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

1.1. Product identifier

Commercial name: **Methyl-(endo)-5-norbornene-2,3-dicarboxylic anhydride METH-E**
REACH registration number: 01-2119979584-19-0000
Index number: NOT AVAILABLE
International Chemical Identification: 1,2,3,6-tetrahydromethyl-3,6-methanophthalic anhydride
CAS number: 25134-21-8
EC number: 246-644-8

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

Formulation
Industrial use as a hardener for epoxy resins, as such or in a mixture

1.3. Details of the supplier of the safety data sheet

Producer: Polynt S.p.A.
Via Enrico Fermi 51
24020 Scanzorosciate (BG)
ITALY
Telephone number: +39 035 652 111
msds@polynt.com

Supplier: Polynt S.p.A.
Via Enrico Fermi 51
24020 Scanzorosciate (BG)
ITALY
Telephone number: +39 035 652 111

1.4. Emergency telephone number

+39 035 652 276

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Reg CE 1272/2008

Classification according to Regulation 1272/2008/EC

Hazard classes and Hazard statement Code(s)	Hazard Class and Category Code(s)
Acute toxicity H302: Harmful if swallowed.	Acute Tox. 4
Acute toxicity H331: Toxic if inhaled.	Acute Tox. 3
Skin corrosion/irritation H315: Causes skin irritation.	Skin Irrit. 2
Serious eye damage/eye irritation H318: Causes serious eye damage.	Eye Dam. 1
Respiratory/skin sensitization H334: May cause allergy or asthma symptoms or breathing difficulties if inhaled.	Resp. Sens. 1
Respiratory/skin sensitization H317: May cause an allergic skin reaction.	Skin Sens. 1

2.2. Label elements

Labelling according to Regulation (EC) No 1272/2008:

Contains: 1,2,3,6-tetrahydromethyl-3,6-methanophthalic anhydride
INDEX N°: Not available
CAS N°: 25134-21-8
EC N°: 246-644-8

Pictograms:

DANGER

Hazard statement:

H315: Causes skin irritation.

H317: May cause an allergic skin reaction.

H302: Harmful if swallowed.

H318: Causes serious eye damage.

H331: Toxic if inhaled.

H334: May cause allergy or asthma symptoms or breathing difficulties if inhaled.

Precautionary statements:

P270: Do not eat, drink or smoke when using this product.

P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P403+P233: Store in a well-ventilated place. Keep container tightly closed.

P501: Dispose of contents/container to waste in accordance with national/international regulation.

P271: Use only outdoors or in a well-ventilated area.

P333+P313: If skin irritation or rash occurs: Get medical advice/attention.

P272: Contaminated work clothing should not be allowed out of the workplace.

P304+P340: IF INHALED: Remove person to fresh air and keep comfortable for breathing.

P264: Wash face, hands and mouth thoroughly after handling.

P302+P352: IF ON SKIN: Wash with plenty of soap and water.

P261: Avoid breathing vapours.

P362+P364: Take off contaminated clothing and wash it before reuse.

P284: (In case of inadequate ventilation) wear respiratory protection. (see MSDS).

P301+P312: IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.

P280: Wear protective gloves/eye protection/face protection. (see MSDS).

P342+P311: If experiencing respiratory symptoms: Call a POISON CENTER or doctor/physician.

2.3. Other hazards

SECTION 3: Composition/information on ingredients

3.1. Substances

1,2,3,6-tetrahydromethyl-3,6-methanophtalic anhydride

International Chemical Identification: 1,2,3,6-tetrahydromethyl-3,6-methanophthalic anhydride
Index number: NOT AVAILABLE

Chemical formula: C10H10O3
Concentration range: > 80 %

REACH registration number: 01-2119979584-19-0000
CAS number: 25134-21-8
EC number: 246-644-8

Contains

International Chemical Identification: 1,2,3,6-tetrahydro-3,6-methanophthalic anhydride

Index number: 607-105-00-6

1,2,3,6-tetrahydro-3,6-methanophthalic anhydride

Chemical formula: C9H8O3

Concentration range: < 20 %

REACH registration number: Not pertinent

CAS number: 826-62-0

EC number: 212-557-9

Classification according to Regulation 1272/2008/EC:

Hazard classes and Hazard statement Code(s)	Hazard Class and Category Code(s)
Serious eye damage/eye irritation H318: Causes serious eye damage.	Eye Dam. 1
Respiratory/skin sensitization H334: May cause allergy or asthma symptoms or breathing difficulties if inhaled.	Resp. Sens. 1
Respiratory/skin sensitization H317: May cause an allergic skin reaction.	Skin Sens. 1

SECTION 4: First aid measures

(*)4.1. Description of first aid measures

Inhalation:
Move to fresh air. Call a physician immediately. If breathing is irregular or stopped, administer artificial respiration.

Skin:
After contact with skin, wash immediately with plenty of soap and water. Consult a physician.

Eye:
In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Call a physician immediately.

Ingestion:
Call a physician immediately. Clean mouth with water. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person.

4.2. Most important symptoms and effects, both acute and delayed

There is no data available for this product.

4.3. Indication of any immediate medical attention and special treatment needed

See section 4.1.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Appropriate fire-fighting equipment:
Foam, carbon dioxide (CO2), powder, water spray.

Inappropriate fire-fighting equipment:
Do not use water jets as they can disperse and spread fire.

5.2. Special hazards arising from the substance or mixture

In combustion emits toxic fumes of carbon dioxide / carbon monoxide.

5.3. Advice for firefighters

In the event of fire, wear self-contained breathing apparatus.
Water mist may be used to cool closed containers.
Use personal protective equipment to protect skin/eyes.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Move any people not authorised to contain the emergency out of the area.
Avoid coming in contact with the substance or handling containers without adequate protection.
Use the personal protective equipment described in section 8.
Use a respirator in the event of emissions/spillage of large quantities.
Eliminate all sources of ignition.
Remove all incompatible materials as outlined in section 10.5 of SDS.

6.2. Environmental precautions

Contain the spillage as far as possible.
Prevent spilled materials getting into the drainage system, wells, surface water or groundwater.
In the case of leaks into a water course, drains, or if the product has contaminated the ground or vegetation, contact the local authorities.

6.3. Methods and material for containment and cleaning up

Do not use equipment that can generate sources of ignition when cleaning.
If possible, vacuum up the spilled material and/or absorb parts that can't be vacuumed up with inert materials (sand, earth, absorbent materials...) and place in suitable containers (separate liquids and solids) for disposal in accordance with section 13. After collection, ventilate and clean the affected area with water before granting access.
Do not flush the water used for cleaning into watercourses or down drains.

6.4. Reference to other sections

See sections 8 and 13.

SECTION 7: Handling and storage

(*)7.1. Precautions for safe handling

Recommendations for safe use:
Provide sufficient air exchange and/or exhaust in work rooms.
Avoid contact with skin and eyes.
Avoid breathing vapors.

Advice on general occupational hygiene:
Do no eat, drink or smoke when using this product.
Wash face, hands and mouth thoroughly after handling.
Take off contaminated clothing and wash it before reuse.
Contaminated work clothing should not be allowed out of the workplace.

7.2. Conditions for safe storage, including any incompatibilities

Eliminate all sources of combustion.
Keep container hermetically closed in a dry and well ventilated environment.
Do not store near heat sources or expose to direct sunlight, to preserve the quality of the product.
Keep away from incompatible materials (see point 10.5).

Keep away from food, feed and beverages.

7.3. Specific end use(s)

None identified.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

DERIVED NO EFFECT LEVEl (DNEL) / DERIVED MINIMUM EFFECT LEVEL(DMEL):

Workers:

oral: not pertinent

Long-term systemic effects:
Dermal: DNEL 0.07 mg/kg bw/day Assessment factor 300
Inhalation: DNEL 0.23 mg/m3 Assessment factor 75

General population: Not available

PREDICTED NO EFFECT CONCENTRATION(PNEC):

Environment:

Water:
PNEC water (freshwater): 0.4 mg/L Assessment factor 50
PNEC water (marine water): 0.04 mg/L Assessment factor 500
PNEC water (intermittent releases): 1 mg/L Assessment factor 100

Soil:
PNEC soil: 0.694 mg/kg soil dw

Sediment:
PNEC sediment (freshwater): 4.64 mg/kg sediment dw
PNEC sediment (marine water): 0.464 mg/kg sediment dw

STP:
PNEC STP: 5.91 mg/L Assessment factor 10

Occupational Exposure limit values: Not available

8.2. Exposure controls

Appropriate engineering controls:
See annexe of this file.

Eye / face protection:
Goggles or protective visor.

Skin protection / of the Hand:
The material the gloves are made of must be impermeable and stable when in contact with the substance. No specific information available on the suitability of the material and thickness of the gloves. Consult the glove manufacturer for specific information on the suitability of the gloves. Replace the gloves in the case of internal contamination, when punctured, or if external contamination cannot be removed. The actual duration of protection depends on the conditions of use.

Skin protection / of the body:
Wear protective clothing resistant to chemical substances.

Respiratory protection:
Mask with A type filter for vapours and organic gases with a boiling point >65°C. (EN 149)

Environmental exposure controls:
See annexe of this file.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

a1) Appearance: Liquid

a2) Color: Pale yellow

b) Odour: Characteristics

c) Odour threshold: NOT AVAILABLE

d) pH: NOT APPLICABLE (pKa1=4.4 pKa2=6.9 @ 20°C)

e2) Freezing point: < - 25 °C

f1) Initial boiling point: 274.6 °C @ 101.3 kPa

g) Flash point: 140.7 °C O.C.

h) Evaporation rate: NOT AVAILABLE

i) Flammability (solid, gas): NOT APPLICABLE

j1) Upper flammability limits: NOT AVAILABLE

j2) Lower flammability limits: NOT AVAILABLE

j3) Upper explosive limits: NOT AVAILABLE

j4) Lowerexplosive limits: NOT AVAILABLE

k) Vapour pressure: 0.956 Pa @ 25°C

l) Vapour density: NOT AVAILABLE

m) Relative density: 1.247 @ 20°C

n) Water solubility: NOT APPLICABLE Half life < 12 h

o) Partition coefficient: n-octanol/water: 1.7 @ 40°C

p) Auto-ignition temperature: 440 °C @ 98.3 kPa

q) Decomposition temperature: NOT AVAILABLE

r) Viscosity: 220 - 300 mPa.s @ 25°C

NOT EXPLOSIVE

NOT OXIDIZING

9.2. Other information

Not any.

SECTION 10: Stability and reactivity

10.1. Reactivity

Stable under normal conditions.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

None known in normal conditions.

10.4. Conditions to avoid

Avoid exposure to heat sources.

10.5. Incompatible materials

Strong acids, strong bases, oxidizing agents.

10.6. Hazardous decomposition products

Unknown

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity:

Oral:
Method:
equivalent or similar to OECD Guideline 401 (Acute Oral Toxicity)
rat (Sprague-Dawley) male/female; oral: gavage.
Results:
LD50: 1300 mg/kg bw (male/female) based on: test mat.

Dermal:
Method:
equivalent or similar to OECD Guideline 402 (Acute Dermal Toxicity)
rat (Tif: RAIf); male/female; Coverage: occlusive.
Results:
LD50: 4920 mg/kg bw (male/female) based on: test mat.

Inhalation:
Method:
equivalent or similar to OECD Guideline 403 (Acute Inhalation Toxicity)
rat (Sprague-Dawley) male/female, inhalation: aerosol (whole body)
Results:
LC50 (4 h): 0.5 < LC50 < 1 mg/L air (analytical) (male/female) based on: test mat.

Skin corrosion/irritation:
Method:
FHSA (CFR 16 1500.41); rabbit, Coverage: occlusive (Intact and abraded).
Results: moderately irritating, Classified Category 2

Serious eye damage/eye irritation:
Method:

equivalent or similar to OECD Guideline 405 (Acute Eye Irritation / Corrosion)
Tissue studied: eye, rabbit (Japanese white).
Results: Highly irritating, Classified Category 1

Respiratory or skin sensitisation:

Respiratory Sensitisation:
Results: Sensitising, Classified Category 1

Skin Sensitisation:
Method:
Human Repeat Insult Patch Test.
Human, Induction: epicutaneous, occlusive; Challenge: epicutaneous, occlusive.
Results: Sensitising, Classified Category 1

Germ cell mutagenicity:

in vitro:

Bacterial reverse mutation assay (e.g. Ames test) (gene mutation).
Method:
OECD Guideline 471 (Bacterial Reverse Mutation Assay)
S. typhimurium TA 1535, TA 1537, TA 98 and TA 100 (met. act.: with and without)
E. coli WP2 uvr A pKM 101 (met. act.: with and without)
Results: Negative

Mammalian cell gene mutation assay (gene mutation).
Method:
OECD Guideline 476 (In vitro Mammalian Cell Gene Mutation Test)
EU Method B.17 (Mutagenicity - In Vitro Mammalian Cell Gene Mutation Test)
EPA OTS 798.5300 (Detection of Gene Mutations in Somatic Cells in Culture)
Chinese hamster Ovary (CHO) (met. act.: with and without)
Results: Negative

Mammalian chromosome aberration test (chromosome aberration)
Method:
OECD Guideline 473 (In vitro Mammalian Chromosome Aberration Test)
EU Method B.10 (Mutagenicity - In Vitro Mammalian Chromosome Aberration Test)
EPA OPPTS 870.5375 - In vitro Mammalian Chromosome Aberration Test
Chinese hamster lung fibroblasts (V79) (met. act.: with and without)
Results: Negative

in vivo: Data not available

Conclusions: Not Classified

Carcinogenicity: Not available

Reproductive toxicity:

Effects on sexual function and fertility:
Method:
OECD Guideline 422 (Combined Repeated Dose Toxicity Study with the Reproduction/Developmental Toxicity Screening Test)
rat (Wistar) male/female; one-generation study; oral: gavage.
Results:
NOAEL (P): 50 mg/kg bw/day (male/female) based on: test mat.
NOAEL (F1): 50 mg/kg bw/day (male/female) based on: test mat.

Effects on development of the offspring:
Method:
OECD Guideline 422 (Combined Repeated Dose Toxicity Study with the Reproduction/Developmental Toxicity Screening Test)
rat (Wistar) male/female; oral: gavage.
Results:
NOAEL (developmental toxicity): 50 mg/kg bw/day (nominal) based on: test mat.
NOAEL (maternal toxicity): 20 mg/kg bw/day (nominal) based on: test mat.

Conclusions: Not Classified

Specific target organ toxicity (STOT) - Single exposure:
Results: Not Classified

Specific target organ toxicity (STOT) - Repeated exposure:

Oral:
Method:
OECD Guideline 422 (Combined Repeated Dose Toxicity Study with the Reproduction/Developmental Toxicity Screening Test)
rat (Wistar); male/female; oral: gavage.
Results:
NOAEL: 20 mg/kg bw/day (actual dose received) (male/female) based on: test mat.
Conclusions: Not Classified

Aspiration hazard: Not available

SECTION 12: Ecological information

12.1. Toxicity

Toxicity to aquatic environment:

Short-term toxicity to the aquatic environment:

Fish:
Method:
equivalent or similar to OECD Guideline 203 (Fish, Acute Toxicity Test)
Oryzias latipes, freshwater, semi-static.
Results:
LC50 (48 h): 359 mg/L test mat. (nominal) based on: mortality

Aquatic invertebrates:
Method:
EU Method C.2 (Acute Toxicity for Daphnia)
OECD Guideline 202 (Daphnia sp. Acute Immobilisation Test)
EPA OPPTS 850.1010 (Aquatic Invertebrate Acute Toxicity Test, Freshwater Daphnids)
Daphnia magna, freshwater, static.
Results:
EC50 (24 h): > 100 mg/L test mat. (nominal) based on: mobility
EC50 (48 h): > 100 mg/L test mat. (nominal) based on: mobility

Algae or other aquatic plants:
Method:
EU Method C.3 (Algal Inhibition test)
OECD Guideline 201 (Alga, Growth Inhibition Test)
EPA OPPTS 850.5400 (Algal Toxicity, Tiers I and II)
Pseudokirchnerella subcapitata (algae), freshwater, static.
Results:
EC50 (72 h): > 100 mg/L test mat. (nominal) based on: growth rate
EC50 (72 h): > 100 mg/L test mat. (nominal) based on: biomass

Aquatic microorganisms:
Method:
EU Method C.11 (Biodegradation: Activated Sludge Respiration Inhibition Test)
OECD Guideline 209 (Activated Sludge, Respiration Inhibition Test)
EPA OPPTS 850.6800 (Modified Activated Sludge, Respiration Inhibition Test for Sapringly Soluble Chemicals)
activated sludge, domestic, freshwater, static.
Results:
EC50 (3 h): 311.82 mg/L test mat. (nominal) based on: respiration rate
NOEC (3 h): 13.3 mg/L test mat. (nominal) based on: respiration rate

Long-term toxicity to aquatic environmental:

Aquatic invertebrates:
Method:
Read-across from supporting substance (structural analogue or surrogate).
OECD Guideline 211 (Daphnia magna Reproduction Test)

EU Method C.20 (Daphnia magna Reproduction Test)
EPA OPPTS 850.1300 (Daphnid Chronic Toxicity Test)
Daphnia magna, freshwater, semi-static.
Results:
NOEC (21 d): > 20 mg/L test mat. (nominal) based on: reproduction
LOEC (21 d): > 40 mg/L test mat. (nominal) based on: reproduction

Toxicity to the Terrestrial environment: Data not available

12.2. Persistence and degradability

Degradability:

Abiotic degradation:

Hydrolysis:
Method:
OECD Guideline 111 (Hydrolysis as a Function of pH)
EU Method C.7 (Degradation: Abiotic Degradation: Hydrolysisas a Function of pH)
Results:
Half-life (DT50): 7 min at 20 °C;
Conclusions: Hydrolysis Half-life: 7 min at 20 °C;

Phototransformation in air:
Method:
QSARs and grouping of chemicals - May2008
Results:
Half-life (DT50): 6,35 h (24-hour day; 0.5E6 OH/cm3)
Conclusions: Half-life in air: 6,35 h

Biotic degradation:

Aquatic environment:
Method:
OECD Guideline 301 C (Ready Biodegradability: Modified MITI Test (I))
Test type: ready biodegradability, mixture of sewage, soil and natural water.
Results:
under test conditions no biodegradation observed
% Degradation of test substance:
0 after 28 d (O2 consumption)
1 after 28 d (TOC removal)
0 after 28 d (Test mat. analysis)
Conclusions: Biodegradation in water: Not biodegradable

Conclusions: The substance is hydrolysed in few minutes in the corresponding acid (estimated to be readily biodegradable); therefore exposure of the aquatic and terrestrial compartments for this substance are unlikely.

12.3. Bioaccumulative potential

Bioaccumulation:

Aquatic environment:
Method:
OECD Guideline 305 C (Bioaccumulation: Test for the Degree of Bioconcentration in Fish)
Cyprinus carpio, aqueous (freshwater), flow-through.
Results:
BCF: 5.5 L/kg ww (or dimensionless)

Terrestrial environment: Data not available

Conclusions:
These data indicate that the substance is not bioaccumulative (B).

12.4. Mobility in soil

Adsorption/desorption:
Method:
QSARs and grouping of chemicals - May2008; Study type: in silico.

Study type: adsorption (soil)
Results:
Adsorption coefficient (soil): Koc: 10 (L/Kg) at 20°C; log Koc: 1

Volatilisation:
Method:
QSAR; HENRYWIN Program (v 3.20).
Results:
Henry's Law constant H: 1.49 Pa m3/mol at 25 °C

Distribution among environmental compartments:
Method:
Calculation according to Mackay, Level III
Calculation programme: EPI Suite v4.10
Media: Air - biota - sediment(s) - soil - Water;
Results:
Percent distribution in media:
Air (%): 0,23
Water (%): 40,4
Soil (%): 59,3
Sediment (%): 0,09

12.5. Results of PBT and vPvB assessment

Regarding all available data on biotic and abiotic degradation, bioaccumulation and toxicity it can be stated that the substance does not fulfil the PBT criteria (not PBT) and not the vPvB criteria (not vPvB).

12.6. Other adverse effects

No other known.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Recycle if possible, or send to an authorized incinerator. Follow the instructions in sections 6 and 7 when handling waste spillages, taking the steps indicated in the same sections. We recommend recycling containers instead of disposal. Observe the local and national legislation in force.

SECTION 14: Transport information

14.1. UN number

2810

14.2. UN proper shipping name

TOXIC LIQUID, ORGANIC, N.O.S

14.3. Transport hazard class(es)

6.1

14.4. Packing group

III

14.5. Environmental hazards

NOT APPLICABLE

14.6. Special precautions for user

NOT APPLICABLE

ADR/RID

- Tunnel restriction code: E
- Category - limited quantities per transport unit: 3

- LQ code - limited quantities per pack unit: 5L
- E code excepted quantities: E1

IMDG

- LQ code - limited quantities per pack unit: 5L
- E code excepted quantities: E1
- Ems: F-A, S-A

ICAO/IATA

- Packing Instructions / max. net quantities per package per plane - combi and cargo: 655/60L - 663/220L
- Packing Instructions / max. net quantities per package in limited quantity regime: Y642 - 2L
- EQ code for excepted quantities regime: E1

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

NOT AVAILABLE

SECTION 15: Regulatory information

(*)15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

European Regulation 1907/2006/EC (Reach);
European Regulation 1272/2008/EC (CLP);
European Regulation 453/2010/EU;
DIRECTIVE 24/1998/EC;
DIRECTIVE 37/2004/EC;
DIRECTIVE 92/1999/EC;
DIRECTIVE 18/2012/EU;

15.2. Chemical safety assessment

CSA available.

SECTION 16: Other information

Safety Data Sheet compiled according to Regulation 453/2010/EU.

Exposure Scenarios in local languages will be published as soon as they are available.

(*) on the left indicate the modifications with respect to the last version.

References:
GESTIS International Limit Values.

Acronyms:

ACGIH: American Conference of Governmental Industrial Hygienist.
ADN: European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways.
ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road.
ASTM: American Society of Testing and Materials.
B: Bioaccumulabile.
BCF: BioConcentration Factor.
BSAF: Biological Soil Accumulation Factor.
CSA: Chemical Safety Assessment.
CSR: Chemical Safety Report.
DIN: Deutsches Institut für Normung.
DMEL: Derived Minimal Effect Level.
DNEL: Derived No Effect Level.
Ec: Effective concentration.
EC50: Effective Concentration 50 (that produces an effect (other than death) for 50% of organisms test).
ECx: Effective Concentration 50 (that produces an effect (other than death)

	for X% of organisms test).
EPA:	Environmental Protection Agency.
IATA:	International Air Transport Association.
IBC:	International code for the construction and equipment of ships carrying dangerous Bulk Chemicals.
ICAO:	International Civil Air-transport Organisation.
IMGD:	International Maritime Dangerous Goods code.
ISO:	International Standards Organisation.
KoC:	organic carbon/water partition coefficient (adsorpion coefficient).
KoW:	n-octanol/water partition coefficient.
LC50:	Lethal Concentration for 50% of animal test.
LCx:	Lethal Concentration for X% of animal test.
LD50:	Lethal Dose for 50% test animal.
LDx:	Lethal Dose for X% test animal.
LLNA:	Local Lymph Node Assay.
LOAEC:	Lowest Observed Adverse Effect Concentration.
LOAEL:	Lowest Observed Adverse Effect Level.
LOEC:	Lowest Observed Effect Concentration.
LOEL:	Lowest Observed Effect Level.
MARPOL:	International Convention for the Prevention of Pollution from Ships.
NOAEC:	No Observed Adverse Effects Concentration.
NOAEL:	No Observed Adverse Effect Level.
NOEC:	No Observed Effect Concentration.
NOEL:	No Observed Effect Level.
OECD-OCSE:	Organisation for Economic Co-operation and Development.
P:	Persistent.
PBT:	Persistent Bioaccumulable and Toxic.
PNEC:	Predicted No Effect Concentration.
(Q)SAR:	Quantitative Structure-Activity Relationship.
RID:	Regulations concerning the International carriage of Dangerous goods by rail.
SDS:	Safety Data Sheet.
STP:	Sewage Treatment Plant.
TLV:	Threshold Limit Value.
TLV-C:	Threshold Limit Value - Ceiling.
TLV-STEL:	Threshold Limit Value - Short Term Exposure Limit.
TLV-TWA:	Threshold Limit Value - Time Weighted Average.
vPvB:	very Persistent and very Bio-accumulative.

EXPOSURE SCENARIOS

Table of Contents

Sommario

General information

Based on the high hazard band and the moderate likelihood of exposure risk is characterised as high when using the risk matrix (relevant Substance Hazard Band: bold-typed) according to ECHA-12-B-49-EN (2012). Thus, a high risk is regarded as acceptable for nearly all processes occurring under the condition of indoor ventilation. Suitable chemical resistant gloves (wear chemically resistant gloves according to Standard EN 374 with a breakthrough time > 480 min in combination with specific activity training and intensive management supervision.), suitable eye protection and suitable respirator masks (3M Respirator 42 CFR 84 N100 Particulate Filter, or equivalent) are mandatory in all scenarios with likelihood of exposure due to the irritant and sensitising and potential of the test substance.
Furthermore, for the high risk control band the following occupational conditions (OCs) and risk management measures (RMMs) are further required:
In case of potential exposure:
- Any measure to eliminate exposure should be considered;
- Very high level of containment required, except for short term exposures e.g. taking samples;
- Design closed system to allow for easy maintenance;
- If possible keep equipment under negative pressure;
- Control staff entry to work area;
- Ensure all equipment well maintained;
- Permit to work for maintenance work;
- Regular cleaning of equipment and work area;
-Management/supervision in place to check that the RMMs in place are being used correctly and OCs followed;
- Training for staff on good practice;
- Procedures and training for emergency decontamination and disposal;
- Good standard of personal hygiene
- Recording of any ‘near miss’ situations
- Sensitizers :without prejudice to relevant national legislation, pre-employment screening and appropriate health surveillance
Furthermore:
- at workplace eating, drinking and smoking as well as carrying and storage of food, drink and cigarettes is prohibited
- after leaving the workplace, hands, forearms and face are washed thoroughly after handling chemical products, especially before eating, smoking and using the lavatory and at the end of the working period.

If occupational conditions and risk management measures described above are applied, risk of skin irritation, eye damage, as well as skin and respiratory sensitisation is adequately controlled.
A quantitative risk assessment is carried out for long-term, systemic effects after dermal and inhalative exposure and for long-term, local effects after inhalative exposure.
With reference to the test substance, no peak exposure is expected for any route of exposure. Thus, no peak exposures were determined for the test substance.

The quantitative risk characterisation for environmental exposures was calculated using EasyTRA.
The environmental exposure calculation per compartment is based on the algorithms of the EU TGD 2003 Risk Assessment Spreadsheet Model 1.24a.

2. Scenario 2: Formulation of the substance

Formulation of the substance	
Environment	
CS 1: Formulation of preparations	ERC 2
Worker	
CS 2: Use in closed batch process (synthesis or formulation)	PROC 3
CS 3: Mixing or blending in batch processes (multistage and/or significant contact)	PROC 5
CS 4: Transfer of chemicals from/to vessels/ large containers at non dedicated facilities	PROC 8a
CS 5: Transfer of chemicals from/to vessels/ large containers at dedicated facilities	PROC 8b
CS 6: Transfer of chemicals into small containers (dedicated filling line)	PROC 9

2.1. Conditions of use affecting exposure

2.1.1. Control of environmental exposure: Formulation of the substance (ERC2)

Operational conditions	
Annual site tonnage	999 to/year
Daily amount used at site	3,461.538 kg/day
Release times per year	260 days/year *(justification: The release times per year are 260 days/year).*
Local freshwater dilution factor	10
Local marine water dilution factor	100
Release fraction to air from process	1 %
Release fraction to wastewater from process	0.300 %
Release fraction to soil from process	0.010 %
Fraction tonnage to region	100 %
Fraction used at main source	90.09 % *(justification: Maximum local tonnage: 900 to/year)*
STP	yes
River flow rate	18000 m^3/day
Municipal sewage treatment plant discharge	2000000 L/day
Risk management measures	
No direct discharge to marine water compartment *(justification: The relevant rivers at the formulation sites have no exit to the sea. If water of these rivers reaches sea water through other connecting rivers, then the substance is already diluted to negligible/ non existing amounts.)*	

Other modified EUSES values	
Fraction released to waste water (Femis.water)	0.300 % *(justification: In accordance with IC 2 (Chemical Industry: Basic Chemicals), table A2.1, formulation, tonnage >= 1000 (including formulation additives), MC=3, release fraction to waste water: 0.3%).* *(Reference: "Technical guidance on Risk Assessment in support of Commission Directive 93/67/EEC on Risk Assessment for new notified substances, Commission Regulation (EC) No 1488/94 on Risk Assessment for existing substances, Directive 98/8/EC of the European Parliament and of the Council concerning the placing of biocidal products on the market" Part II, European Commission Joint Research Centre, EUR 20418 EN/2).*
Fraction released to air (Femis.air)	1 % *(justification: In accordance with IC 2 (Chemical Industry: Basic Chemicals), table A2.1, formulation, vapour pressure 1000 -1000 Pa, MC=3, release fraction to air: 1%).* *(Reference: "Technical guidance on Risk Assessment in support of Commission Directive 93/67/EEC on Risk Assessment for new notified substances, Commission Regulation (EC) No 1488/94 on Risk Assessment for existing substances, Directive 98/8/EC of the European Parliament and of the Council concerning the placing of biocidal products on the market" Part II, European Commission Joint Research Centre, EUR 20418 EN/2).*
Temperature at which hydrolysis was measured (TEMPhydrtest)	288.15 K *(justification: Temperature at which hydrolysis rate of test item was measured)*
Rate constant hydrolosis in water at test temperature (khydr.water.test)	104.11 d-1 *(justification: 104.110 Hydrolysis rate in water for test item was empirically determined)*

2.1.2. Control of worker exposure: Use in closed batch process (synthesis or formulation) (PROC 3)

Qualitative Risk Assessment	
Eyes	Wear suitable safety goggles
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial

Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	yes (inhalation 90 %; dermal 90 %)
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 20 95 %
Respiratory protection	99 % *(justification: Use of suitable respiratory protection (3M Respirator 42 CFR 84 N100 Particulate Filter, or equivalent)).*

2.1.3. Control of worker exposure: Mixing or blending in batch processes (multistage and/or significant contact) (PROC 5)

Qualitative Risk Assessment	
Eyes	Wear suitable safety goggles
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	240 min/day, duration of activity was considered linearly *(justification: Do not carry out activity for more than 240 min/day).*
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	yes (inhalation 90 %; dermal 90 %)
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 20 95 %
Respiratory protection	99 % *(justification: Use of suitable respiratory protection(3M Respirator 42 CFR 84 N100 Particulate Filter, or equivalent).)*

2.1.4. Control of worker exposure: Transfer of chemicals from/to vessels/ large containers at non dedicated facilities (PROC 8a)

Qualitative Risk Assessment	
Eyes	Wear suitable safety goggles
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	240 min/day, duration of activity was considered linearly *(justification: Do not carry out activity for more than 240 min/day).*
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	yes (inhalation 90 %; dermal 90 %)
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 20 95 %
Respiratory protection	99 % *(justification: Use of suitable respiratory protection (3M Respirator 42 CFR 84 N100 Particulate Filter, or equivalent)).*

2.1.5. Control of worker exposure: Transfer of chemicals from/to vessels/ large containers at dedicated facilities (PROC 8b)

Qualitative Risk Assessment	
Eyes	Wear suitable safety goggles
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	> 4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2

Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	yes (inhalation 95 %; dermal 95 %)
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 20 95 %
Respiratory protection	99 % *(justification: Use of suitable respiratory protection(3M Respirator 42 CFR 84 N100 Particulate Filter, or equivalent).)*

2.1.6. Control of worker exposure: Transfer of chemicals into small containers (dedicated filling line) (PROC 9)

Qualitative Risk Assessment	
Eyes	Wear suitable safety goggles
Product characteristics	
Physical state	liquid
Concentration in substance	100 %
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	240 min/day, duration of activity was considered linearly *(justification: Do not carry out activity for more than 240 min/day).*
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	yes (inhalation 90 %; dermal 90 %)
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 20 95 %
Respiratory protection	99 % *(justification: Use of suitable respiratory protection (3M Respirator 42 CFR 84 N100 Particulate Filter, or equivalent)).*

2.2. Exposure estimation and reference to its source

2.2.1. Environmental release and exposure: Formulation of the substance (ERC2)

Environmental risk aquatic compartment (including sediment) of ES 2

Compartments	PEC	PNEC	RCR = PEC/PNEC
Freshwater	0.380498 mg/L	0.400 mg/L	0.951246
Freshwater sediment	1.75 mg/kg_{dwt}	4.64 mg/kg_{dwt}	0.377218
Marine water	2.07E-10 mg/L	0.464 mg/L	4.46E-10
Marine water sediment	9.51E-10 mg/kg_{dwt}	0.048 mg/kg_{dwt}	1.98E-8

Environmental risk terrestrial compartment of ES 2

Compartments	PEC	PNEC	RCR = PEC/PNEC
Agricultural soil	0.026764 mg/kg_{dwt}	0.614 mg/kg_{dwt}	0.04359
Grassland	0.006608 mg/kg_{dwt}	0.614 mg/kg_{dwt}	0.010763

Environmental risk STP of ES 2

Compartments	PEC	PNEC	RCR = PEC/PNEC
STP	3.805 mg/L	5.91 mg/L	0.643831

2.2.2. Worker exposure: Use in closed batch process (synthesis or formulation) (PROC3)

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal long-term systemic	0.003429 mg/kg_{bw}/day	0.280 mg/kg_{bw}/day	0.012245
inhalation long-term systemic	0.074244 mg/m^3	0.230 mg/m^3	0.322798
Combined routes	0.014035 mg/kg_{bw}/day	-	0.335043

2.2.3. Worker exposure: Mixing or blending in batch processes (multistage and/or significant contact) (PROC 5)

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal long-term systemic	0.034286 mg/kg_{bw}/day	0.280 mg/kg_{bw}/day	0.122449
inhalation long-term systemic	0.185609 mg/m^3	0.230 mg/m^3	0.806995
Combined routes	0.060801 mg/kg_{bw}/day	-	0.929444

2.2.4. Worker exposure: Transfer of chemicals from/to vessels/ large containers at non dedicated facilities (PROC 8a)

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal long-term systemic	0.034286 mg/kg_{bw}/day	0.280 mg/kg_{bw}/day	0.122449
inhalation long-term systemic	0.185609 mg/m^3	0.230 mg/m^3	0.806995
Combined routes	0.060801 mg/kg_{bw}/day	-	0.929444

2.2.5. Worker exposure: Transfer of chemicals from/to vessels/ large containers at dedicated facilities (PROC 8b)

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal long-term systemic	0.034286 mg/kg_{bw}/day	0.280 mg/kg_{bw}/day	0.122449
inhalation long-term systemic	0.092804 mg/m^3	0.230 mg/m^3	0.403498
Combined routes	0.047543 mg/kg_{bw}/day	-	0.525947

2.2.6. Worker exposure: Transfer of chemicals into small containers (dedicated filling line) (PROC 9)

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal long-term systemic	0.017143 mg/kg_{bw}/day	0.280 mg/kg_{bw}/day	0.061224
inhalation long-term systemic	0.185609 mg/m^3	0.230 mg/m^3	0.806995
Combined routes	0.043658 mg/kg_{bw}/day	-	0.86822

3. Scenario 3: Hardener for epoxy resins (inclusion in matrix)

Hardener for epoxy resins (inclusion in matrix)	
Environment	
CS 1: Industrial use resulting in inclusion into or onto a matrix	ERC 5
Worker	
CS 2: Use in closed batch process (synthesis or formulation)	PROC 3
CS 3: Use in batch and other process (synthesis) where opportunity for exposure arises	PROC 4
CS 4: Mixing or blending in batch processes (multistage and/or significant contact)	PROC 5
CS 5: Transfer of chemicals from/to vessels/ large containers at non dedicated facilities	PROC 8a
CS 6: Transfer of chemicals from/to vessels/ large containers at dedicated facilities	PROC 8b
CS 7: Transfer of chemicals into small containers (dedicated filling line)	PROC 9
CS 8: Roller application or brushing	PROC 10
CS 9: Treatment of articles by dipping and pouring	PROC 13

3.1. Conditions of use affecting exposure

3.1.1. Control of environmental exposure: Industrial use resulting in inclusion into or into a matrix (ERC5)

Operational conditions	
Annual site tonnage	999 to/year
Daily amount used at site	538.462 kg/day
Release times per year	260 days/year *(justification: The release times per year are 260 days/year).)*
Local freshwater dilution factor	10
Local marine water dilution factor	100
Release fraction to air from process	0.050 %
Release fraction to wastewater from process	0.500 %
Release fraction to soil from process	1 %
Fraction tonnage to region	100 %
Fraction used at main source	14.014 % *(justification: Maximum local tonnage: 140 to/year)*
STP	yes
River flow rate	18000 m^3/day
Municipal sewage treatment plant discharge	2000000 L/day

Other modified EUSES values	
Fraction released to waste water (Femis.water)	0.500 % *(justification: In accordance with IC 11 (Polymer Industry), table A3.10, industrial use, substance solubility >1000 mg/L, Type III "wet",* *Fraction of tonnage released to waste water: 0.5%).* *(Reference: "Technical guidance on Risk Assessment in support of Commission Directive 93/67/EEC on Risk Assessment for new notified substances, Commission Regulation (EC) No 1488/94 on Risk Assessment for existing substances, Directive 98/8/EC of the European Parliament and of the Council concerning the placing of biocidal products on the market" Part II, European Commission Joint Research Centre, EUR 20418 EN/2).*
Fraction released to air (Femis.air)	0.050 % *(justification: In accordance with IC 11 (Polymer Industry), table A3.10, industrial use, vapour pressure 1000 - 10000 Pa, Type III "wet",* *Fraction of tonnage released to air: 0.05%).* *(Reference: "Technical guidance on Risk Assessment in support of Commission Directive 93/67/EEC on Risk Assessment for new notified substances, Commission Regulation (EC) No 1488/94 on Risk Assessment for existing substances, Directive 98/8/EC of the European Parliament and of the Council concerning the placing of biocidal products on the market" Part II, European Commission Joint Research Centre, EUR 20418 EN/2).*
Temperature at which hydrolysis was measured (TEMPhydrtest)	288.15 K *(justification: Temperature at which hydrolysis was measured)*
Rate constant hydrolosis in water at test temperature (khydr.water.test)	104.11 d-1 *(justification: Hydrolysis rate in water for test item was empirically measured)*

3.1.2. Control of worker exposure: Use in closed batch process (synthesis or formulation) (PROC 3)

Qualitative Risk Assessment	
Eyes	Wear suitable safety goggles
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration was considered linearly *(justification: The concentration of the preparation consist of 50 % of substance only.)*
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm^2

Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	yes (inhalation 90 %; dermal 90 %)
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 20 95 %
Respiratory protection	99 % *(justification: Use of suitable respiratory protection (3M Respirator 42 CFR 84 N100 Particulate Filter, or equivalent)).*

3.1.3. Control of worker exposure: Use in batch and other process (synthesis) where opportunity for exposure arises (PROC 4)

Qualitative Risk Assessment	
Eyes	Wear suitable safety goggles
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration was considered linearly *(justification: The concentration of the preparation consist of 50 % of substance only.)*
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	yes (inhalation 90 %; dermal 90 %)
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 20 95 %
Respiratory protection	99 % *(justification: Use of suitable respiratory protection (3M Respirator 42 CFR 84 N100 Particulate Filter, or equivalent).)*

3.1.4. Control of worker exposure: Mixing or blending in batch processes (multistage and/or significant contact) (PROC 5)

Qualitative Risk Assessment	
Eyes	Wear suitable safety goggles
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration was considered linearly *(justification: The concentration of the preparation consist of 50 % of substance only.)*
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	yes (inhalation 90 %; dermal 90 %)
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 20 95 %
Respiratory protection	99 % *(justification: Use of suitable respiratory protection (3M Respirator 42 CFR 84 N100 Particulate Filter, or equivalent)).*

3.1.5. Control of worker exposure: Transfer of chemicals from/to vessels/ large containers at non dedicated facilities (PROC 8a)

Qualitative Risk Assessment	
Eyes	Wear suitable safety goggles
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration was considered linearly *(justification: The concentration of the preparation consist of 50 % of substance only)*
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2

Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	yes (inhalation 90 %; dermal 90 %)
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 20 95 %
Respiratory protection	99 % *(justification: Use of suitable respiratory protection (3M Respirator 42 CFR 84 N100 Particulate Filter, or equivalent)).*

3.1.6. Control of worker exposure: Transfer of chemicals from/to vessels/ large containers at dedicated facilities (PROC 8b)

Qualitative Risk Assessment	
Eyes	Wear suitable safety goggles
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration was considered linearly *(justification: The concentration of the preparation consist of 50 % of substance only)*
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	yes (inhalation 95 %; dermal 95 %)
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 20 95 %
Respiratory protection	99 % *(justification: Use of suitable respiratory protection (3M Respirator 42 CFR 84 N100 Particulate Filter, or equivalent).)*

3.1.7. Control of worker exposure: Transfer of chemicals into small containers (dedicated filling line) (PROC 9)

Qualitative Risk Assessment	
Eyes	Wear suitable safety goggles
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration was considered linearly *(justification: The concentration of the preparation consist of 50 % of substance only.)*
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	yes (inhalation 90 %; dermal 90 %)
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 20 95 %
Respiratory protection	99 % *(justification: Use of suitable respiratory protection (3M Respirator 42 CFR 84 N100 Particulate Filter, or equivalent).*

3.1.8. Control of worker exposure: Roller application or brushing (PROC 10)

Qualitative Risk Assessment	
Eyes	Wear suitable safety goggles
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration was considered linearly *(justification: The concentration of the preparation consist of 50 % of substance only).*
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	120 min/day, duration of activity was considered linearly *(justification: Do not carry out activity for more than 120 min/day).*
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2

Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	yes (inhalation 90 %; dermal 0 %)
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 20 95 %
Respiratory protection	99 % *(justification: Use of suitable respiratory protection (3M Respirator 42 CFR 84 N100 Particulate Filter, or equivalent).)*

3.1.9. Control of worker exposure: Treatment of articles by dipping and pouring (PROC 13)

Qualitative Risk Assessment	
Eyes	Wear suitable safety goggles
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration was considered linearly *(justification: The concentration of the preparation consist of 50 % of substance only).*
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	yes (inhalation 90 %; dermal 90 %)
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 20 95 %
Respiratory protection	99 % *(justification: Use of suitable respiratory protection (3M Respirator 42 CFR 84 N100 Particulate Filter, or equivalent)).*

3.2. Exposure estimation and reference to its source

3.2.1. Environmental release and exposure: Industrial use resulting in inclusion into or into a matrix (ERC5)

Environmental risk aquatic compartment (including sediment) of ES 3

Compartments	PEC	PNEC	RCR = PEC/PNEC
Freshwater	0.098648 mg/L	0.400 mg/L	0.246619
Freshwater sediment	0.45378 mg/kg_{dwt}	4.64 mg/kg_{dwt}	0.097797
Marine water	0.009865 mg/L	0.464 mg/L	0.02126
Marine water sediment	0.045378 mg/kg_{dwt}	0.048 mg/kg_{dwt}	0.945374

Environmental risk terrestrial compartment of ES 3

Compartments	PEC	PNEC	RCR = PEC/PNEC
Agricultural soil	0.006074 mg/kg_{dwt}	0.614 mg/kg_{dwt}	0.009892
Grassland	0.000848 mg/kg_{dwt}	0.614 mg/kg_{dwt}	0.001382

Environmental risk STP of ES 3

Compartments	PEC	PNEC	RCR = PEC/PNEC
STP	0.986492 mg/L	5.91 mg/L	0.166919

3.2.2. Worker exposure: Use in closed batch process (synthesis or formulation) (PROC3)

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal long-term systemic	0.001714 mg/kg_{bw}/day	0.280 mg/kg_{bw}/day	0.006122
inhalation long-term systemic	0.037122 mg/m^3	0.230 mg/m^3	0.161399
Combined routes	0.007017 mg/kg_{bw}/day	-	0.167522

3.2.3. Worker exposure: Use in batch and other process (synthesis) where opportunity for exposure arises (PROC 4)

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal long-term systemic	0.017143 mg/kg_{bw}/day	0.280 mg/kg_{bw}/day	0.061224
inhalation long-term systemic	0.074244 mg/m^3	0.230 mg/m^3	0.322798
Combined routes	0.027749 mg/kg_{bw}/day	-	0.384023

3.2.4. Worker exposure: Mixing or blending in batch processes (multistage and/or significant contact) (PROC 5)

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal long-term systemic	0.034286 mg/kg_{bw}/day	0.280 mg/kg_{bw}/day	0.122449
inhalation long-term systemic	0.185609 mg/m^3	0.230 mg/m^3	0.806995

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
Combined routes	0.060801 mg/kg$_{bw}$/day	-	0.929444

3.2.5. Worker exposure: Transfer of chemicals from/to vessels/ large containers at non dedicated facilities (PROC 8a)

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal long-term systemic	0.034286 mg/kg$_{bw}$/day	0.280 mg/kg$_{bw}$/day	0.122449
inhalation long-term systemic	0.185609 mg/m^3	0.230 mg/m^3	0.806995
Combined routes	0.060801 mg/kg$_{bw}$/day	-	0.929444

3.2.6. Worker exposure: Transfer of chemicals from/to vessels/ large containers at dedicated facilities (PROC 8b)

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal long-term systemic	0.017143 mg/kg$_{bw}$/day	0.280 mg/kg$_{bw}$/day	0.061224
inhalation long-term systemic	0.046402 mg/m^3	0.230 mg/m^3	0.201749
Combined routes	0.023772 mg/kg$_{bw}$/day	-	0.262973

3.2.7. Worker exposure: Transfer of chemicals into small containers (dedicated filling line) (PROC 9)

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal long-term systemic	0.017143 mg/kg$_{bw}$/day	0.280 mg/kg$_{bw}$/day	0.061224
inhalation long-term systemic	0.185609 mg/m^3	0.230 mg/m^3	0.806995
Combined routes	0.043658 mg/kg$_{bw}$/day	-	0.86822

3.2.8. Worker exposure: Roller application or brushing (PROC 10)

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal long-term systemic	0.171429 mg/kg$_{bw}$/day	0.280 mg/kg$_{bw}$/day	0.612245
inhalation long-term systemic	0.046402 mg/m^3	0.230 mg/m^3	0.201749
Combined routes	0.178057 mg/kg$_{bw}$/day	-	0.813994

3.2.9. Worker exposure: Treatment of articles by dipping and pouring (PROC 13)

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal long-term systemic	0.034286 mg/kg$_{bw}$/day	0.280 mg/kg$_{bw}$/day	0.122449
inhalation long-term systemic	0.185609 mg/m^3	0.230 mg/m^3	0.806995
Combined routes	0.060801 mg/kg$_{bw}$/day	-	0.929444

4. Scenario 4: Manufacture of another substance (use of intermediates)

Manufacture of another substance (use of intermediates)	
Environment	
CS 1: Industrial use resulting in inclusion into or onto a matrix	ERC 6a
Worker	
CS 2: Use in closed batch process (synthesis or formulation)	PROC 3
CS 3: Use in batch and other process (synthesis) where opportunity for exposure arises	PROC 4
CS 4: Mixing or blending in batch processes (multistage and/or significant contact)	PROC 5
CS 5: Transfer of chemicals from/to vessels/ large containers at non dedicated facilities	PROC 8a
CS 6: Transfer of chemicals from/to vessels/ large containers at dedicated facilities	PROC 8b
CS 7: Transfer of chemicals into small containers (dedicated filling line)	PROC 9
CS 8: Roller application or brushing	PROC 10
CS 9: Treatment of articles by dipping and pouring	PROC 13

4.1. Conditions of use affecting exposure

4.1.1. Control of environmental exposure: Manufacture of another substance (use of intermediates) (ERC6a)

Operational conditions	
Annual site tonnage	999 to/year
Daily amount used at site	538.462 kg/day
Release times per year	260 days/year *(justification: The release times per year are 260 days/year.)*
Local freshwater dilution factor	10
Local marine water dilution factor	100
Release fraction to air from process	0.050 %
Release fraction to wastewater from process	0.500 %
Release fraction to soil from process	0.100 %
Fraction tonnage to region	100 %
Fraction used at main source	14.014 % *(justification: Maximum local tonnage: 140 to/year)*
STP	yes
River flow rate	18000 m^3/day
Municipal sewage treatment plant discharge	2000000 L/day

Other modified EUSES values	
Fraction released to waste water (Femis.water)	0.500 % *(justification: In accordance with IC 11 (Polymer Industry), table A3.10, industrial use, substance solubility >1000 mg/L, Type III "wet",* *Fraction of tonnage released to waste water: 0.5%).* *(Reference: "Technical guidance on Risk Assessment in support of Commission Directive 93/67/EEC on Risk Assessment for new notified substances, Commission Regulation (EC) No 1488/94 on Risk Assessment for existing substances, Directive 98/8/EC of the European Parliament and of the Council concerning the placing of biocidal products on the market" Part II, European Commission Joint Research Centre, EUR 20418 EN/2).*
Fraction released to air (Femis.air)	0.050 % *(justification: In accordance with IC 11 (Polymer Industry), table A3.10, industrial use, vapour pressure 1000 - 10000 Pa, Type III "wet",* *Fraction of tonnage released to air: 0.05%).* *(Reference: "Technical guidance on Risk Assessment in support of Commission Directive 93/67/EEC on Risk Assessment for new notified substances, Commission Regulation (EC) No 1488/94 on Risk Assessment for existing substances, Directive 98/8/EC of the European Parliament and of the Council concerning the placing of biocidal products on the market" Part II, European Commission Joint Research Centre, EUR 20418 EN/2).*
Temperature at which hydrolysis was measured (TEMPhydrtest)	288.15 K *(justification: Temperature at which hydrolysis was measured)*
Rate constant hydrolosis in water at test temperature (khydr.water.test)	104.112 d-1 *(justification: Temperature at which hydrolysis was measured)*

4.1.2. Control of worker exposure: Use in closed batch process (synthesis or formulation) (PROC 3)

Qualitative Risk Assessment	
Eyes	Wear suitable safety goggles
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration was considered linearly (justification: The concentration of the preparation consist of 50 % of substance only).
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	240 cm2

Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	yes (inhalation 90 %; dermal 90 %)
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 20 95 %
Respiratory protection	99 % (justification: Use of suitable respiratory protection (3M Respirator 42 CFR 84 N100 Particulate Filter, or equivalent).

4.1.3. Control of worker exposure: Use in batch and other process (synthesis) where opportunity for exposure arises (PROC 4)

Qualitative Risk Assessment	
Eyes	Wear suitable safety goggles
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration was considered linearly *(justification: The concentration of the preparation consist of 50 % of substance only.)*
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	yes (inhalation 90 %; dermal 90 %)
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 20 95 %
Respiratory protection	99 % *(justification: Use of suitable respiratory protection (3M Respirator 42 CFR 84 N100 Particulate Filter, or equivalent).)*

4.1.4. Control of worker exposure: Mixing or blending in batch processes (multistage and/or significant contact) (PROC 5)

Qualitative Risk Assessment	
Eyes	Wear suitable safety goggles
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration was considered linearly (justification: The concentration of the preparation consist of 50 % of substance only.)
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	yes (inhalation 90 %; dermal 90 %)
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 20 95 %
Respiratory protection	99 % (justification: Use of suitable respiratory protection (3M Respirator 42 CFR 84 N100 Particulate Filter, or equivalent)).

4.1.5. Control of worker exposure: Transfer of chemicals from/to vessels/ large containers at non dedicated facilities (PROC 8a)

Qualitative Risk Assessment	
Eyes	Wear suitable safety goggles
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration was considered linearly (justification: The concentration of the preparation consist of 50 % of substance only).
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm2

Qualitative Risk Assessment	
Eyes	Wear suitable safety goggles
Product characteristics	
Physical state	
Concentration in substance	50 %, concentration was considered linearly (justification: The concentration of the preparation consist of 50 % of substance only).
Fugacity / Dustiness	
Frequency and duration of use	
Duration of activity	>4 hours (default)
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	yes (inhalation 90 %; dermal 90 %)
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 20 95 %
Respiratory protection	99 % *(justification: Use of suitable respiratory protection (3M Respirator 42 CFR 84 N100 Particulate Filter, or equivalent)).*

4.1.6. Control of worker exposure: Transfer of chemicals from/to vessels/ large containers at dedicated facilities (PROC 8b)

Qualitative Risk Assessment	
Eyes	Wear suitable safety goggles
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration was considered linearly *(justification: The concentration of the preparation consist of 50 % of substance only)*
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	Industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	yes (inhalation 95 %; dermal 95 %)

Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 20 95 %
Respiratory protection	99 % *(justification: Use of suitable respiratory protection (3M Respirator 42 CFR 84 N100 Particulate Filter, or equivalent).)*

4.1.7. Control of worker exposure: Transfer of chemicals into small containers (dedicated filling line) (PROC 9)

Qualitative Risk Assessment	
Eyes	Wear suitable safety goggles
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration was considered linearly (justification: The concentration of the preparation consist of 50 % of substance only).
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	yes (inhalation 90 %; dermal 90 %)
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 20 95 %
Respiratory protection	99 % (justification: Use of suitable respiratory protection (3M Respirator 42 CFR 84 N100 Particulate Filter, or equivalent).)

4.1.8. Control of worker exposure: Roller application or brushing (PROC 10)

Qualitative Risk Assessment	
Eyes	Wear suitable safety goggles
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration was considered linearly *(justification: The concentration of the preparation consist of 50 % of substance only.)*
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	120 min/day, duration of activity was considered linearly *(justification: Do not carry out activity for more than 120 min/day)*
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	960 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	yes (inhalation 90 %; dermal 0 %)
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 20 95 %
Respiratory protection	99 % *(justification: Use of suitable respiratory protection (3M Respirator 42 CFR 84 N100 Particulate Filter, or equivalent)).*

4.1.9. Control of worker exposure: Treatment of articles by dipping and pouring (PROC 13)

Qualitative Risk Assessment	
Eyes	Wear suitable safety goggles
Product characteristics	
Physical state	liquid
Concentration in substance	50 %, concentration was considered linearly *(justification: The concentration of the preparation consist of 50 % of substance only).*
Fugacity / Dustiness	medium
Frequency and duration of use	
Duration of activity	>4 hours (default)
Frequency of use	5 days / week
Human factors not influenced by risk management	
Exposed skin surface	480 cm^2
Other given operational conditions affecting workers exposure	
Location	indoors
Domain	industrial
Technical conditions and measures to control dispersion and exposure	
Local exhaust ventilation	yes (inhalation 90 %; dermal 90 %)
Conditions and measures related to personal protection, hygiene and health evaluation	
Protective gloves	Gloves APF 20 95 %
Respiratory protection	99 % *(justification: Use of suitable respiratory protection (3M Respirator 42 CFR 84 N100 Particulate Filter, or equivalent)).*

4.2. Exposure estimation and reference to its source

4.2.1. Environmental release and exposure: Manufacture of another substance (use of intermediates) (ERC6a)

Environmental risk aquatic compartment (including sediment) of ES4

Compartments	PEC	PNEC	RCR = PEC/PNEC
Freshwater	0.098648 mg/L	0.400 mg/L	0.246619
Freshwater sediment	0.45378 mg/kg_{dwt}	4.64 mg/kg_{dwt}	0.097797
Marine water	0.009865 mg/L	0.464 mg/L	0.02126
Marine water sediment	0.045378 mg/kg_{dwt}	0.048 mg/kg_{dwt}	0.945374

Environmental risk terrestrial compartment of ES 4

Compartments	PEC	PNEC	RCR = PEC/PNEC
Agricultural soil	0.006074 mg/kg_{dwt}	0.614 mg/kg_{dwt}	0.009892
Grassland	0.000848 mg/kg_{dwt}	0.614 mg/kg_{dwt}	0.001382

Environmental risk STP of ES 4

Compartments	PEC	PNEC	RCR = PEC/PNEC
STP	0.986492 mg/L	5.91 mg/L	0.166919

4.2.2. Worker exposure: Use in closed batch process (synthesis or formulation) (PROC3)

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal long-term systemic	0.001714 mg/kg$_{bw}$/day	0.280 mg/kg$_{bw}$/day	0.006122
inhalation long-term systemic	0.037122 mg/m^3	0.230 mg/m^3	0.161399
Combined routes	0.007017 mg/kg$_{bw}$/day	-	0.167522

4.2.3. Worker exposure: Use in batch and other process (synthesis) where opportunity for exposure arises (PROC 4)

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal long-term systemic	0.017143 mg/kg$_{bw}$/day	0.280 mg/kg$_{bw}$/day	0.061224
inhalation long-term systemic	0.074244 mg/m^3	0.230 mg/m^3	0.322798
Combined routes	0.027749 mg/kg$_{bw}$/day	-	0.384023

4.2.4. Worker exposure: Mixing or blending in batch processes (multistage and/or significant contact) (PROC 5)

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal long-term systemic	0.034286 mg/kg$_{bw}$/day	0.280 mg/kg$_{bw}$/day	0.122449
inhalation long-term systemic	0.185609 mg/m^3	0.230 mg/m^3	0.806995
Combined routes	0.060801 mg/kg$_{bw}$/day	-	0.929444

4.2.5. Worker exposure: Transfer of chemicals from/to vessels/ large containers at non dedicated facilities (PROC 8a)

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal long-term systemic	0.034286 mg/kg$_{bw}$/day	0.280 mg/kg$_{bw}$/day	0.122449
inhalation long-term systemic	0.185609 mg/m^3	0.230 mg/m^3	0.806995
Combined routes	0.060801 mg/kg$_{bw}$/day	-	0.929444

4.2.6. Worker exposure: Transfer of chemicals from/to vessels/ large containers at dedicated facilities (PROC 8b)

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal long-term systemic	0.017143 mg/kg_{bw}/day	0.280 mg/kg_{bw}/day	0.061224
inhalation long-term systemic	0.046402 mg/m^3	0.230 mg/m^3	0.201749
Combined routes	0.023772 mg/kg_{bw}/day	-	0.262973

4.2.7. Worker exposure: Transfer of chemicals into small containers (dedicated filling line) (PROC 9)

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal long-term systemic	0.017143 mg/kg_{bw}/day	0.280 mg/kg_{bw}/day	0.061224
inhalation long-term systemic	0.185609 mg/m^3	0.230 mg/m^3	0.806995
Combined routes	0.043658 mg/kg_{bw}/day	-	0.86822

4.2.8. Worker exposure: Roller application or brushing (PROC 10)

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal long-term systemic	0.171429 mg/kg_{bw}/day	0.280 mg/kg_{bw}/day	0.612245
inhalation long-term systemic	0.046402 mg/m^3	0.230 mg/m^3	0.201749
Combined routes	0.178057 mg/kg_{bw}/day	-	0.813994

4.2.9. Worker exposure: Treatment of articles by dipping and pouring (PROC 13)

Route	Exposure concentration (EC)	DNEL	Risk characterisation ratio = EC/DNEL
dermal long-term systemic	0.034286 mg/kg_{bw}/day	0.280 mg/kg_{bw}/day	0.122449
inhalation long-term systemic	0.185609 mg/m^3	0.230 mg/m^3	0.806995
Combined routes	0.060801 mg/kg_{bw}/day	-	0.929444

5. OVERALL EXPOSURE (COMBINED FOR ALL RELEVANT EMISSION/RELEASE SOURCES)

5.1. Local release of all wide dispersive uses (including regional exposure)

Aquatic compartment (including sediment)

Compartments	PEC	PNEC	RCR = PEC/PNEC
Freshwater	7.05E-8 mg/L	0.400 mg/L	1.76E-7
Freshwater sediment	4.65E-8 mg/kg_{dwt}	4.64 mg/kg_{dwt}	1.00E-8
Marine water	2.07E-10 mg/L	0.464 mg/L	4.46E-10
Marine water sediment	1.37E-10 mg/kg_{dwt}	0.048 mg/kg_{dwt}	2.86E-9

Terrestrial compartment

Compartments	PEC	PNEC	RCR = PEC/PNEC
Agricultural soil	5.18E-8 mg/kg_{dwt}	0.614 mg/kg_{dwt}	8.44E-8
Grassland	5.18E-8 mg/kg_{dwt}	0.614 mg/kg_{dwt}	8.44E-8

Total releases

Release route	Total releases per year
water	8.242 to/year
air	15.235 to/year
soil	2.797 to/year