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.

These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C:
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
Handle substance within a predominantly closed system provided with extract ventilation.
Handle in a fume cupboard or under extract ventilation.
Clear spills immediately.
Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
Ensure control measures are regularly inspected and maintained.

Local exhaust ventilation is required.
Provide extract ventilation to points where emissions occur.
Provide extract ventilation to material transfer points and other openings.

Conditions and measures related to personal protection, hygiene and health evaluation

These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying:
Do not inhale vapours / aerosols.
Ensure that direct skin contact is avoided.
Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training.
Wash off any skin contamination immediately.
Use suitable eye protection.
Wear suitable coveralls to prevent exposure to the skin.
The use of latex gloves is not supported.

These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C:
Do not inhale vapours / aerosols.
Ensure that direct skin contact is avoided.
Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training.
Wash off any skin contamination immediately.
Use suitable eye protection.
Wear suitable coveralls to prevent exposure to the skin.
The use of latex gloves is not supported.
Wear a full face respirator conforming to EN136.
Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure

Exposed skin area	:	480 cm² (palms of both hands)
Indoor or outdoor use	:	Indoor

8.2.4. Control of worker exposure: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/ or significant contact) (PROC5)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol

Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	1 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.		
Local exhaust ventilation is required. Provide extract ventilation to points where emissions occur. Provide extract ventilation to material transfer points and other openings.		
Conditions and measures related to personal protection, hygiene and health evaluation		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.		
Other conditions affecting workers exposure		
Exposed skin area	:	480 cm² (palms of both hands)
Indoor or outdoor use	:	Indoor

8.2.5. Control of worker exposure: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities (PROC8a)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	1 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.		
Local exhaust ventilation is required.		
Conditions and measures related to personal protection, hygiene and health evaluation		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.		
Other conditions affecting workers exposure		
Exposed skin area	:	960 cm² (both hands)

Indoor or outdoor use	:	Indoor

8.2.6. Control of worker exposure: Roller application or brushing (PROC10) [MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	1 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.		
Local exhaust ventilation is required.		
Conditions and measures related to personal protection, hygiene and health evaluation		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.		

Other conditions affecting workers exposure		
Exposed skin area	:	960 cm² (both hands)
Indoor or outdoor use	:	Indoor

8.2.7. Control of worker exposure: Treatment of articles by dipping and pouring (PROC13) [MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	1 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.		
Local exhaust ventilation is required.		
Conditions and measures related to personal protection, hygiene and health evaluation		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection.		

Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	480 cm² (palms of both hands)
Indoor or outdoor use	:	Indoor

8.2.8. Control of worker exposure: Use as laboratory reagent (PROC15)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid

Amount used, frequency and duration of use (or from service life)		
General exposures	:	1 hours/day
Frequency of use	:	5 days/week

Technical and organisational conditions and measures
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
With Local exhaust ventilation (LEV) : Local exhaust ventilation is required. Provide extract ventilation to points where emissions occur. OR Provide extract ventilation to material transfer points and other openings. OR Handle in a fume cupboard or under extract ventilation.
Without Local exhaust ventilation (LEV) : Ensure the ventilation system is regularly maintained and tested.

Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying:

Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.
Without Local exhaust ventilation (LEV) : Wear suitable respiratory protection.

Other conditions affecting workers exposure		
Exposed skin area	:	240 cm² (palm of one hand)
Indoor or outdoor use	:	Indoor

8.3. Exposure estimation and reference to its source

8.3.1. Worker exposure: Use in closed process, no likelihood of exposure (PROC1) [MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.00023 mg/m³ (EasyTRA, v4.1)	0.0046	General ventilation: 30%, LEV: 90% efficiency
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

8.3.2. Worker exposure: Use in closed batch process (synthesis or formulation) (PROC3) [MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.0023 mg/m³ (EasyTRA, v4.1)	0.046	General ventilation: 30%
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
*

Qualitative approach used to conclude safe use.

8.3.3. Worker exposure: Use in batch and other process (synthesis) where opportunity for exposure arises (PROC4)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.00023 mg/m³ (EasyTRA, v4.1)	0.0046	General ventilation: 30%, LEV: 90% efficiency
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

8.3.4. Worker exposure: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/ or significant contact) (PROC5)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.00023 mg/m³ (EasyTRA, v4.1)	0.0046	General ventilation: 30%, LEV: 90% efficiency
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

8.3.5. Worker exposure: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities (PROC8a)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.0023 mg/m³ (EasyTRA, v4.1)	0.046	General ventilation: 30%, LEV: 99% efficiency
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

8.3.6. Worker exposure: Roller application or brushing (PROC10)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.0023 mg/m³ (EasyTRA, v4.1)	0.046	General ventilation: 30%, LEV: 90% efficiency
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation

Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

8.3.7. Worker exposure: Treatment of articles by dipping and pouring (PROC13) [MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.0023 mg/m³ (EasyTRA, v4.1)	0.046	General ventilation: 30%, LEV: 90% efficiency
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

8.3.8. Worker exposure: Use as laboratory reagent (PROC15) [MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.00023 mg/m³ (EasyTRA, v4.1)	0.0046	General ventilation: 30%, LEV: 90% efficiency, OR, Respirator: 90% protection
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

8.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

MDI
The risk management measures given in this exposure scenario apply to the specified substance in a concentration as indicated in the scenario. The concentration of the substance in the product may differ. A downstream user should evaluate if the risk management measures may be adapted accordingly.
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.
Further information on the assumptions contained in this Exposure Scenario can be found at: www.ISOPA.org

ES9: Widespread use by professional workers; Use in coatings.

9.1. Title section

Exposure Scenario name	:	Use in coatings
Structured Short Title	:	Widespread use by professional workers; Use in coatings.

Worker		
CS1	**Use in coatings** [MDI]	PROC4
CS2	**Use in coatings** [MDI]	PROC5
CS3	**Use in coatings** [MDI]	PROC8a
CS4	**Use in coatings** [MDI]	PROC8b
CS5	**Use in coatings** [MDI]	PROC10
CS6	**Use in coatings** [MDI]	PROC11
CS7	**Use in coatings** [MDI]	PROC13

9.2. Conditions of use affecting exposure

9.2.1. Control of worker exposure: Use in batch and other process (synthesis) where opportunity for exposure arises (PROC4)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 60%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents		

BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
With Local exhaust ventilation (LEV) : Local exhaust ventilation is required. Provide extract ventilation to points where emissions occur. Provide extract ventilation to material transfer points and other openings.
Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.
Other conditions affecting workers exposure
Exposed skin area : 480 cm² (palms of both hands)
Indoor or outdoor use : Indoor use
Temperature : 50 °C

9.2.2. Control of worker exposure: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/ or significant contact) (PROC5)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 60%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
Duration of the acitivity	:	1 hours/day

Frequency of use	:	5 days/week

Technical and organisational conditions and measures

These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying:
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
Clear spills immediately.
Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.

These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C:
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
Handle substance within a predominantly closed system provided with extract ventilation.
Handle in a fume cupboard or under extract ventilation.
Clear spills immediately.
Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
Ensure control measures are regularly inspected and maintained.

Indoor use
With Local exhaust ventilation (LEV)
:
Ensure control measures are regularly inspected and maintained.
Local exhaust ventilation is required.
Provide extract ventilation to points where emissions occur.
Provide extract ventilation to material transfer points and other openings.

Indoor use
Without Local exhaust ventilation (LEV)
OR
Outdoor use
:
Ensure control measures are regularly inspected and maintained.

Conditions and measures related to personal protection, hygiene and health evaluation

These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying:
Do not inhale vapours / aerosols.
Ensure that direct skin contact is avoided.
Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training.
Wash off any skin contamination immediately.
Use suitable eye protection.
Wear suitable coveralls to prevent exposure to the skin.
The use of latex gloves is not supported.

These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C:
Do not inhale vapours / aerosols.
Ensure that direct skin contact is avoided.
Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training.
Wash off any skin contamination immediately.
Use suitable eye protection.
Wear suitable coveralls to prevent exposure to the skin.
The use of latex gloves is not supported.
Wear a full face respirator conforming to EN136.
Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Indoor use
Without Local exhaust ventilation (LEV)
OR
Outdoor use
:
Wear a respirator conforming to EN140.

Other conditions affecting workers exposure		
Exposed skin area	:	480 cm² (palms of both hands)
Indoor or outdoor use	:	Indoor/Outdoor use
Temperature	:	23 °C

9.2.3. Control of worker exposure: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities (PROC8a)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 60%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
Duration of the acitivity	:	1 hours/day
Remarks	:	daily or less, ,, Short term
Frequency of use	:	5 days/week

Technical and organisational conditions and measures

These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying:
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
Clear spills immediately.
Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.

These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C:
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
Handle substance within a predominantly closed system provided with extract ventilation.
Handle in a fume cupboard or under extract ventilation.
Clear spills immediately.
Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
Ensure control measures are regularly inspected and maintained.

Conditions and measures related to personal protection, hygiene and health evaluation

These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying:
Do not inhale vapours / aerosols.
Ensure that direct skin contact is avoided.
Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training.
Wash off any skin contamination immediately.
Use suitable eye protection.
Wear suitable coveralls to prevent exposure to the skin.
The use of latex gloves is not supported.

These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C:
Do not inhale vapours / aerosols.
Ensure that direct skin contact is avoided.

Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	960 cm² (both hands)
Indoor or outdoor use	:	Indoor use
Temperature	:	23 °C

9.2.4. Control of worker exposure: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities (PROC8b)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 60%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
Duration of the acitivity	:	1 hours/day
Remarks	:	daily or less, ,, Short term
Frequency of use	:	5 days/week

Technical and organisational conditions and measures
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
Handle substance within a closed system.

Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training.

Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	960 cm² (both hands)
Indoor or outdoor use	:	Indoor use
Temperature	:	23 °C

9.2.5. Control of worker exposure: Roller application or brushing (PROC10) [MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 60%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week

Technical and organisational conditions and measures
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
Conditions and measures related to personal protection, hygiene and health evaluation

These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	960 cm² (both hands)
Indoor or outdoor use	:	Indoor use
Temperature	:	23 °C

9.2.6. Control of worker exposure: Non industrial spraying (PROC11) [MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 60%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
Duration of the acitivity	:	6 hours/day
Remarks	:	1, -, 5
Frequency of use	:	5 days/week

Technical and organisational conditions and measures
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation.

Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
Indoor use 1 : Ensure control measures are regularly inspected and maintained. Local exhaust ventilation is required. Handle substance within a predominantly closed system provided with extract ventilation. Provide extract ventilation to points where emissions occur. Provide extract ventilation to material transfer points and other openings.
Indoor use 2 : Access to work area only for authorised persons. Ensure control measures are regularly inspected and maintained. Local exhaust ventilation is required. Ensure that a spraying booth is used.
Indoor use 3 : Access to work area only for authorised persons. Ensure control measures are regularly inspected and maintained. Open doors and windows. Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Ensure good ventilation.
Indoor use 4 : Access to work area only for authorised persons. Ensure control measures are regularly inspected and maintained. Local exhaust ventilation is required. Provide extract ventilation to points where emissions occur.
Outdoor use 5 : Access to work area only for authorised persons. Ensure control measures are regularly inspected and maintained. Ensure operation is undertaken outdoors. Stay upwind/keep distance from source.

Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.

Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.
General advice Irrespective of the stated risk management measures respiratory protection is generally recommended for spraying applications.
Indoor use 2 Wear a full face respirator conforming to EN136.
Indoor use 3 Wear a full face respirator conforming to EN136.
Indoor use 4 Wear a full face respirator conforming to EN136.
Outdoor use 5 Wear a full face respirator conforming to EN136.

Other conditions affecting workers exposure		
Exposed skin area	:	1500 cm² (both hands and forearms)
Indoor or outdoor use	:	Indoor/Outdoor use
Temperature	:	35 °C
Remarks	:	1, -, 5

9.2.7. Control of worker exposure: Treatment of articles by dipping and pouring (PROC13) [MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 60%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		

These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately.

Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	480 cm² (palms of both hands)
Indoor or outdoor use	:	Indoor use
Temperature	:	23 °C

9.3. Exposure estimation and reference to its source

9.3.1. Worker exposure: Use in batch and other process (synthesis) where opportunity for exposure arises (PROC4)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.0006 mg/m³ (EasyTRA, v4.1)	0.012	General ventilation: 30%, Respirator: 90% protection, LEV: 90% efficiency
long term, inhalative, local,	0.0006 mg/m³ (EasyTRA, v4.1)	0.012	General ventilation: 30%, Respirator: 90% protection, Without Local Exhaust Ventilation
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

9.3.2. Worker exposure: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/ or significant contact) (PROC5)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.00011 mg/m³ (EasyTRA, v4.1)	0.0022	Indoor use, General ventilation: 30%, LEV: 90% efficiency, OR, Respirator: 90% protection
long term, inhalative, local,	0.00011 mg/m³ (EasyTRA, v4.1)	0.0022	Outdoor use, Outdoor use: 30%, Respirator: 90% protection
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

9.3.3. Worker exposure: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities (PROC8a)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.0036 mg/m³ (EasyTRA, v4.1)	0.072	General ventilation: 30%
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

9.3.4. Worker exposure: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities (PROC8b)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.00364 mg/m³ (EasyTRA, v4.1)	0.0728	General ventilation: 30%, Closed system, 99% efficiency
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

9.3.5. Worker exposure: Roller application or brushing (PROC10)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.017 mg/m³ (EasyTRA, v4.1)	0.340	General ventilation: 30%

Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

9.3.6. Worker exposure: Non industrial spraying (PROC11)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.012 mg/m³ (EasyTRA, v4.1)	0.240	Indoor use, 1, General ventilation: 30%, LEV: 99% efficiency
long term, inhalative, local,	0.003 mg/m³ (EasyTRA, v4.1)	0.060	Indoor use, 2, General ventilation: 30%, Spray booth: 90% reduction, Respirator: 97.5% protection
long term, inhalative, local,	0.022 mg/m³ (EasyTRA, v4.1)	0.440	Indoor use, 3, General ventilation: 30%, Respirator: 97.5% protection
long term, inhalative, local,	0.003 mg/m³ (EasyTRA, v4.1)	0.060	Indoor use, 4, General ventilation: 30%, LEV: 90% efficiency, Respirator: 97.5% protection
long term, inhalative, local,	0.022 mg/m³ (EasyTRA, v4.1)	0.440	Outdoor use, 5, Outdoors: 30% reduction, Respirator: 97.5% protection
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

9.3.7. Worker exposure: Treatment of articles by dipping and pouring (PROC13)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.017 mg/m³ (EasyTRA, v4.1)	0.340	General ventilation: 30%
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

9.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

MDI

The risk management measures given in this exposure scenario apply to the specified substance in a concentration as indicated in the scenario. The concentration of the substance in the product may differ. A downstream user should evaluate if the risk management measures may be adapted accordingly.
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.
Further information on the assumptions contained in this Exposure Scenario can be found at: www.ISOPA.org

ES10: Widespread use by professional workers; Adhesives, sealants.

10.1. Title section

Exposure Scenario name	:	Adhesives, sealants
Structured Short Title	:	Widespread use by professional workers; Adhesives, sealants.

Worker		
CS1	**Adhesives, sealants** [MDI]	PROC4
CS2	**Adhesives, sealants** [MDI]	PROC5
CS3	**Adhesives, sealants** [MDI]	PROC8a
CS4	**Adhesives, sealants** [MDI]	PROC8b
CS5	**Adhesives, sealants** [MDI]	PROC10
CS6	**Adhesives, sealants** [MDI]	PROC11
CS7	**Adhesives, sealants** [MDI]	PROC13

10.2. Conditions of use affecting exposure

10.2.1. Control of worker exposure: Use in batch and other process (synthesis) where opportunity for exposure arises (PROC4)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 60%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.		
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents		

BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
With Local exhaust ventilation (LEV) : Local exhaust ventilation is required. Provide extract ventilation to points where emissions occur. Provide extract ventilation to material transfer points and other openings.
Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.
Other conditions affecting workers exposure
Exposed skin area : 480 cm² (palms of both hands)
Indoor or outdoor use : Indoor use
Temperature : 50 °C

10.2.2. Control of worker exposure: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/ or significant contact) (PROC5)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 60%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
Duration of the acitivity	:	1 hours/day

Frequency of use	: 5 days/week

Technical and organisational conditions and measures

These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying:
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
Clear spills immediately.
Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.

These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C:
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
Handle substance within a predominantly closed system provided with extract ventilation.
Handle in a fume cupboard or under extract ventilation.
Clear spills immediately.
Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
Ensure control measures are regularly inspected and maintained.

Indoor use
With Local exhaust ventilation (LEV)
:
Ensure control measures are regularly inspected and maintained.
Local exhaust ventilation is required.
Provide extract ventilation to points where emissions occur.
Provide extract ventilation to material transfer points and other openings.

Indoor use
Without Local exhaust ventilation (LEV)
OR
Outdoor use
:
Ensure control measures are regularly inspected and maintained.

Conditions and measures related to personal protection, hygiene and health evaluation

These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying:
Do not inhale vapours / aerosols.
Ensure that direct skin contact is avoided.
Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training.
Wash off any skin contamination immediately.
Use suitable eye protection.
Wear suitable coveralls to prevent exposure to the skin.
The use of latex gloves is not supported.

These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C:
Do not inhale vapours / aerosols.
Ensure that direct skin contact is avoided.
Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training.
Wash off any skin contamination immediately.
Use suitable eye protection.
Wear suitable coveralls to prevent exposure to the skin.
The use of latex gloves is not supported.
Wear a full face respirator conforming to EN136.
Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Indoor use
Without Local exhaust ventilation (LEV)
OR
Outdoor use
:
Wear a respirator conforming to EN140.

Other conditions affecting workers exposure		
Exposed skin area	:	480 cm² (palms of both hands)
Indoor or outdoor use	:	Indoor/Outdoor use
Temperature	:	23 °C

10.2.3. Control of worker exposure: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities (PROC8a)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 60%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
Duration of the acitivity	:	1 hours/day
Remarks	:	daily or less, ,, Short term
Frequency of use	:	5 days/week

Technical and organisational conditions and measures

These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying:
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
Clear spills immediately.
Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.

These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C:
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
Handle substance within a predominantly closed system provided with extract ventilation.
Handle in a fume cupboard or under extract ventilation.
Clear spills immediately.
Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
Ensure control measures are regularly inspected and maintained.

Conditions and measures related to personal protection, hygiene and health evaluation

These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying:
Do not inhale vapours / aerosols.
Ensure that direct skin contact is avoided.
Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training.
Wash off any skin contamination immediately.
Use suitable eye protection.
Wear suitable coveralls to prevent exposure to the skin.
The use of latex gloves is not supported.

These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C:
Do not inhale vapours / aerosols.
Ensure that direct skin contact is avoided.

Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	960 cm² (both hands)
Indoor or outdoor use	:	Indoor use
Temperature	:	23 °C

10.2.4. Control of worker exposure: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities (PROC8b)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 60%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
Duration of the acitivity	:	1 hours/day
Remarks	:	daily or less, ,, Short term
Frequency of use	:	5 days/week

Technical and organisational conditions and measures
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
Handle substance within a closed system.

Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training.

Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	960 cm² (both hands)
Indoor or outdoor use	:	Indoor use
Temperature	:	23 °C

10.2.5. Control of worker exposure: Roller application or brushing (PROC10) [MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 60%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week

Technical and organisational conditions and measures
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
Conditions and measures related to personal protection, hygiene and health evaluation

These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	960 cm² (both hands)
Indoor or outdoor use	:	Indoor use
Temperature	:	23 °C

10.2.6. Control of worker exposure: Non industrial spraying (PROC11) [MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 60%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
Duration of the acitivity	:	6 hours/day
Remarks	:	1, -, 5
Frequency of use	:	5 days/week

Technical and organisational conditions and measures
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation.

Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
Indoor use 1 : Ensure control measures are regularly inspected and maintained. Local exhaust ventilation is required. Handle substance within a predominantly closed system provided with extract ventilation. Provide extract ventilation to points where emissions occur. Provide extract ventilation to material transfer points and other openings.
Indoor use 2 : Access to work area only for authorised persons. Ensure control measures are regularly inspected and maintained. Local exhaust ventilation is required. Ensure that a spraying booth is used.
Indoor use 3 : Access to work area only for authorised persons. Ensure control measures are regularly inspected and maintained. Open doors and windows.
Indoor use 4 : Access to work area only for authorised persons. Ensure control measures are regularly inspected and maintained. Local exhaust ventilation is required. Provide extract ventilation to points where emissions occur.
Outdoor use 5 : Access to work area only for authorised persons. Ensure control measures are regularly inspected and maintained. Ensure operation is undertaken outdoors. Stay upwind/keep distance from source.

Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion

activities which are likely to lead to substantial aerosol release, e.g. spraying.
General advice Irrespective of the stated risk management measures respiratory protection is generally recommended for spraying applications.
Indoor use 2 : Wear a full face respirator conforming to EN136.
Indoor use 3 : Wear a full face respirator conforming to EN136.
Indoor use 4 : Wear a full face respirator conforming to EN136.
Outdoor use 5 : Wear a full face respirator conforming to EN136.

Other conditions affecting workers exposure		
Exposed skin area	:	1500 cm² (both hands and forearms)
Indoor or outdoor use	:	Indoor/Outdoor use
Temperature	:	35 °C
Remarks	:	1, -, 5

10.2.7. Control of worker exposure: Treatment of articles by dipping and pouring (PROC13) [MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 60%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	8 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		

These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Handle substance within a predominantly closed system provided with extract ventilation.

Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
Conditions and measures related to personal protection, hygiene and health evaluation
These measures are for all contributing scenarios at product temperature BELOW 40°C for MDI monomeric substances and BELOW 45°C for other MDI based substances or without spraying: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported.
These measures are for all contributing scenarios at product temperature ABOVE 40°C for MDI monomeric substances and ABOVE 45°C for other MDI based substances or with spraying and use of aprotic polar solvents BELOW 40°C: Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	480 cm² (palms of both hands)
Indoor or outdoor use	:	Indoor use
Temperature	:	23 °C

10.3. Exposure estimation and reference to its source

10.3.1. Worker exposure: Use in batch and other process (synthesis) where opportunity for exposure arises (PROC4)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.0006 mg/m³ (EasyTRA, v4.1)	0.012	General ventilation: 30%, LEV: 90% efficiency, OR, Respirator: 90% protection
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

10.3.2. Worker exposure: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/ or significant contact) (PROC5)
[MDI]

Exposure route	Exposure level	RCR	Remarks

long term, inhalative, local,	0.00011 mg/m³ (EasyTRA, v4.1)	0.0022	Indoor use, General ventilation: 30%, LEV: 90% efficiency, OR, Respirator: 90% protection
long term, inhalative, local,	0.00011 mg/m³ (EasyTRA, v4.1)	0.0022	Outdoor use, Outdoor use: 30%, Respirator: 90% protection
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

10.3.3. Worker exposure: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities (PROC8a)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.0036 mg/m³ (EasyTRA, v4.1)	0.072	General ventilation: 30%
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

10.3.4. Worker exposure: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities (PROC8b)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.00364 mg/m³ (EasyTRA, v4.1)	0.0728	General ventilation: 30%, Closed system, 99% efficiency
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

10.3.5. Worker exposure: Roller application or brushing (PROC10)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.017 mg/m³ (EasyTRA, v4.1)	0.340	General ventilation: 30%
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).

* Qualitative approach used to conclude safe use.

10.3.6. Worker exposure: Non industrial spraying (PROC11) [MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.012 mg/m³ (EasyTRA, v4.1)	0.240	Indoor use, 1, General ventilation: 30%, LEV: 99% efficiency
long term, inhalative, local,	0.003 mg/m³ (EasyTRA, v4.1)	0.060	Indoor use, 2, General ventilation: 30%, LEV: 90% efficiency, Respirator: 97.5% protection
long term, inhalative, local,	0.022 mg/m³ (EasyTRA, v4.1)	0.440	Indoor use, 3, General ventilation: 30%, Respirator: 97.5% protection
long term, inhalative, local,	0.003 mg/m³ (EasyTRA, v4.1)	0.060	Indoor use, 4, General ventilation: 30%, LEV: 90% efficiency, Respirator: 97.5% protection
long term, inhalative, local,	0.022 mg/m³ (EasyTRA, v4.1)	0.440	Outdoor use, 5, Outdoors: 30% reduction, Respirator: 97.5% protection
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

10.3.7. Worker exposure: Treatment of articles by dipping and pouring (PROC13) [MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.017 mg/m³ (EasyTRA, v4.1)	0.340	General ventilation: 30%
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

10.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

MDI
The risk management measures given in this exposure scenario apply to the specified substance in a concentration as indicated in the scenario. The concentration of the substance in the product may differ. A downstream user should evaluate if the risk management measures may be adapted accordingly.
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
Where other risk management measures/operational conditions are adopted, then users should ensure that risks are

managed to at least equivalent levels.
Further information on the assumptions contained in this Exposure Scenario can be found at: www.ISOPA.org

ES11: Widespread use by professional workers; Cleaning; without Aprotic Polar Solvents.

11.1. Title section

Exposure Scenario name	:	Cleaning, without Aprotic Polar Solvents
Structured Short Title	:	Widespread use by professional workers; Cleaning; without Aprotic Polar Solvents.

Worker		
CS1	**Cleaning, without Aprotic Polar Solvents** [MDI]	PROC3
CS2	**Cleaning, without Aprotic Polar Solvents** [MDI]	PROC4
CS3	**Cleaning, without Aprotic Polar Solvents** [MDI]	PROC5
CS4	**Cleaning, without Aprotic Polar Solvents** [MDI]	PROC8a
CS5	**Cleaning, without Aprotic Polar Solvents** [MDI]	PROC10
CS6	**Cleaning, without Aprotic Polar Solvents** [MDI]	PROC13
CS7	**Cleaning, without Aprotic Polar Solvents** [MDI]	PROC15

11.2. Conditions of use affecting exposure

11.2.1. Control of worker exposure: Use in closed batch process (synthesis or formulation) (PROC3) [MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	1 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		
Handle substance within a closed system. Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.		
Indoor use		

: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
Conditions and measures related to personal protection, hygiene and health evaluation
Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.
Other conditions affecting workers exposure

Exposed skin area	:	240 cm² (palm of one hand)
Indoor or outdoor use	:	Indoor/Outdoor use

11.2.2. Control of worker exposure: Use in batch and other process (synthesis) where opportunity for exposure arises (PROC4)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	1 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		
Indoor use With Local exhaust ventilation (LEV) : Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Local exhaust ventilation is required. Provide extract ventilation to points where emissions occur. Provide extract ventilation to material transfer points and other openings. Ensure control measures are regularly inspected and maintained.		
Indoor use With respiratory protection Without Local exhaust ventilation (LEV) : Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).		
Outdoor With Local exhaust ventilation (LEV)		

:
Clear spills immediately.
Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
Local exhaust ventilation is required.
Provide extract ventilation to points where emissions occur.
Provide extract ventilation to material transfer points and other openings.
Ensure control measures are regularly inspected and maintained.

Outdoor
With respiratory protection
Without Local exhaust ventilation (LEV)
:
Clear spills immediately.
Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure.
Provide extract ventilation to points where emissions occur.
Provide extract ventilation to material transfer points and other openings.
Ensure control measures are regularly inspected and maintained.

Conditions and measures related to personal protection, hygiene and health evaluation

Indoor use
With Local exhaust ventilation (LEV)
:
Do not inhale vapours / aerosols.
Ensure that direct skin contact is avoided.
Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training.
Wash off any skin contamination immediately.
Use suitable eye protection.
Wear suitable coveralls to prevent exposure to the skin.
The use of latex gloves is not supported.

Indoor use
With respiratory protection
Without Local exhaust ventilation (LEV)
:
Do not inhale vapours / aerosols.
Ensure that direct skin contact is avoided.
Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training.
Wash off any skin contamination immediately.
Use suitable eye protection.
Wear suitable coveralls to prevent exposure to the skin.
The use of latex gloves is not supported.
Wear a respirator conforming to EN140.
Ensure control measures are regularly inspected and maintained.

Outdoor
With Local exhaust ventilation (LEV)
:
Do not inhale vapours / aerosols.
Ensure that direct skin contact is avoided.
Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training.
Wash off any skin contamination immediately.
Use suitable eye protection.
Wear suitable coveralls to prevent exposure to the skin.
The use of latex gloves is not supported.

Outdoor
With respiratory protection
Without Local exhaust ventilation (LEV)
:
Do not inhale vapours / aerosols.
Ensure that direct skin contact is avoided.
Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training.
Wash off any skin contamination immediately.
Use suitable eye protection.
Wear suitable coveralls to prevent exposure to the skin.
The use of latex gloves is not supported.
Wear a respirator conforming to EN140.

Ensure control measures are regularly inspected and maintained.

Other conditions affecting workers exposure		
Exposed skin area	:	480 cm² (palms of both hands)
Indoor or outdoor use	:	Indoor/Outdoor use
Temperature	:	< 40 °C

11.2.3. Control of worker exposure: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/ or significant contact) (PROC5)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid

Amount used, frequency and duration of use (or from service life)		
General exposures	:	1 hours/day
Frequency of use	:	5 days/week

Technical and organisational conditions and measures
Handle substance within a closed system. Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
Outdoor : Provide extract ventilation to points where emissions occur. Provide extract ventilation to material transfer points and other openings.

Conditions and measures related to personal protection, hygiene and health evaluation
Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	480 cm² (palms of both hands)
Indoor or outdoor use	:	Outdoor use

11.2.4. Control of worker exposure: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities (PROC8a)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	1 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		
Handle substance within a closed system. Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.		
Indoor use : Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Local exhaust ventilation is required.		
Conditions and measures related to personal protection, hygiene and health evaluation		
Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.		
Other conditions affecting workers exposure		
Exposed skin area	:	960 cm² (both hands)
Indoor or outdoor use	:	Indoor/Outdoor use

11.2.5. Control of worker exposure: Roller application or brushing (PROC10)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C

Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	1 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		
Handle substance within a closed system. Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.		
Indoor use : Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Local exhaust ventilation is required.		
Conditions and measures related to personal protection, hygiene and health evaluation		
Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.		
Other conditions affecting workers exposure		
Exposed skin area	:	960 cm² (both hands)
Indoor or outdoor use	:	Indoor/Outdoor use

11.2.6. Control of worker exposure: Treatment of articles by dipping and pouring (PROC13) [MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	1 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		
Handle substance within a closed system. Handle substance within a predominantly closed system provided with extract ventilation.		

Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
Indoor use : Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Local exhaust ventilation is required.

Conditions and measures related to personal protection, hygiene and health evaluation
Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.

Other conditions affecting workers exposure		
Exposed skin area	:	480 cm² (palms of both hands)
Indoor or outdoor use	:	Indoor/Outdoor use

11.2.7. Control of worker exposure: Use as laboratory reagent (PROC15)
[MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	<= 100%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Physical form of product	:	Low volatile liquid
Amount used, frequency and duration of use (or from service life)		
General exposures	:	1 hours/day
Frequency of use	:	5 days/week
Technical and organisational conditions and measures		

Handle substance within a closed system. Handle substance within a predominantly closed system provided with extract ventilation. Handle in a fume cupboard or under extract ventilation. Clear spills immediately. Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Ensure control measures are regularly inspected and maintained.
With Local exhaust ventilation (LEV) : Local exhaust ventilation is required. Provide extract ventilation to points where emissions occur. OR Provide extract ventilation to material transfer points and other openings. OR Handle in a fume cupboard or under extract ventilation.

Without Local exhaust ventilation (LEV) : Ensure the ventilation system is regularly maintained and tested.
Conditions and measures related to personal protection, hygiene and health evaluation
Do not inhale vapours / aerosols. Ensure that direct skin contact is avoided. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wash off any skin contamination immediately. Use suitable eye protection. Wear suitable coveralls to prevent exposure to the skin. The use of latex gloves is not supported. Wear a full face respirator conforming to EN136. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying.
Other conditions affecting workers exposure

Exposed skin area	:	240 cm² (palm of one hand)
Indoor or outdoor use	:	Indoor use

11.3. Exposure estimation and reference to its source

11.3.1. Worker exposure: Use in closed batch process (synthesis or formulation) (PROC3) [MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.0023 mg/m³ (EasyTRA)	0.046	Indoor use, General ventilation: 30%
long term, inhalative, local,	0.0016 mg/m³ (EasyTRA)	0.032	Outdoor use, Outdoor use: 30%
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

11.3.2. Worker exposure: Use in batch and other process (synthesis) where opportunity for exposure arises (PROC4) [MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.00023 mg/m³ (EasyTRA)	0.0046	Indoor use, General ventilation: 30%, LEV: 90% efficiency, OR, Respirator: 90% protection
long term, inhalative, local,	0.00069 mg/m³ (EasyTRA)	0.0138	Outdoor use, Outdoor use: 30%, LEV: 90% efficiency, OR, Respirator: 90% protection
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation

Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

11.3.3. Worker exposure: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/ or significant contact) (PROC5)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.00069 mg/m³ (EasyTRA)	0.0138	Outdoor use: 30%, Respirator: 90% protection
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

11.3.4. Worker exposure: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities (PROC8a)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.0023 mg/m³ (EasyTRA)	0.046	Indoor use, General ventilation: 30%, LEV: 99% efficiency
long term, inhalative, local,	0.0016 mg/m³ (EasyTRA)	0.032	Outdoor use, Outdoor use: 30%
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

11.3.5. Worker exposure: Roller application or brushing (PROC10)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.0023 mg/m³ (EasyTRA)	0.046	Indoor use, General ventilation: 30%, LEV: 90% efficiency
long term, inhalative, local,	0.0016 mg/m³ (EasyTRA)	0.032	Outdoor use, Outdoor use: 30%
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

11.3.6. Worker exposure: Treatment of articles by dipping and pouring (PROC13)
[MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.0023 mg/m³ (EasyTRA)	0.046	Indoor use, General ventilation: 30%, LEV: 90% efficiency
long term, inhalative, local,	0.0016 mg/m³ (EasyTRA)	0.032	Outdoor use, Outdoor use: 30%
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

11.3.7. Worker exposure: Use as laboratory reagent (PROC15) [MDI]

Exposure route	Exposure level	RCR	Remarks
long term, inhalative, local,	0.00023 mg/m³ (EasyTRA)	0.0046	General ventilation: 30%, LEV: 90% efficiency, Respirator: 90% protection
long term, inhalative, local,	0.00023 mg/m³ (EasyTRA)	0.0046	General ventilation: 30%, Respirator: 90% protection
Dermal exposure,	* (Qualitative assessment)	< 1	Gloves: 90% protection

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).
* Qualitative approach used to conclude safe use.

11.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

MDI
The risk management measures given in this exposure scenario apply to the specified substance in a concentration as indicated in the scenario. The concentration of the substance in the product may differ. A downstream user should evaluate if the risk management measures may be adapted accordingly.
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.
Further information on the assumptions contained in this Exposure Scenario can be found at: www.ISOPA.org

ES12: Consumer use; Coatings and paints, thinners, paint removers (PC9a).

12.1. Title section

Exposure Scenario name	:	Use in coatings
Structured Short Title	:	Consumer use; Coatings and paints, thinners, paint removers (PC9a).

Consumer		
CS1	**Use in coatings** [MDI]	PC9a

12.2. Conditions of use affecting exposure

12.2.1. Control of consumer exposure: Coatings and paints, thinners, paint removers (PC9a) [MDI]

Product (article) characteristics		
Concentration of the Substance in Mixture/Article	:	35%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Amount used, frequency and duration of use (or from service life)		
PC9a: Coatings and paints, thinners, paint removers: 2 component roof and gutter coating - mixing	:	1000 g
Remarks	:	Inhalation exposure
PC9a: Coatings and paints, thinners, paint removers: 2 component roof and gutter coating - applying	:	1000 g
Remarks	:	Inhalation exposure
Duration	:	PC9a: Coatings and paints, thinners, paint removers: 2 component roof and gutter coating - mixing
Duration	:	Exposure duration 5 min
Duration	:	Application duration 5 min
Duration	:	PC9a: Coatings and paints, thinners, paint removers: 2 component roof and gutter coating - applying
Duration	:	Exposure duration 240 min
Duration	:	Application duration 240 min
Conditions and measures related to personal protection, hygiene and health evaluation		
Remarks	:	No spraying
Other conditions affecting consumers exposure		
Indoor or outdoor use	:	PC9a: Coatings and paints, thinners, paint removers: 2 component roof and gutter coating - mixing

Room size	:	1 m³
Temperature	:	20 °C
Ventilation rate	:	0.6
Indoor or outdoor use	:	PC9a: Coatings and paints, thinners, paint removers: 2 component roof and gutter coating - applying
Room size	:	20 m³
Temperature	:	20 °C
Ventilation rate	:	0.6
Release area 320 cm²PC9a: Coatings and paints, thinners, paint removers: 2 component roof and gutter coating - mixing		
Release area 1,000 cm²PC9a: Coatings and paints, thinners, paint removers: 2 component roof and gutter coating - applying		
Mass transfer rate 0.192 m/min		
Mol weight matrix 3,000 g/mol		

12.3. Exposure estimation and reference to its source

12.3.1. Consumer exposure: Coatings and paints, thinners, paint removers (PC9a) [MDI]

Value type	Exposure level	RCR	Remarks
short term, inhalative, systemic,	0.000883 mg/m³ (ConsExpo)	0.017657	PC9a: Coatings and paints, thinners, paint removers: 2 component roof and gutter coating - mixing
short term, inhalative, systemic,	0.001345 mg/m³ (ConsExpo)	0.026893	PC9a: Coatings and paints, thinners, paint removers: 2 component roof and gutter coating - applying
combined routes,	0.00000144 mg/kg bw/day (ConsExpo)	0.017657	PC9a: Coatings and paints, thinners, paint removers: 2 component roof and gutter coating - mixing
combined routes,	0.000105 mg/kg bw/day (ConsExpo)	0.026893	PC9a: Coatings and paints, thinners, paint removers: 2 component roof and gutter coating - applying

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).

12.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

MDI
The risk management measures given in this exposure scenario apply to the specified substance in a concentration as indicated in the scenario. The concentration of the substance in the product may differ. A downstream user should evaluate if the risk management measures may be adapted accordingly.
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.
Further information on the assumptions contained in this Exposure Scenario can be found at: www.ISOPA.org

ES13: Consumer use; Adhesives, sealants (PC1).

13.1. Title section

Exposure Scenario name	:	Adhesives, sealants
Structured Short Title	:	Consumer use; Adhesives, sealants (PC1).

Consumer		
CS1	**Adhesives, sealants** [MDI]	PC1

13.2. Conditions of use affecting exposure

13.2.1. Control of consumer exposure: Adhesives, sealants (PC1) [MDI]

Product (article) characteristics		
1 Component Bottled Construction Glue - Applying	:	20%
1 Component Bottled Universal Wood Glue - Applying	:	20%
2 Component Adhesives - Applying	:	30%
2 Component Adhesives - Mixing	:	30%
2 Component Joint Sealant - Mixing	:	45%
2 Component Joint Sealant - Applying	:	45%
2 Component Parquet Glue - Mixing	:	50%
2 Component Parquet Glue - Applying	:	50%
1 Component Assembly Sealant - Applying	:	20%
Molar Mass	:	250 g/mol
Vapour pressure	:	0.001 Pa at 20 °C
Amount used, frequency and duration of use (or from service life)		
1 Component Bottled Construction Glue - Applying	:	250 g
Remarks	:	Inhalation exposure
1 Component Bottled Universal Wood Glue - Applying	:	10 g
Remarks	:	Inhalation exposure
2 Component Adhesives - Mixing	:	20 g
Remarks	:	Inhalation exposure
2 Component Adhesives - Applying	:	20 g
Remarks	:	Inhalation exposure
2 Component Joint Sealant - Mixing	:	160 g
Remarks	:	Inhalation exposure

2 Component Joint Sealant - Applying	:	160 g
Remarks	:	Inhalation exposure
2 Component Parquet Glue - Mixing	:	7000 g
Remarks	:	Inhalation exposure
2 Component Parquet Glue - Applying	:	22000 g
Remarks	:	Inhalation exposure
1 Component Assembly Sealant - Applying	:	390 g
Remarks	:	Inhalation exposure
Duration	:	1 Component Bottled Construction Glue - Applying
Duration	:	Exposure duration 240 min
Duration	:	Application duration 30 min
Duration	:	
Duration	:	1 Component Bottled Universal Wood Glue - Applying
Duration	:	Exposure duration 240 min
Duration	:	Application duration 20 min
Duration	:	
Duration	:	2 Component Adhesives - Mixing
Duration	:	Exposure duration 5 min
Duration	:	Application duration 5 min
Duration	:	
Duration	:	2 Component Adhesives - Applying
Duration	:	Exposure duration 240 min
Duration	:	Application duration 30 min
Duration	:	
Duration	:	2 Component Joint Sealant - Mixing
Duration	:	Exposure duration 5 min
Duration	:	Application duration 5 min
Duration	:	
Duration	:	2 Component Joint Sealant - Applying
Duration	:	Exposure duration 15 min
Duration	:	Application duration 15 min
Duration	:	
Duration	:	2 Component Parquet Glue - Mixing
Duration	:	Exposure duration 10 min
Duration	:	Application duration 10 min
Duration	:	
Duration	:	2 Component Parquet Glue - Applying
Duration	:	Exposure duration 480 min
Duration	:	Application duration 480 min
Duration	:	
Duration	:	1 Component Assembly Sealant - Applying

Duration	:	Exposure duration 240 min
Duration	:	Application duration 30 min
Conditions and measures related to personal protection, hygiene and health evaluation		
Remarks	:	No spraying
Other conditions affecting consumers exposure		
Indoor or outdoor use	:	1 Component Bottled Construction Glue - Applying
Room size	:	20 m³
Temperature	:	20 °C
Ventilation rate	:	0.6
Indoor or outdoor use	:	
Indoor or outdoor use	:	1 Component Bottled Universal Wood Glue - Applying
Room size	:	20 m³
Temperature	:	20 °C
Ventilation rate	:	0.6
Indoor or outdoor use	:	
Indoor or outdoor use	:	2 Component Adhesives - Mixing
Room size	:	20 m³
Temperature	:	20 °C
Ventilation rate	:	0.6
Indoor or outdoor use	:	2 Component Adhesives - Applying
Room size	:	20 m³
Temperature	:	20 °C
Ventilation rate	:	0.6
Indoor or outdoor use	:	
Indoor or outdoor use	:	2 Component Joint Sealant - Mixing
Room size	:	1 m³
Temperature	:	20 °C
Ventilation rate	:	0.6
Indoor or outdoor use	:	
Indoor or outdoor use	:	2 Component Joint Sealant - Applying
Room size	:	20 m³
Temperature	:	20 °C
Ventilation rate	:	0.6
Indoor or outdoor use	:	
Indoor or outdoor use	:	2 Component Parquet Glue - Mixing
Room size	:	1 m³
Temperature	:	20 °C
Ventilation rate	:	0.6
Indoor or outdoor use	:	
Indoor or outdoor use	:	2 Component Parquet Glue - Applying

Room size	:	58 m³
Temperature	:	20 °C
Ventilation rate	:	0.5
Indoor or outdoor use	:	
Indoor or outdoor use	:	1 Component Assembly Sealant - Applying
Room size	:	20 m³
Temperature	:	20 °C
Ventilation rate	:	0.6
Release area 10,000 cm²1 Component Bottled Construction Glue - Applying		
Release area 400 cm²1 Component Bottled Universal Wood Glue - Applying		
Release area 20 cm²2 Component Adhesives - Mixing		
Release area 20 cm²2 Component Adhesives - Applying		
Release area 20 cm²2 Component Joint Sealant - Mixing		
Release area 10 cm²2 Component Joint Sealant - Applying		
Release area 320 cm²2 Component Parquet Glue - Mixing		
Release area 10,000 cm²2 Component Parquet Glue - Applying		
Release area 15,000 cm²1 Component Assembly Sealant - Applying		
Mass transfer rate 0.192 m/min		
Mol weight matrix 3,000 g/mol		

13.3. Exposure estimation and reference to its source

13.3.1. Consumer exposure: Adhesives, sealants (PC1)
[MDI]

Value type	Exposure level	RCR	Remarks
short term, inhalative, systemic,	0.017921 mg/m³ (ConsExpo)	0.358417	Adhesives, sealants, 1 Component Bottled Construction Glue - Applying
combined routes,	0.001404 mg/kg bw/day (ConsExpo)	0.358417	Adhesives, sealants, 1 Component Bottled Construction Glue - Applying
short term, inhalative, systemic,	0.001133 mg/m³ (ConsExpo)	0.022661	Adhesives, sealants, 1 Component Bottled Universal Wood Glue - Applying
combined routes,	0.000089 mg/kg bw/day (ConsExpo)	0.022661	Adhesives, sealants, 1 Component Bottled Universal Wood Glue - Applying
short term, inhalative, systemic,	0.0000027 mg/m³ (ConsExpo)	0.000054	Adhesives, sealants, 2 Component Adhesives - Mixing
combined routes,	0.0000000044 mg/kg bw/day (ConsExpo)	0.000054	Adhesives, sealants, 2 Component Adhesives - Mixing
short term, inhalative, systemic,	0.000063 mg/m³ (ConsExpo)	0.00125	Adhesives, sealants, 2 Component Adhesives -

			Applying
combined routes,	0.0000049 mg/kg bw/day (ConsExpo)	0.00125	Adhesives, sealants, 2 Component Adhesives - Applying
short term, inhalative, systemic,	0.000058 mg/m³ (ConsExpo)	0.001168	Adhesives, sealants, 2 Component Joint Sealant - Mixing
combined routes,	0.0000000953 mg/kg bw/day (ConsExpo)	0.001168	Adhesives, sealants, 2 Component Joint Sealant - Mixing
short term, inhalative, systemic,	0.00000144 mg/m³ (ConsExpo)	0.000029	Adhesives, sealants, 2 Component Joint Sealant - Applying
combined routes,	0.0000000071 mg/kg bw/day (ConsExpo)	0.000029	Adhesives, sealants, 2 Component Joint Sealant - Applying
short term, inhalative, systemic,	0.001841 mg/m³ (ConsExpo)	0.036816	Adhesives, sealants, 2 Component Parquet Glue - Mixing
combined routes,	0.00000601 mg/kg bw/day (ConsExpo)	0.036816	Adhesives, sealants, 2 Component Parquet Glue - Mixing
short term, inhalative, systemic,	0.014584 mg/m³ (ConsExpo)	0.291686	Adhesives, sealants, 2 Component Parquet Glue - Applying
combined routes,	0.002285 mg/kg bw/day (ConsExpo)	0.291686	Adhesives, sealants, 2 Component Parquet Glue - Applying
short term, inhalative, systemic,	0.022601 mg/m³ (ConsExpo)	0.452016	Adhesives, sealants, 1 Component Assembly Sealant - Applying
combined routes,	0.00177 mg/kg bw/day (ConsExpo)	0.452016	Adhesives, sealants, 1 Component Assembly Sealant - Applying

Additional information on exposure estimation
Based on the applied RMMs the risk towards humans is sufficiently controlled (RCR ≤ 1).

13.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

MDI
The risk management measures given in this exposure scenario apply to the specified substance in a concentration as indicated in the scenario. The concentration of the substance in the product may differ. A downstream user should evaluate if the risk management measures may be adapted accordingly.
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.
Further information on the assumptions contained in this Exposure Scenario can be found at: www.ISOPA.org